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Intercultural perspective on needs and approaches for teacher educations programs

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The paper proposes a chronological overview of the normative aspects of the Italian context related to the inclusion of foreign students and a description of the current situation of Italian multicultural and multilingual classrooms. According to the Math Education literature, we propose here a reflection about the multicultural scenario complexities related to the School mathematics and how these can be faced through Teacher Training (TT) courses, aimed to increase the awareness of the potential that such contexts could have in classroom practice. With this aim we discuss the framework, methodology and materials shown to teachers during a Teacher Training online course.

Keywords: Mathematics education, multicultural education, teacher training, cultural differences.

Introduction

In recent years, the topic of migration of peoples and contact between different cultures has been worldwide debated in the political, social, economic, and media contexts. The flow of families from other countries forces educators at all levels to do a huge work to lay the foundations of tomorrow's inclusive society. Schools, in fact, are often the first institution with which migrants must interface/interact. In many cases, children of first or second generation are "thrown" into classes whose customs, expectations, manners and languages they are unfamiliar with. Disoriented, they often have to bridge many complicated steps on their own in a short time, to adapt, even during the critical stage of development of their own personal identity. Some factors as the socio-economic difficulties of the family, the lack of attention from adults, and the low empathy and understanding by the school, in addition to the rare relationships with peers, often could lead these young students to not commit themselves to learning the language or the subjects taught, to not plan their future studies, and to not value, according to family opinions, the school project of the host country.

The term "Multicultural" (Nasir & Cobb, 2006) is used by us as a sociological characterization, indicating the coexistence in a specific local reality of people of different cultures. The term "Intercultural" (Beacco et al., 2016), on the other hand, proposes an interpretation of the problem, of the relationships between these cultures (etymologically means "between cultures"), and refers to a dynamical and an operative dimension. "Transcultural" (D'Ambrosio, 2006) finally refers to the social elaboration, by a group (a citizenry, a neighbourhood, a class...), of a collective net of even different cultural elements shared by the members and experienced by them as natural and common.

Multicultural and multilingual educational contexts in Italy: some data

The massive presence of students of non-Italian culture, despite alarmed media resonances, is actually a well-known phenomenon: since the new millennium it has been above 100,000 units, with a steady growth during the first decade and a more moderate growth from '10 onwards, until it consolidated

in the last five years above 800,000 units, stabilising at around 10% of the entire school population. The presence of foreign students has always been on the rise in the face of a steady decline in the presence of Italian pupils due to the low birth rate. However, a general overview at a national level does not allow us to appreciate many geographical, cultural, and social differences (MIUR, 2022): the local/regional presence of foreign students is not homogeneous. The distribution of foreign pupils in the various school orders over the past decade ranges from a little less than 20% in kindergarten (3-6 years old), 35% in primary grade (6-11 years old), 20% in lower secondary grade (11-14 years old) and a little more than 25% in upper secondary grade (14-19 years old). Upper secondary school, near the ending age for compulsory education (age 16), is thus the critical point for school dropouts, for both Italian and foreign students; this critical situation, compared to the European panorama, is also due to the scholastic "backwardness" accumulated by students arrived recently in Italy; compared to a decade ago, the situation, also due to the increased weight of second generations, improved. This configures Italy as a country of recent immigration.

From the “Italian way to interculture” ...

At the European level today is officially recognised the possibility of personal and social enrichment and growth that can result from the encounter between people of different cultures, religions and languages. The European and Italian Institutions work in this direction with specific indications and standards. Recognizing differences, valuing diversity, of everyone, not just of students of foreign background, is something that in today's Schools is firmly established: the so-called *personalised pathways* (Zanniello, 2003) were born precisely to accompany students with special needs e.g. cognitive, linguistic and socio-economic disadvantages. In an increasingly global perspective, evaluating differences as an opportunity also in relation to the concept of identity, which is perpetually evolving, especially at the school age stage, is necessary. If in some countries all this has been more "accepted" and turned into concrete teaching practices (Zanniello, 2003), much remains to be done in Italy where the question related to real inclusive contents and methods by teachers of single disciplines, in their own daily practice, is still open (Bianco & Di Paola, 2022).

It should be stressed how, in summary, the Italian "reply" recorded over the years to this issue has not been, often, linear and punchy. Starting in the 1970s and up to the late 1980s, a core of themes/strategies was inherited from other European countries with a more substantial migrant heritage/tradition (France and Germany) and from the indications agreed at the EU level. The three strands that were retained and refined in subsequent documents are: inclusion of the newcomers in the host country (especially for first generations), teaching of the language (L2) of the host country, and enhancement and preservation of the migrant students' language and culture of origin. The landscape of linguistic and cultural differences in which the teacher has to operate on a daily basis has been taken as the basis from which to set up, from the planning stage, an "inclusive" way of teaching, in accordance with what has already been established with regard to pupils with special needs. On this, however, there have been no always consequent contributions focused on individual disciplines from the Educational Institutions: the subsequent specifications have been developed in a pedagogical or practical sense, codifying into rules already existing good practices. Interculture began to emerge as a coherent response in the 1990s as a reflection focused both on the person and on each culture. During the 1990s, when the presence of foreign students (first and second generations) in

Italy was still manageable, much emphasis was placed on the role of the dialogical and interacting between cultures. In 2006, "an Italian way to interculture" (Giusti, 2017) was definitively codified, as over the years the phenomenon has completely changed, numerically and in terms of the territories and cultures involved. In this synthesis document, it is explicitly stated to "assume diversity as a paradigm of identity in the school of pluralism, as an opportunity to open the school system to differences of origin, gender, social level, and school history" (Giusti, 2017, p.144). Since then, there have been strong appeals to teachers to maintain and value the language and manners of migrant pupils as well as include cultural cues in their daily teaching proposals. While subsequent normative documents (2012 and 2018) address disciplinary issues, the Ministry leaves to teachers of each discipline to create pathways, for each pupil, although it is not specified how, and to enhance each student's experiences and knowledge, to enrich all the class. As expected, Italian teachers have not always shown sufficient competence to implement this demand/purpose.

...to a possible bottom-up response to school needs

A broad view of the topic (from curricula to students assessment) in the sense of educational planning, also and especially from the teachers viewpoint, is what is envisaged, with regard to the linguistic dimension especially, by the European document (Beacco et al., 2016): an interdisciplinary, "transversal" approach, open to welcoming and valuing diversity is seen in daily practice too often as an obstacle, especially in the higher school orders. For several years, the European Community has recognized the central role of the teacher in defining a classroom climate that is positive to overcome this quite negative view of the "foreign" presence in the classroom. However, not in all countries these proposals have been materialised into meaningful actions in the educational sphere. TALIS (2018) documents the absence of an initial and organic training: only about a quarter of Italian secondary school teachers have been trained with the aim to "teach in multilingual and multicultural contexts" (compared to almost a third for EU countries) while it is specified that less than a fifth of teachers (almost a quarter for EU countries) feel to be "well prepared" or "very well prepared" in this area. Teacher Training courses on the themes discussed here are, as we know, just few: quite always are local, not well promoted, and not focused on mathematics; so we think our project can mean something new and needful in the Italian context.

According to the Math Education Research, in the absence of adequate training, it is up to the different "actors" in the school to develop initiatives around the inclusion issues; "bottom up" Teacher Training (TT), in particular, seems to us a direct way to influence the situation. We therefore asked ourselves: *How can the results of the Research (theoretical and methodological aspects) define a framework for in-service Teacher Training in mathematics, suitable for fostering reflection by the teachers, regarding teaching issues concerning the topic of interculture? In a context of in-service training, which approaches/methodologies can be put in practice in a training course in order to accompany, in itinere, in classroom teachers in addressing their own daily challenges of inclusion, configuring, with their students, a transcultural form of mathematics?*

So, the levels in the following are two, even parallel: School and Research. On one side our aim is to provide teachers with some tools/perspectives developed by research useful for shaping new resources, with the support of trainers. The materials, as below, were proposed not as finished

products but as a starting point, on which reflect, to elaborate effective teaching resources, also through the theoretical lenses offered. The design and use of new resources has an effect/echo on inclusion, both at the level of awareness by teachers, after an initial rethinking of one's own teaching methodologies, and as classroom practice. The methodological frames therefore become the starting point for training teachers as tools in the hands of teachers to shape new practices. Finally, these frames are reciprocally complemented/enlightened by new experimental findings.

Toward a possible framework for teacher training focused on an intercultural perspective

Starting from the fact that an "intercultural declination" of individual disciplines is something that needs to be readjusted according to the needs of the classroom and its students, and that the notion of interculturality, as dynamic, by its nature should be applied in synergy with individual curricular subjects and in a dialectical sense with respect to their usual rigidities and specificities. The directions related to the theoretical assumptions we will explore in the next section have led us to reflect on and then compose different frameworks and methodologies useful for framing mathematics teaching/learning, and thus also teacher education, through (multi-)cultural lenses. We mean so interculturality as the pedagogical response to multicultural reality, in which the relational and dialogical component of equality (of rights and possibilities) in diversity is valued for each person (MIUR, 2022). On the educational side, the result is the proficiency by teacher and students in overcoming/revising prejudices, to know (each other), in a perspective of "decentralisation", rethinking (Mellone et al., 2019) and "contamination". Didactics of Mathematics and Ethnomathematics can provide, in this varied and complex situation, useful tools and overviews.

Interculture

In the area of teacher education, the issue discussed must lead to a reformulation of curricula and a re-discussion of our paradigms as a rediscovery of the contributions and traditions of other cultures. Regarding classroom practice, in which the teacher is focused, training in math should be integrated with an empathy awareness, necessary for a true people encounter. The primary environment of mediation is the classroom, which is configured as the scene of a laboratory among cultures, where the culture-discipline dimension, can be thematized, both to create a constructive classroom climate, precondition for any disciplinary project, and to broaden the vision of the discipline.

Ethnomathematics, mathematics education and cultural transposition

Educational research, in response to these issues is defining theoretical and methodological frameworks capable of capturing the recurrent and significant phenomena occurring in multicultural school settings, with the aim of supporting all actors of the school inclusion. Regarding the teaching of Mathematics, our focus, Bishop (1991), recognizing that mathematics and its practices are not culturally or value-free, gives enormous weight to the process of *enculturation* and thus, as social process, to *enculturators* (mainly teachers but also curriculum developers and researchers) as transmitters of knowledge but also of a cultural frame that is realised into practices, uses, words. Barton (2007) also reinforced the importance of a cultural perspective in studying the elements and facts of mathematics education, focusing also on the different linguistic aspects of mathematical

learning. More recently, Mellone et al. (2019), within a socio-constructivist framework, introduced the paradigm of Cultural Transposition, suggesting the use of this approach in teacher education.

The Ethnomathematics, as body of militant research and practice (D'Ambrosio, 2006), is born by the reaction to the traditional underestimation of the contributions of the technical, engineering and scientific (material or theoretical) productions of communities of cultures other than Western Europe or its main colonial offshoots. Historically, philosophical and pedagogical studies have pointed to mathematics as a set of certainties, absolute, unquestionable, ahistorical, stable for every human mind and well determined in their form, in the subjects they deal with and in their representations, in a Eurocentrism that in some authors goes so far to disregard the contributions of Arab, Indian, Mesopotamian or Egyptian civilizations. The reaction of intellectuals, especially those less involved in colonialism, impressed by the monumental achievements of communities of quite different cultural traditions, involved during 19th century many fields of activity and thought, but remained very timid until the late 20th century, when a group of scholars from contexts of great cultural diversity (Brazil, U.S., many excolonial countries) recognized the validity and interest of a plurality of scientific strands (D'Ambrosio, 2002). This entailed a substantially inclusive redefinition of concepts such as Mathematics, Scientific Rigor, Acceptability, Method, Practice, and many others, which allowed many practices and contents hitherto classified as folk wisdom to be admitted among well-founded scientific knowledge. For D'Ambrosio (2002), Science is a complex of contents and practices with two objectives: 1) the material survival of a social group in its concrete context; 2) transcendence as the symbolic survival of the social group at the death of individuals. In his conception, "group" is to be understood in the most varied way: from small communities isolated for thousands of years to professional categories, classes or even school classes. The social transformations of increasingly articulated societies around the world, globalisation, with its widespread circulation of goods and symbols, and direct contacts between communities of different traditions, including in the form of massive migrations, have made this field the place to deepen the choice of disciplinary content and classroom practices.

All these frameworks for TT could offer us the opportunity to discuss with teachers the possibility/need to enhance the prior knowledge of our students, typical of their familiar/social contexts, in order to build new experiences on an established foundation. In simple words, it is a matter of making school knowledge permeable to learners' solicitations, including representations (e.g. written and oral numerals), practices (algorithms), deductive procedures, and disciplinary objects from the learner's reality, in order to accommodate their specific diversities in all senses.

Accompanying teachers: an example of distance continuing education in Italy

The indications coming from the top (Beacco et al., 2016, p.133), as discussed earlier, are clear and propose: local training courses; distance or combined distance and face-to-face training; action-research projects; moments of observation sessions in the classroom and reflective practice outside the classroom. According to this and in response to the complexities of the Italian context, briefly exposed, over the last two years we have designed training courses on the national territory. We operated in the local realities where the presence of foreign students is a determining factor to school

success. The TTs were implemented online with the support of U4Learn (<https://www.u4learn.it/>) for about 25 hours each and were articulated as following:

- 1) Intro to the TT course's topics: multicultural and multilingual situation of Italian classrooms.
- 2) Discussion on some theoretical and methodological frameworks focused on Didactics of Mathematics, Ethnomathematics, Cultural Transposition.
- 3) Historical-epistemological comparisons of educational systems of different countries.
- 4) Insight into the characterization of the Scientific Area through different cultural perspectives.

The last 14 hours of the course were left to the teachers' work, declined as follows:

- 5) Shared distance planning, between teachers and researchers, of inclusive classroom resources and practices for multicultural contexts, starting from some thematic cores chosen by the teachers.
- 6) Classroom experimentation of the practices designed during the online TT course.
- 7) Review of teaching practices by the entire group during regular meetings with researchers.

The work we conducted for each training path led to the design of a digital, online sharing "place" suitable for the use and creation of appropriately designed materials, according to a cross-cultural perspective, and continuously updated. A salient feature of the proposed courses is to offer, during the theoretical phase, pedagogical and didactic lenses useful for enhancing and actively including in own teaching the mathematical practices heritage of our students in a cross-cultural perspective. The overall balance of the realized courses is more than positive in terms of awareness of the complexity of the subject discussed, autonomy in designing personalised teaching paths from a cross-cultural perspective and in sharing/exchange among teachers good practices that can be implemented in different cultural contexts on a national level. In the next section we briefly show an example of instructional design defined by one of the authors of this article together with some teachers involved in one of the proposed accompanying teacher pathways in Northern Italy.

An example of a cross-cultural approach: numerals

In this section we briefly propose a sketch of an activity conducted with in training teachers (Di Paola & Nicosia, 2017); the example refers to the discussion with teachers on the existence and potential of dealing with different numeral systems from various cultural traditions in classroom. As an example, we gave a few pictures of digital, written and linguistic numerals in Chinese, Indo-Muslim, and Ethiopian cultures. The theoretical framework, in addition to what already described above and related to stages 1, 2 and 3, of the TT, referred to semiotic theories on the relationships between mathematical objects and their representations (Radford, 2004). In accordance with what was planned for stages 4 and 5, of the TT, the trained teachers were initially proposed to compare directly and work together on the number systems (graphical, concrete, oral, gestural as they vary across cultures). Subsequently, with the help of the researchers and colleagues, it was possible to design resources for multicultural classrooms, aimed to include and enhance the different knowledge and experiences related to the cultures represented by students of the class. During step 6, the representations proper to the culture of some students (often minority) became an element of the common culture of all the class, which was then stimulated to reflect on the properties of these numeral systems. Transculture

is here intended as the organic set of elements built by a group during his social activities, as a class of pupils in the mathematical classroom. One of the hypothesis of Ethnomathematics is that every community merges elements and shares visions simply by reciprocal communication, that means the building of a own culture. As in the classroom, later, also for the teachers, earlier, this moment allowed teachers to share the results and rethink their teaching practice (Mellone et al, 2019), reshaped from a more cross-cultural perspective.

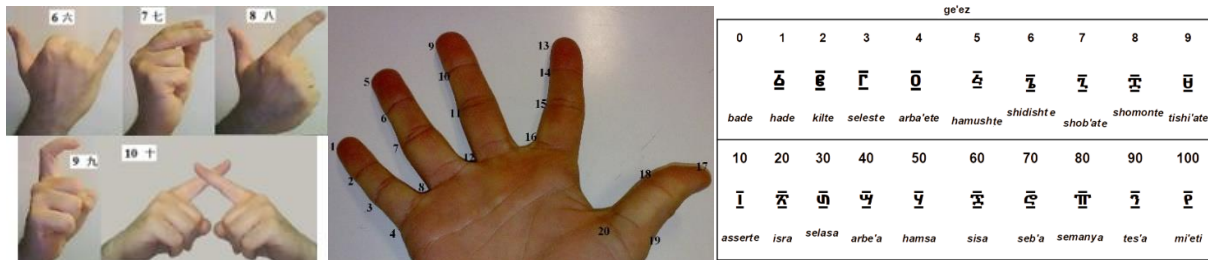


Figure 1: Digital, written and linguistic numerals in Chinese, Indo-Muslim, and Ethiopian cultures

Conclusions

The School for several years highlighted the need of teachers, students and their families for a help/support to structure educational projects in which the presence of other cultures is considered as a fundamental contribution to the growth of the entire class group. As mentioned, the Italian situation varies widely geographically and socially compared to other European countries and within the country, at the local level, regarding the cultures present in the classroom. This entails a great challenge for teachers who often have to educate pupils from several cultures, very distant one from the other and from the Italian one. Educational research, and specifically, for our perspective, Didactics of Mathematics, has tried to satisfy these needs through the definition of theoretical and methodological frameworks aimed at supporting all the actors of school inclusion.

It is our deep belief that the best strategy in this regard may be “bottom-up” since “analysing the existing situation (particularly resources available) is an essential preliminary if innovation is to be a step-by-step and not an all-or-nothing process” (Beacco et al., 2016, p.12). Hence the need to reflect and develop theoretical/methodological insights for teacher education, from a cross-cultural perspective. In this paper, referring specifically to the contributions of D'Ambrosio (2002), Bishop (1991), and Mellone et al. (2019), we have made explicit the theoretical and methodological research assumptions used and which can be used in online continuing TTs. These were used by us both to design the entire course described in the previous paragraph and during the TT phases as an explicit theoretical framework for teachers. TT, in general, has fostered and is still fostering greater self-reflection by teachers on teaching issues concerning the interculturality and, thanks to the ongoing accompanying, is enabling them to develop greater awareness/competence in dealing with the challenges posed by the classrooms of the present, the age of globalisation and dialogue. We think that, for a long time, the inclusion of learners from non-Italian cultures has been interpreted primarily as "language realignment". In several educational settings if a learner had used a calculation algorithm learned in the school of his home country/family, he would be penalised and forced to conform to the ways of the host country's culture. The preliminary and promising results let us say that the exposure

of teachers to knowledge from different cultures is allowing them to appreciate the richness of cultural dynamics in all dimensions of their students.

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