

Teaching mathematics to foreign pupils in Italian compulsory schools: Findings from an European project

Franco Favilli and Stefania Tintori, Università di Pisa, Italy

An European project about teaching mathematics in multicultural contexts started in the 2000/01 school year. The project target are teachers in lower secondary schools and their 11-14 years old pupils. The partner countries are Italy, Portugal and Spain. In the first year of the project life (three years), a wide set of data and information have been gathered to have a better view of the *state of the art* in each country. In the paper we present a few of the first findings from this activity, with respect to the Italian schools. The findings are, in particular, from the teachers' answers to a questionnaire and the interviews to some of the mathematics teachers with foreign pupils in their classes.

The Italian school in the multicultural society

Due to a greater and greater presence of foreign citizens, coming from everywhere in the world, multiculturalism has become one of the peculiar aspects of the Italian school and represents, at the social level, one of the most significant transformation in the last years.

An investigation carried out by the Italian Ministry of the Education in the 2000/01 school year (see [13], [14]) estimates that the foreign pupils in the Italian primary, lower and higher secondary schools were approximately 150.000, i.e. 2% of the entire school population, and represented 184 countries. Compared to the percentages in other European countries, the above figure is, however, rather low and shows how, in Italy, the multiculturalism in the classroom is quite a new phenomenon. It is a varied phenomenon too, as we have

- 1 *geographical variety*, as 66% of foreign pupils concentrates in the Northern schools while only 10% of them are in the Southern ones;
- 2 *citizenship variety*, mainly characterized by the fact that in the same town or region foreign pupils may usually represent a high number of citizenships with significantly different distribution of presences (e.g. in Milan the majority of foreign pupils are from Peru, in Rome from Romania, in Florence from China);
- 3 *time variety*, as the presence of foreign pupils has had in Italy different characteristics: in fact, while in the last two years the country with more pupils has been Albania, in the 1995/96 and 1996/97 school years it was the former Yugoslavia, as well as in the 1997/98 and 1998/99 it was Morocco.

To these remarks we have to add the fact that the *multiculturalism in the classroom*, as already said, is a rapidly developing phenomenon. The presence of foreign pupils is more and more increasing; some countries, in the last five years, have even tripled their presence in the Italian schools! This trend makes it possible, how pointed out in [14], that, just assuming the average arrival of just

50.000 foreign citizens per year, in the 2016/17 school year the foreign pupils in the Italian schools will be approximately 300.000, i.e. 3.8% of the whole school population.

Nowadays the foreign pupil is no more an exception in Italy and has become a reality, implying needs and asking for resources. The school system, once got through the emergency, is starting to meet, in a more systematic and careful way, the demands arisen from the new situation. In particular, the school is asked to undertake the double task to be an active subject in the process of foreign pupil's integration in the society and give the pupil all the cognitive tools, which are needed to be an acquainted and conscious citizen.

The significance of the immigration phenomenon and the related unavoidable educational difficulties has been the main incentives for numerous investigations and researches. The Ministry of the Education studies, which we have referred to, are a rich source of quantitative information. They meet also the need of a deep knowledge about the way the Italian school has progressively changed, as for both its organization and didactics.

Besides those studies, a view at the Italian bibliography on *multiculturalism and school* allowed us to have a better understanding of the dimension of the phenomenon. From the analysis of a list of approximately 130 publications related to that topic further remarks could be derived, which help to get a better awareness of the prominence of the new educational reality. It clearly turns out the strong need for a deeper knowledge of the phenomenon too, not only at the quantitative level but also at the qualitative one. First of all, we can realize that all the filed publications have been edited in the last ten years, so proving the greater and greater importance of the intercultural education and the need to get a better understanding of the related cultural, educational and institutional problems. On the other hand, the need of a definition of ethically correct and didactically effective strategies is not clearly acknowledged yet. In fact the large majority of the publications are mainly focused into the general problem of the integration. There are only few texts, which tackle the multicultural topic in a more specific and disciplinary way: among them we can consider *L'educazione interculturale. Curricolo linguistico e curricolo etnomusicale* [11], *L'educazione interculturale, ipotesi di curricoli per la scuola dell'obbligo. 2. Ambito delle religioni* [12]. In particular, it is significant the fact that the texts devoted to mathematics education in multicultural contexts are only two ([3], [4]), just 1.5% of the filed ones. This fact proves the need of more bibliography about this topic and the wideness of a research field that, in the outline of the Italian investigations in mathematics education, appears not well explored yet.

The IDMAMIM European Project.

Inside the above-described reality, as for both the study of the present situation created by the presence of foreign pupils in the schools and the investigation on the Italian texts on multicultural education, we can locate the first part of the

activities carried on under the IDMAMIM Project. This acronym stands for *Innovazione Didattica MAtematica e sussidi tecnologici in contesti Multiculturali, con alunni Immigrati e Minoranze* (Mathematical didactics innovation and technological aids in multicultural contexts, with immigrant pupils and minorities).

IDMAMIM is a European Union SOCRATES-COMENIUS/action 3.1 project. Its target is the mathematics teaching staff, in particular mathematics teachers in lower secondary schools (pupils age: 11 to 14 years). The partners Institutions are the Universities of Granada (Spain), Lisbon (Portugal) and Pisa (Italy), which is co-ordinating the project. As for the Spain we have to recall the project referred to in [9] and [10].

IDMAMIM project manages to get directly into the research on multiculturalism with two aims: to point out possible didactical needs in mathematics education in multicultural school contexts and to meet them through the planning and production of educational aids for the teachers and multimedia didactical supports. The planning and production of these aids will be founded on the ethnomathematics programme ([5], [7], [8]) and the in-context mathematics education ([1], [2], [15]), which are the epistemological support to the whole project.

The three years long project is in its second year of activity. The first year was almost completely devoted to obtain a deep knowledge of the present mathematics teaching in multicultural contexts in the three partner countries, through

- 4 a questionnaire addressed to mathematics teachers in the compulsory schools (primary school and lower secondary school, pupils from 6 to 14 years of age);
- 5 interviews of a few mathematics teachers in lower secondary schools (pupils from 11 to 14 years of age));
- 6 video recording of mathematics classes, in classrooms with foreign pupils.

Just referring to the knowledge obtained in Italy through this research, we'll show in this paper some of the most interesting findings; but we wish first to present the situation of the Province of Pisa, in Tuscany Region, which the project focuses into.

IDMAMIM project takes advantage in Italy of the co-operation of the schools of the Province of Pisa, to which the questionnaires have been sent, and of some mathematics teachers, who have accepted to be interviewed and video-recorded during their classes.

It is useful to consider some data related to the school population in that Province and remark that they are fully coherent with the data gathered at national level; this coherence shows the relevance of the local data. In the Province of Pisa, in the 1999/2000 school year (the year of reference for the questionnaire), there were 859 foreign pupils, i.e. 2.5% of the pupils attending the compulsory schools [16]. Furthermore, as for the provenance, the Province

of Pisa was and is still characterized (as we have remarked for the entire country) by a significant migratory polycentrism, which obviously influences the foreigner's presence in the schools. This makes it possible that we can find up to 30 countries, which are represented by at least three pupils. Finally, again coherently with what found out at national level, we remark that Albania was the country with the greatest number of pupils.

The questionnaire and the interviews

While writing the questionnaire items, we have taken advantage of the experience and some findings from a previous questionnaire, that we had circulated in the Province of Pisa in the year 1996 to get a first view of the intercultural educational reality. The analysis of the answers to those questions has been the motivation and the foundation of the IDMAMIM project, which has been extended to Portugal and Spain, European countries with similar conditions.

The IDMAMIM project questionnaire has been addressed, in the year 2000, to mathematics teachers in compulsory schools and is composed of two sections. The Section 1 focuses into the pupils: each teacher has been asked to fill in just one Section 1 for every single foreign pupil in the classroom. The Section 1, in turn, is divided in two parts. The first one is almost exclusively devoted to the collection of general information on pupil's provenience and school career. The second part is devoted to the pupil's possible difficulties in both processes of integration in the class and learning, with a specific attention paid to mathematics. The Section 2, instead, focuses into the mathematics teachers: they are asked detailed information on the way they face the specific didactical situation, created by the presence in their classes of one or more foreign students, and an evaluation of the experience carried on.

Surprisingly, respect to the expectations, the teachers' co-operation to the initiative of the questionnaire has been, in terms of number, very good: in fact, we received back 106 Sections 1 (focused into the pupils) and 63 Sections 2 (focused into the teachers). From a statistical point of view, we have therefore got a significant sample, as foreign pupils attending the compulsory schools in the Province of Pisa during the 1999/2000 school year were 594: our sample represents then 18% of the total.

After a careful analysis of the data gathered from the questionnaires, twelve mathematics teachers from different lower secondary schools have been interviewed to have a deeper knowledge of some aspects of specific prominence and interest, emerged from the analysis itself. The interviews have had a semi-structured form: the interviewer had to collect teachers' opinion on a list of topics, but the teachers were free to talk first about everything related to their experience. If necessary, the interviewer had to put specific questions to get the information on the topics the teachers had not talked about yet.

Foreign pupils between integration and education

Our exposition of some of the main findings of the investigation will be divided in two parts, according to the questionnaire structure. In particular, in the first part, devoted to the foreign pupil, we'll report some of the most relevant issues come out from the analysis of teachers' answers in the Section 1.

But, first of all, it is important to point out very soon the two investigation levels, which characterize that Section and are therefore reflected in the related analysis. The aim of the questions in the Section 1 is to focus teachers' attention into the foreign students in their classes. Through their answers, we try to understand the way mathematics teachers perceive the new professional reality and use adequate educational strategies in view of

- 7 an effective integration of the foreign pupil in the class, which should be the base for an appropriate integration in the society too;
- 8 a real and complete learning, by the foreign pupil, of the cultural patrimony and cognitive tools presented by the teacher to the whole class.

The two issues are strictly related and ask for positive and efficacious answers, not general but specific ones, which take into account the single foreign pupil, his/her cultural background and the whole class one.

The awareness that an effective intercultural education must involve both issues led us to structure the second part of the Section 1 in two groups of questions. The first group is devoted to the integration, with questions aimed to get information on the level of the Italian language knowledge by the foreign pupil, his/her integration in the class, his/her relationships with the classmates, etc. The second group of questions is devoted, instead, to pupil's education, in particular in mathematics: therefore, in this group there are questions on possible specific difficulties met learning this subject. It is widely shared the opinion that it is impossible to obtain a full school and social integration, if the foreign pupil is not allowed to attain an adequate cultural level, through the educational path supplied by the school itself. Starting from the above premises, we can describe a few specific findings from the questionnaires analysis.

As for the integration, the foreign pupils who have shown big difficulties in their insertion in the class are 25% of the total; to them we have to add another 34% of pupils who experienced, at first, average difficulties. It is therefore significant that for only 41% of the foreign pupils the insertion in the class has not implied specific difficulties. These data can be better understood if we compare them with those related to the next question: *Is such difficulty of insertion still present?* . Well, 72% of the foreign students, at the end of the school year, have no insertion problem and this has happened mainly thanks both to the direct teachers' engagement and the classmates co-operation. The school system, basically the teachers, seems to be able to face the integration problem!

To these remarks is then important to add more data, in the attempt to evaluate the foreign pupil's learning standard and understand if to a good integration corresponds a good education too. Again, a specific attention has been paid to mathematics learning. The analysis of the data has been done mainly following two lines:

- 9 the first one, of general nature, led us to the analysis of the linkage between foreign pupil and mathematics learning;
- 10 the second one, more specific, led us to a distinct analysis of the situations met in the two school orders (primary and lower secondary schools) under investigation.

As for the first line, it is possible to remark some interesting findings. First of all, Italian and Mathematics are the subjects where foreign pupils show greater learning difficulties. Further, also if the mathematics learning difficulties, in most cases, are viewed (we recall, by the teachers who have answered the questionnaires) of average extent, however they are, in 59% of the cases, greater than the average difficulty met in the same topics by the other pupils. Such data clearly show the presence of a rather problematic condition, which has necessarily to be studied, tackled and, if possible, worked out.

Through the second line, instead, it is possible to get even more specific, sometimes surprising, information about foreign pupils' mathematics learning. With regard to that, we synthetically refer to some data obtained by the answers to the following question in the Section 1:

The foreign pupil mainly meets learning difficulty in:

	ITALIAN	MATHEMATICS	HISTORY
PRIMARY	42%	32%	11%
SECONDARY	21%	42%	16%

Dwelling upon mathematics, we realize that both in primary and lower secondary schools (with quite similar percentages) the foreign pupil meet an average mathematics learning difficulty, which is however greater than the average one met by the classmates. Other interesting hints are offered also by one of the following questions, where teachers are asked to say in which mathematics field the foreign pupil meets greater problems. Here are the findings:

The pupil meets more difficulty in:

	ARITHMETIC	GEOMETRY	BOTH
PRIMARY	42%	14%	29%
SECONDARY	4%	58%	38%

In short, we can say that the analysis of the Section 1 shows a general condition of difficulty in mathematics learning by foreign pupils. It shows some divergences too between the data gathered in the two school orders, divergences possibly related to different teachers' aptitudes in mathematics education: more attentive to the pupil as individual in the primary schools, more attentive to the

subject contents in the lower secondary ones. For sure, the general difficulty met by foreign pupils makes it necessary a precise investigation on the way mathematics teachers have behaved in such a context of clear cultural conflict. The Section 2 of the questionnaire is fully devoted to this investigation.

Mathematics teachers: A description of their experience.

There are many hints given by the answers to the questionnaire as well as by the subsequent interviews to mathematics teachers. Here we present the ones we judge more useful for an exhaustive picture of the way teachers have faced the specific didactical condition and of their consequent reflections. We can describe the experience of teaching mathematics in multicultural contexts considering the matter from three points of view:

- 11 the teacher's aptitude,
- 12 the teacher's vocational education,
- 13 the teacher's behaviour.

As for the teachers' *aptitude*, we can single out three categories:

- 14 the concerned teachers (92%):

My concern has been motivated by the strong desire to help pupil's integration in the class.

I am curious to know different cultures (habits, behaviour).

I am interested in understanding the breaking points between the scientific knowledge of our culture and the scientific knowledge of foreign pupils cultures.

- 15 the unconcerned teachers (3%)

I think I have to consider the foreign pupils as the Italian ones.

- 16 the bored teachers (2%)

I got bored because of the difficulty of having to do a specific work, taking into account the poor available means.

It is important to remark that the interest, shown by almost all teachers who have answered the questionnaire, has different levels of depth. It can be reduced to a simple attention to the integration problem (as, for example, in the first referred answer). But it can even push the teacher to try to find out (as in the third answer) specific views of the taught subject, in this way showing the belief that mathematics is a product of the human mind which is nor culture-free nor universal [2].

As for the *vocational education* that teachers state they have tried to acquire before starting the new didactical-professional experience, it has come out that

- 17 48% of the teachers have done nothing
- 18 15% of them have attended specific courses
- 19 2% have read texts related to the multiculturalism

20 35% have tried to get ready to the task in different ways: for example, talking to colleagues who had previously done such experience.

The poor attention paid by mathematics teachers to acquire a specific vocational education is particularly surprising, mainly if compared with the high degree of their concern to the new experience, as pointed out before. Possibly, this fact is a consequence of the shortage of time officially devoted in the Italian school system to the in-service teachers training. It could also be caused by the lack of training courses and aids concerning mathematics education in multicultural contexts.

However, if we pay attention to mathematics teachers' *behaviour* in the classrooms, it is clear that the multicultural context has significantly affected their activities, pushing them

21 to start specific projects to make easier the insertion of the foreign pupil in the class (63% of teachers);

22 to modify their teaching methodologies (58%), using a plain language, building individual didactical paths or starting more frequently from real life situations when introducing new concepts or posing problems;

23 to carry out a differentiated work for foreign pupils (62%).

Mathematics teachers and multicultural contexts

The research has mainly focused into the considerations done by the teachers about their vocational experience of teaching mathematics having foreign pupils in the classroom. As the most important observers of the present socio-cultural change in the Italian schools and, at the same time, subjects actively involved in such change, teachers represent one of the best sources for information about a reality which is still hardly describable, mainly in mathematics education.

From the considerations done by the teachers, in a quite structured way through the questionnaires and in a much more free way through the interviews, it has come out

24 the acknowledgement of the peculiarity of the new didactical condition;

25 the awareness of the partial effectiveness of the activities carried on to tackle that condition;

26 the strong need of a specific in-service training and adequate didactical aids;

27 the belief of the existence of a link, to be carefully investigated, between mathematics education and foreign pupils culture.

Mathematics teachers, most frequently, refer to their experience pointing out

28 difficulties originated by the foreign pupils' poor knowledge of the discipline:

They don't know even what geometry means.

When such pupils have arrived – I think they arrived in the second grade of the lower secondary school – they had done almost nothing, they were at the level of a third or fourth grade pupil in primary school, no more.

29 difficulties originated by the language, which are shown both by their poor comprehension of the Italian and by, more particularly, an inadequate use of the Italian in mathematics (as for this topic, see [6]):

These pupils meet difficulties, first of all, in the language, so that the language, sometimes free and easy, used by the teacher...what can the pupils understand from this language?... Very few, I believe.

The greatest difficulties, in my opinion, are met in mathematics, because of the language; I mean, mathematics needs a knowledge of the language, so that it is not sufficient to understand the meaning from the context...as one must be able to analyse the quantificators, to understand...

30 difficulties originated by the ways and the times characterizing their insertion in the class:

Another very difficult thing is that these foreign pupils, more than the Italian ones, arrive in any period of the school year, so that they arrive in a class where certain dynamics already exist, groups have already been created, like a bomb. Further they cannot speak...Most likely, I do not exactly know that, but I have the idea that they are inserted [in a class] only taking into account their age and not their knowledge.

Clearly, the teachers, worried about carrying out their institutional task as better as possible, are mainly affected by the additional difficulties often presented by the multiculturalism in the class. However we can single out that some of them can find, in the experience they are living, positive points of views, at human level too:

A very positive fact I remember in this experience is the friendly relations, I would say sometimes affectionate, I have been able to create with these pupils.

Again as in the Section 1 devoted to the pupils, a good integration in the class of the foreign pupil is for the teachers the first problem to be solved and, at the same time, it seems to be a problem they are able to tackle very successfully. Therefore, it is even more necessary to deepen the investigation to give teachers aids and methods to face the other difficulties, mainly the difficulties related to foreign pupils' cultural training, in particular the mathematical one: such difficulties still appear as an unsolved problem.

Many and various have been the ways by which numerous teachers have tried to get through the teaching/learning difficulties. As for that, after the analysis of their answers to the question *How has such didactical condition been faced?*, we have to pay attention not only to the different methodologies used by the teachers, but also to their dissatisfaction and the common feeling of inefficacy that each methodology, even though very different, has produced in the teacher:

I have hoped to be able to follow a path like that: to teach them the four operations, especially in the first grade of the lower secondary school...but it is difficult.

Also for these two, the first exercises...the other pupils received the test and had to find the data...in the class-work I already gave them the figure with the letters and the data written...and the intermediate data with the question mark...but they met some difficulties anyway.

The emergency condition has pushed many teachers to try to use, in the way they were judging as more useful, any available thing:

As for geometry, they work willingly with the PC, as we use CABRI and therefore they work with pleasure, but always at the level of a play.

I was lucky as I had in my class a supporting teacher...who had the chance to help also the others, not attending only the pupil with handicap, but involving the foreign pupil too and enlarge a little bit the group.

Frequently the teachers, to carry out an individual path for the foreign pupil, have relied on the supporting teacher, when available because of the presence in the class of a pupil with handicap. To assimilate, some way or other, the two conditions – to be a foreign pupil and to be a pupil with handicap – looks a dangerous forcing for the foreign pupil both at psychological and didactical level.

It is important therefore to point out that the use of certain didactical aids and the help from the supporting teachers are not specific answers to a precise problem or even represent specific answers for a quite different problem, the education of a handicapped pupil. In general, the fact that, in spite of the introduction of different strategies, mathematics teachers have not been able to attain the appointed educational aims, pushes them very often to a re-definition, culturally lower, of those aims:

From her I required the most important things...there is a maybe wrong demand, from us, from the teachers...there was a smaller demand from me.

This behaviour strongly contrasts with the achievement by the foreign pupil of a good and complete cultural patrimony. In this way, the school relinquishes one of its main tasks: to give everybody an adequate education. Paradoxically the school, through the teachers, seems to be more ready to make effectively easier the correct integration of foreign pupils, than their education. As for this, there are many teachers who point out the strong need of in-service training courses (see [17]) and specific didactical aids, how is shown by the following data gathered from the answers to questions in the Section 2:

- Do you think that teachers with foreign pupils in the class need to have a specific training?
Yes (76%) No (16%) It depends (8%)
- Do you think it useful to acquire specific abilities on methodologies aimed to the school integration of foreign pupils?
Yes (90%) No (10%)

- Do you think it useful the attendance of training and refresher courses for teachers working with foreign students?
Yes (80%) No (20%)
- Do you think the available didactical resources adequate to the presence of foreign pupils in the class?
Yes (16%) No (84%)

Furthermore, the interviews have given many suggestions on the paths which could be chosen; sometimes the suggestions are in contrast, but they all help to describe the multiple sides of a reality, the multiculturalism in the classroom, didactically new and, to many teachers, stimulating. Among the suggestions, we can include:

31 to promote a deep knowledge of the Italian

I believe it necessary to aim always at the language...I think that it is the first support...

32 to find the ways and the times to take care of foreign pupils more directly and individually

If we had a support or more hours, for example, the hours available could be organized to be devoted only to foreign pupils...then we could really obtain some results

33 to understand exactly which are their mathematics knowledge, taking information about their previous school curriculum too

It would be necessary something to understand which are their abilities...entrance tests to understand...to be informed, at least superficially, about the programmes and the related ages

34 to pay a specific attention to a didactics which could be adapted to the pupils, hopefully rich of references to the real life

The more we can use a didactics in which we are able to manipulate the things, from tables to drawings, to geometric figures, to cut etc., the more we are probably able to allow them to understand the things

35 to make available different teaching aids, possibly related to the pupil's culture

Wherever there is a real problem...maybe there, having the knowledge of the culture where they come from, having teaching aids like geometric instruments, abaci, everything could be useful...having teaching aids it is easier to verify that the pupil is understanding what he/she is doing

36 to have a deeper knowledge of the discipline, to have a better knowledge of what must be taught and of the mathematics learnt by the pupil in his/her origin country

It should be helpful the support from somebody who knows mathematics very well, because he/she could help us to find easier ways, different ways, mainly if they have learnt something in a different way...

As for the last suggestion, we have to say that in the Italian compulsory schools very few mathematics teachers have got a University qualification in mathematics.

In the above suggestions we can identify different levels of depth and specificity. They range from a general level, which refers to the language, to a very specific one, the last one, which is strictly related to the discipline. We can remark a sequence of steps, which offers a gradual perspective change: from initial focuses into the linguistic barrier or the time scarcity to a more didactical perspective, which pays a great attention to the methodologies, the teaching aids, the mathematical contents. Further, we can see that the deeper is the suggestion level the greater is the teacher's awareness of the links between mathematics education and foreign pupils' culture.

It is manifest that the teachers who experienced multicultural teaching contexts become aware of the ethnologic dimension of mathematics. They realize that mathematics, at non-scholastic and non-formal levels, may have different faces in different cultures. The interviewed teachers variously feel this linkage between mathematics and culture and it is interesting to look at the way they face it; we can identify two opposite aptitudes:

37 an aptitude focused into the attempt to force the foreign pupil to change his/her way of thinking, complying with the rest of the class

I think it difficult to disassemble what they have inside and reassemble it according to our method, I think that the difficulty is mainly there, to oblige them to think in a different way

38 an aptitude of acceptance of the foreign pupil different culture, which cannot and has not to be changed

In my opinion, we want to change their culture, we want to put on our culture and change their one...it is impossible, they do have their culture...

Behind both aptitudes there is the common acknowledgement of the fact that foreign pupils enter the classes with their own culture. Therefore they possibly take into the class a set of mathematical knowledge which could appear non-standard (with respect to the rest of the class); they possibly use computing algorithms which are different from the ones used by their classmates (and which sometimes are not accepted by the teachers!); they can have a different way of tackling mathematics problems...

As for all that, it is very interesting to refer what a lower secondary school mathematics teacher, who has a Peruvian girl in her class, has said:

I have become curious for a certain way of reasoning that, I think, is a little bit different, but which I am unable to describe very well...especially the Peruvian girl, who is clever, she is good in mathematics but sometimes she says "No, no! I cannot absolutely understand this reasoning!". Now I have no examples about that, but sometimes she amazes her classmates too...as some of our ways of reasoning appear to be foreign to her...They have attended the primary school in Italy and therefore they have learnt all the algorithms in Italy; that's why I am very curious, as I feel that sometimes there is a different way of

reasoning...especially, I would say, different thinking strategies, not techniques, as I can say she has always lived in Italy.

The teachers' attention moves to a deeper level as they emphasize not only technical differences (like the way of making computations), but also meta-cognitive ones (concerning the way of reasoning and the thought structures).

References

1. Barton B.: 1996, 'Anthropological Perspectives on Mathematics and Mathematics Education', *International Handbook of Mathematics Education*, 1035-1053.
2. Bishop A. J.: 1988, 'Mathematics Education in its cultural context', *Educational Studies in Mathematics*, **19**, 179-191.
3. Cappelletti A.M.: 2000, *Didattica interculturale della geometria*, EMI, Bologna, Italy.
4. Cappelletti A.M.: 2000, *Didattica interculturale della matematica*, EMI, Bologna, Italy.
5. D'Ambrosio U.: 1995-96, 'Ethnomathematics: theory and pedagogical practice', I and II parts, *L'educazione matematica*, **2**, n.3, 147-159 and **3**,n.1, 29-48.
6. Ellerton N.F., Clarkson P.C.: 1996, 'Language Factors in Mathematics Teaching and Learning', *International Handbook of Mathematics Education*, 987-1033.
7. Gerdes P.: 1999, *Geometry from Africa – Mathematical and Educational Explorations*, The Mathematical Association of America, Washington, USA.
8. Gerdes P.: 1988, 'On Possible Uses of Traditional Angolan Sand Drawings in the Mathematics Classroom', *Educational Studies in Mathematics*, **19**, 3-22.
9. Gorgorio N.: 1998, 'Starting a Research Project with Immigrant Students: Constraints, Possibilities, Observations and Challenges', *Proceedings of MES 1*, Nottingham, UK.
10. Gorgorio N., Planas N., Vilella X.: 1999, 'The Cultural Conflict in Mathematics Classroom: Overcoming its 'Invisibility'', *Proceedings of CIEAEM 51*, Chichester, UK.
11. IRRSAE Puglia: 1995, *L'educazione interculturale. Curricolo linguistico e curricolo etnomusicale*, Quaderno n.22, Bari, Italy.
12. Massimeo F., Portoghese A., Selvaggi P.: 1995, *L'educazione interculturale, ipotesi di curricula per la scuola dell'obbligo 2. Ambito delle religioni*. Bari, Italy.
13. Ministero della Pubblica Istruzione: 2001, *Le trasformazioni della scuola nella società multiculturale*, Servizio per l'Automazione Informatica e l'Innovazione Tecnologica e Dipartimento per lo Sviluppo dell'Istruzione, Roma, Italy.
14. Ministero dell'Istruzione, dell'Università e della Ricerca: 2001, *Alunni con cittadinanza non italiana – anno scolastico 2000/2001*, Servizio per l'Automazione Informatica e l'Innovazione Tecnologica e Dipartimento per lo Sviluppo dell'Istruzione, Roma, Italy.
15. Presmeg N.C.: 1988, 'School Mathematics in Culture-Conflict Situations', *Educational Studies in Mathematics*, **19**, 163-177.
16. Provincia di Pisa - Osservatorio per le Politiche Sociali: 2001, *Base informativa statistica – dossier statistico zero*, Pisa, Italy.
17. Shirley L.: 1998, 'Ethnomathematics in teachers' education', *Proceedings of I International Congress of Ethnomathematics*, Granada, Spain.

