PEACE, SOCIAL JUSTICE AND ETHNOMATHEMATICS

Ubiratan D'Ambrosio
Pontifícia Universidade Católica de São Paulo, Brazil
&
(Emeritus Professor) State University of Campinas, São Paulo, Brazil

Abstract: *Issues affecting society nowadays, such as national security, personal security, economics, social and environmental disruption, relations among nations, relations among social classes, people's welfare, the preservation of natural and cultural resources, and many others can be synthesized as Peace in its several dimensions: Inner Peace, Social Peace, Environmental Peace and Military Peace. These four dimensions are intimately related. Social Justice, the theme of this book, naturally leads to Social Peace. Although, as I said, the four dimensions of Peace are intimately related, in this chapter I will focus my reflection on Social Justice and how can Ethnomathematics contribute to it.*

THE RESPONSIBILITY OF MATHEMATICIANS AND MATHEMATICS EDUCATORS

It is widely recognized that all the issues affecting society nowadays are universal, and it is common to blame, not without cause, the technological, industrial, military, economic and political complexes as responsible for the growing crises threatening humanity. Survival with dignity is the most universal problem facing mankind.

Mathematics, mathematicians and mathematics educators are deeply involved with all the issues affecting society nowadays. But we learn, through History, that the technological, industrial, military, economic and political complexes have developed thanks to mathematical instruments. And also that mathematics has been relying on these complexes for the material bases for its continuing progress. It is also widely recognized that mathematics is the most universal mode of thought.

Are these two universals conflicting or are they complementary? It is sure that mathematicians and math educators, are concerned with the advancement of the most universal mode of thought, that is, mathematics. But it is also sure that, as human beings, they are equally concerned with the most universal problem facing mankind, that is, survival with dignity.

It is absolutely natural to expected that they, mathematicians and math educators, look into the relations between these two universals. That is, mathematicians and math educators look into the most universal problem facing mankind as the most urgent problem to be dealt with. Mathematicians and math educators must accept, as priority, the pursuit of a civilization with dignity for all, in which inequity, arrogance and bigotry have no place. This means, to achieve a world in peace (see Pugwash 1955 and D'Ambrosio 2001). I have no doubt that every mathematician and math educator agree and are concerned with this

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most universal problem. Their discourse supporting this appeal is, without any doubt, sincere. But once they move into their practice, as mathematicians and math educators, something like a barrier appears and obfuscates their concern. They continue to do what they ever did. For mathematicians, priority is to publish their research in the best journals and for math educators, to propose, theorize and publish methods, which supposedly help teachers to better prepare their students to pass the variety of tests which are imposed on them. And sameness prevails!

Although with a somewhat different focus, discussing individualism in research activity, the late John M. Ziman (2006) described, in a provocative essay, the essence of a familiar attitude:

> "To a remarkable degree, the scientist is represented as studying the natural world as if alone in it, served only by mindless assistants who might as well be replaced by machines. Scientific theories are presented as systems of thought conjured up and tested by that same individual in a further series of single-headed operations. Research results are formulated and treated philosophically as the independent findings of lone explorers, each reporting the evidence of their own eyes and their rational inferences concerning the hidden mechanisms by which these personal percepts might be generated. Our epistemological role models are Robinson Crusoe and Sherlock Holmes, self-sufficient intellectuals to human their human companions Friday and Watson, are mere stooges."

As I said above, Peace must be understood in its multiple dimensions:

- inner peace
- social peace
- environmental peace
- military peace.

My research program is to understand the responsibility of mathematicians and mathematics educators in offering venues for Peace. The Program Ethnomathematics, which will be discussed later in the paper, is a response to this.

A research program, on mathematics, history, education and on the curriculum, which is an attempt to face the question of responsibility, begins with a reflection on the nature of mathematical behavior. How is mathematics created? How different is mathematical creativity from other forms of creativity? To face these questions there is need of a complete and structured view of the role of mathematics in building up our civilization, hence a look into the history and geography of human behavior.

I emphasize that History not only as a chronological narrative of events, focused in the narrow geographic limits of a few civilizations, which have been successful in a short span of time. The course of the history of mankind can not be separated from the natural history of the planet. The history of civilization has developed in close and increasing interdependence with the natural history of the planet.

About Education, I claim that its major goals are:

- to promote creativity, helping people to fulfill their potentials and raise to the highest of their capability, but being careful not to promote docile citizens. We do not want our students to become citizens who obey and accept rules and codes which violate human dignity.

- to promote citizenship transmitting values and showing rights and responsibilities in society, but being careful not to promote irresponsible creativity. We do not want our student to become bright scientists creating new weaponry and instruments of oppression and inequity.

The big challenge we face is the encounter of the old and the new. The old is present in the societal values, which were established in the past and are essential in the concept of citizenship. And the new is intrinsic to the promotion of creativity, which points to the future. The strategy of education systems to pursue these goals is the curriculum. Curriculum is usually organized in three strands: objectives, contents, and methods. This Cartesian organization implies accepting the social aims of education systems, then identifying contents that may help to reach the goals and developing methods to transmit those contents.

THE POLITICAL DIMENSIONS OF MATHEMATICS EDUCATION

The discussion on the objectives of Mathematics Education or, in other words, on "Why teach mathematics?", is regarded as the political dimension of education, but very rarely we see mathematics content and methodology been examined with respect to this dimension (see Sriraman & Törner, 2007). Indeed, some educators and mathematicians claim that content and methods in mathematics have nothing to do with the political dimension of education. Even more disturbing is the possibility of offering our children a world convulsed by wars. Because mathematics conveys the imprint of Western thought, it is naïve not to look into a possible role of mathematics in framing a state of mind that tolerates war. As argued above, our major responsibility, as mathematicians and mathematics educators, is to offer venues of peace (D'Ambrosio 1998).

There is an expectation about our role, as mathematicians and mathematics educators, in the pursuit of peace. Anthony Judge (2000), when director of communications and research of the Union of International Associations, expressed how we, mathematicians, are seen by others:

> "Mathematicians, having lent the full support of their discipline to the weapons industry supplying the missile delivery systems, would claim that their subtlest thinking is way beyond the comprehension of those seated around a negotiating table. They have however failed to tackle the challenge of the packing and unpacking of complexity to render it comprehensible without loss of relationships vital to more complex patterns. As with the protagonists in any conflict, they would deny all responsibility for such failures and the manner in which these have reinforced unsustainably simplistic solutions leading to further massacres."

I see my role as an educator and my discipline, mathematics, as complementary instruments to fulfill commitments to mankind. To make good use of these instruments, I must master them, but I also need to have a critical view of their potentialities and of the risk involved in misusing them. This is my professional commitment.

It is difficult to deny that mathematics provides an important instrument for social analyses. Western civilization entirely relies on data control and management. "The world of the twenty-first century is a world awash in numbers" (Steen 2001, 1). Social critics will find it difficult to argue without an understanding of basic quantitative mathematics.

Since the emergence of modern science, enormous emphasis has been placed on the rational dimension of man. Recently, multiple intelligences, emotional intelligence, spiritual intelligence, and numerous approaches to cognition, including new developments in artificial intelligence, challenge this. In mathematics education, this challenge is seen in the

exclusive emphasis given to skill and drilling, as defended in some circles of mathematicians and mathematics educators.

I argue against the excessive emphasis on the quantitative, which may be detrimental to the equally important emphasis on the qualitative. My proposal of *literacy*, *matheracy*, and *technoracy*, discussed below, is an answer to my criticism of the lack of equilibrium. *Literacy* is a communicative instrument and, as such, includes what has been called quantitative literacy or numeracy. This is very much in line with the mathematics learned from the Egyptians and Babylonians, but not central in Greco-Roman civilization nor in the High Middle Ages. It was incorporated into European thought in the Lower Middle Ages and it was essential for mercantilism and for the development of modern science. Indeed, it became the imprint of the modern world. In contrast, *matheracy* is an analytical instrument, as proposed by classical Greek mathematicians (for example, in Plato's *Republic*). I will return to this subsequently.

It is an undeniable right of every human being to share in all the cultural and natural goods needed for material survival and intellectual enhancement. This is the essence of the United Nations' *Universal Declaration of Human Rights* (UN 1948) to which every nation is committed. The educational strand of this important profession on the rights of mankind is the *World Declaration on Education for All* (UNESCO 1990) to which 155 countries are committed. Of course, there are many difficulties in implementing United Nations resolutions and mechanisms. But as yet this is the best instrument available that may lead to a planetary civilization, with peace and dignity for all mankind. Regrettably, mathematics educators are generally unfamiliar with these documents.

THE ETHICAL DIMENSION OF MATHEMATICS EDUCATION

It is not possible to relinquish our duty to cooperate, with respect and solidarity, with all the human beings who have the same rights for the preservation of good. The essence of the ethics of diversity is respect for, solidarity with, and cooperation with the other (the different). This leads to quality of life and dignity for all.

It is impossible to accept the exclusion of large sectors of the population of the world, both in developed and undeveloped nations. An explanation for this perverse concept of civilization asks for a deep reflection on colonialism. This is not to place blame on one or another, not an attempt to redo the past. Rather, to understand the past is a first step to move into the future. To accept inequity, arrogance, and bigotry is irrational and may lead to disaster. Mathematics has everything to do with this state of the world. A new world order is urgently needed. Our hopes for the future depend on learning - critically - the lessons of the past.

We have to look into history and epistemology with a broader view. The denial and exclusion of the cultures of the periphery, so common in the colonial process, still prevails in modern society. The denial of knowledge that affects populations is of the same nature as the denial of knowledge to individuals, particularly children. To propose directions to counteract ingrained practices is the major challenge of educators, particularly mathematics educators. Large sectors of the population do not have access to full citizenship. Some do not have access to the basic needs for survival. This is the situation in most of the world and occurs even in the most developed and richest nations.

Let me discuss the proposal of a new concept of curriculum, synthesized in three strands: literacy, matheracy, and technoracy (D'Ambrosio 1999b). The three provide, in a critical way, the communicative, analytical and technological instruments necessary for life in the twenty-first century. Let me discuss each one.

Literacy is the capability of processing information, such as the use of written and spoken language, of signs and gestures, of codes and numbers. Clearly, reading has a new meaning today. We have to read a movie or a TV program. It is common to listen to a concert with a new reading of Chopin. Also, socially, the concept of literacy has gone through many changes. Nowadays, reading includes also the competency of numeracy, the interpretation of graphs and tables, and other ways of informing the individual. Reading even includes understanding the condensed language of codes. These competencies have much more to do with screens and buttons than with pencil and paper. There is no way to reverse this trend, just as there has been no successful censorship to prevent people from having access to books in the past 500 years. Getting information through the new media supersedes the use of pencil and paper and numeracy is achieved with calculators. But, if dealing with numbers is part of modern literacy, where has mathematics gone?

Matheracy is the capability of inferring, proposing hypotheses, and drawing conclusions from data. It is a first step toward an intellectual posture, which is almost completely absent in our school systems. Regrettably, even conceding that problem solving, modeling, and projects can be seen in some mathematics classrooms, the main importance is usually given to numeracy, or the manipulation of numbers and operations. Matheracy is closer to the way mathematics was present both in classical Greece and in indigenous cultures. The concern was not with counting and measuring but with divination and philosophy. Matheracy, this deeper reflection about man and society, should not be restricted to the elite, as it has been in the past.

Technoracy is the critical familiarity with technology. Of course, the operative aspects of it are, in most cases, inaccessible to the lay individual. But the basic ideas behind technological devices, their possibilities and dangers, the morality supporting the use of technology, are essential issues to be raised among children at a very early age. History show us that ethics and values are intimately related to technological progress.

The three together constitute what is essential for citizenship in a world moving swiftly toward a planetary civilization.

THE PROGRAM ETHNOMATHEMATICS

A response to the responsibility of mathematicians and mathematics educators and a realization of this new concept of curriculum is the Program Ethnomathematics. To build a civilization that rejects inequity, arrogance, and bigotry, education must give special attention to the redemption of peoples that have been, for a long time, subordinated and must give priority to the empowerment of the excluded sectors of societies.

The **Program Ethnomathematics** contributes to restoring cultural dignity and offers the intellectual tools for the exercise of citizenship. It enhances creativity, reinforces cultural self-respect, and offers a broad view of mankind. In everyday life, it is a system of knowledge that offers the possibility of a more favorable and harmonious relation between humans and between humans and nature (D'Ambrosio 1999a).

The Program Ethnomathematics offers the possibility of harmonious relations in human behavior and between humans and nature. it has; intrinsic to it; the ethics of diversity:

- respect for the other (the different);
- solidarity with the other;
- cooperation with the other.

Let me elaborate on the genesis of this research program, which has obvious pedagogical implications.

An important question, frequently asked: is Ethnomathematics research or practice?

I see Ethnomathematics arising from research, and this is the reason for calling it the Program Ethnomathematics. But equally important, indeed what justifies this research, are the implications for curriculum innovation and development, teaching, teacher education, policy making and the effort to erase arrogance, inequity and bigotry in society.

For almost three decades, I have been formally involved with Pugwash Movement and the pursuit of peace (in all four dimensions: individual, social, environmental and military) (Pugwash 1955). A lecture of the History of Mankind makes it clear that Mathematics is central in all these dimensions. There is no need to elaborate on this.

An insight is gained by looking into non-Western civilizations. I base my research on established forms of knowledge (communications, languages, religions, arts, techniques, sciences, mathematics) and in a theory of knowledge and behavior which I call the "cycle of knowledge". This theoretical approach recognizes the cultural dynamics of the encounters, based on what I call the "basin metaphor". All this links to the historical and epistemological dimensions of the Program Ethnomathematics, which can bring new light into our understanding of how mathematical ideas are generated and how they evolved through the history of mankind. It is fundamental to recognize the contributions of other cultures and the importance of the dynamics of cultural encounters.

Culture, understood in its widest form, which includes art, history, languages, literature, medicine, music, philosophy, religion, science, technology, is characterized by shared knowledge systems, by compatible behavior and by acceptance of an assemblage of values. Research in ethnomathematics is, necessarily, transcultural and transdisciplinarian. The encounters of cultures are examined in its widest form, to permit exploration of more indirect interactions and influences, and to permit examination of subjects on a comparative basis.

Although academic mathematics developed in the Mediterranean Basin, expanded to Northern Europe and later to other parts of the World, it is difficult to deny that the codes and techniques which were developed, such as measuring, quantifying, inferring and the emergence of abstract thinking, as strategies to express and communicate the reflections on space, time, classifying, comparing, which are proper to the human species, are contextual. Clearly, in other regions of the World, other context give origin to different codes and techniques developed as strategies to express and communicate the reflections of a different spatial context, a different time perception, and different ways of classifying and comparing. These are, obviously, contextual.

At this moment, it is important to clarify that my view of ethnomathematics should not be confused with ethnic-mathematics, as it is mistakenly understood by many. This is the reason why I insist in using Program Ethnomathematics, which tries to understand and explain the various system of knowledge, such as mathematics, religion, culinary, dressing, football and several other practical and abstract manifestations of the human species in different contextual realities. Of course, the Program Ethnomathematics was initially inspired by recognizing ideas and ways of doing that reminds us of Western mathematics. What we call mathematics in the academia is a Western construct. Although dealing with space, time, classifying, comparing, which are is proper to the human species, the codes and techniques to express and communicate the reflections on these behaviors is undeniably contextual. I

got an insight into this general approach while visiting other cultural environments, during my work in Africa, in practically all the countries of continental America and the Caribbean, and in some European environments. Later, I tried to understand the situation in Asia and Oceania, although with no field work. Thus, came my approach to Cultural Anthropology (curiously, my first book on Ethnomathematics was placed by the publishers in a collection of Anthropology).

To express these ideas, which I call a research program, I created a neologism, ethno + mathema + tics. This caused much criticism, because it does not reflect the etymology of "mathematics". Indeed, "mathematics" is not composed, it is a neologism, with Greek origin, introduced in the XIV century. It is not mathema+tics. The idea of organizing these reflections occurred to me while attending International Congress of Mathematicians ICM 78, in Helsinki. In playing with Finnish dictionaries (to play with dictionaries is a favorite pastime), I was tempted to write alustapasivistykselitys for the research program. Bizarre! So, I believed Ethnomathematics would be more palatable.

I understand that there are immediate questions facing World societies and education, particularly mathematics education. As a mathematics educator, I address these questions. Thus, the Program Ethnomathematics links to the study of curriculum, and to my proposal for a modern *trivium*: literacy, matheracy and technoracy.

The pursuit of Peace, in all four dimensions mentioned above, is an urgent need. Thus, the relation of the Program Ethnomathematics with Peace, Ethics and Citizenship. These lines of work in mathematics education link, naturally, to the pedagogical and social dimensions of the Program Ethnomathematics.

As I said above, it is important to insist that the Program Ethnomathematics is not ethnic mathematics, as some commentators interpret it. Of course, one has to work with different cultural environments and, as an ethnographer, try to describe mathematical ideas and practices of other cultures. This is a style of doing ethnomathematics, which is absolutely necessary. These cultural environments include not only indigenous populations, but labour and artisan groups, communities in urban environment and in the periphery, farms, professional groups. These groups develop their own practices, have specific jargons and theorize on their ideas. This is an important element for the development of the Program Ethnomathematics, as important as the cycle of knowledge and the recognition of the cultural encounters.

Basically, investigation in ethnomathematics start with three basic questions:

1. How are *ad hoc* practices and solution of problems developed into methods?
2. How are methods developed into theories?
3. How are theories developed into scientific invention?

It is important to recognize the special role of technology in the human species and the implications of this for science and mathematics. Thus, the need of History of Science and Technology (and, of course, of Mathematics) to understand the role of technology as a consequence of science, but also as an essential element for furthering scientific ideas and theories.(D'Ambrosio 2004).

Once recognized the role of technology in the development of mathematics, reflections about the future of mathematics propose important questions about the role of technology in mathematics education. Besides these more immediate concerns, there are long term concerns. Of course, they are related. Hence, the importance of linking with Future Studies. And, in particular, with Distance Education.

Reflections about the presence of technology in modern civilization leads, naturally, to question about the future of our species. Thus, the importance of the emergent fields of Primatology and Artificial Intelligence, which lead to a reflection about the future of the human species. Cybernetics and human consciousness lead, naturally, to reflections about fyborgs (a kind of "new" species, *i.e.*, humans with enormous inbuilt technological dependence). Our children will be fyborgs when, around 2025, they become decision makers and take charge of all societal affairs. Educating these future fyborgs calls, necessarily, for much broader concepts of learning and teaching. The role of mathematics in the future is undeniable. But what kind of mathematics?

To understand how, historically, societies absorb innovation, is greatly aided by looking into fiction literature (from iconography to written fiction, music and cinema). It is important to understand the way material and intellectual innovation permeates the thinking and the myths, and the ways of knowing and doing of non-initiated people. In a sense, how new ideas vulgarise, understanding vulgarise as making abstruse theories and artefacts easier to understand in a popular way.

How communities deal with space and time, mainly to understand the the sacralization of chronology and topology in history, is also central.

We have to look into the cultural dynamics of the encounter of generations (parents and teachers and youth). This encounter is dominated by mistrust and cooptation, reflected in testing and evaluation practices, which dominate our civilization. In mathematics education, this is particularly disastrous. Mathematics is, usually, seen by youth as uninteresting, obsolete and useless way. And they are right. Much of is in the traditional curriculum is uninteresting, obsolete and useless.

Resources to testing is the main argument to justify current math contents. The claims of the importance of current math contents are fragile. Myths surround these claims.

It is important to understand children and youth behavior and their expectations. History gives us hints on how periods of great changes affect the relations between generations. Most interesting is the analysis of youth movements after WWII and Viet Nam War. Particularly 1968.

Regrettably, education, in general, is dominated by a kind of "corporate" attitude, in the sense that there is more concern with the subjects taught than with the children. This is particularly true with Mathematics Education. There is more concern with attaining pre-decided goals of proficiency, which favours sameness and may lead to the promotion of docile citizens and irresponsible creativity. Tests are the best instruments to support this corporate aspect of education. Tests penalize creative and critical education, which leads to intimidation of the new and to the reproduction of this model of society.

THE CRITICS OF ETHNOMATHEMATICS

What to say to critics who dismiss ethnomathematics as political correctness gone too far?
It is difficult to deny that mathematics, as well as education in general, are the arms of a political and ideological posture. Ethnomathematics is no different. Yes, ethnomathematics is political correctness. If proposing a pedagogical practice which aims at eliminating truculence, arrogance, intolerance, discrimination, inequity, bigotry and hatred, is labeled as going too far, what to say?

Is it questionable to refer to truculence, arrogance, intolerance, discrimination, inequity, bigotry, hatred, when discussing mathematics? Then the question is not pedagogical, but historical. As I said above, the historiography of mathematics has been very conservative and biased. Of course, both pedagogical and historical issues are related (see D'Ambrosio, 1998b).

What to say to critics who charge that ethnomathematics does little to advance students' knowledge and understanding of mathematics?

It is clear that traditional teaching of mathematics is not satisfying. Testing and assessment is part of the traditional teaching. The alarming results of tests are the result of a very poor education, which is performed in the traditional methods and curricula. Ethnomathematics do not reach a substantial student population and do not have any effect in the bad results of testing. Measures to "tighten" traditional teaching, hoping to get better results in tests and assessment, are nothing less than disastrous. Countries which are model of traditional teaching and are proud of their systems, are the most vulnerable.

It is clear that reinforcing sameness is not the answer to vulnerability. Although history tells this, and as examples I mention the fall of the Roman empire, the collapse of the Third Reich, the fiasco of the Soviet interference in Afghanistan, the demolition of the Berlin Wall, and others. Sameness, like fundamentalism, lacks creativity to counter vulnerability. Tightening measures lead to worsening effects.

This is particularly true in education. Insisting in obsolete, uninteresting and useless mathematics education, will not avoid its rejection by the new generations. On the other hand, by focusing on individual dignity, recognizing the previous knowledge of the individual and of her/his culture [ethnomathematics], we can prepare the most fertile ground for building up new knowledge [mathematics].

It is an important step in education to recognize that all forms of knowledge, both ethnomathematics and mathematics as well, have limitations. So, it is natural to look for new communicative and analytic instruments. This is why history of mathematics and ethnomathematics should be together. Every advance in mathematics is related to overcoming difficulties in doing or explaining something. The advancement of knowledge and understanding of mathematics, once the ground is fertile, is a matter of motivation. Has much more to do with the overall goals and objectives of mathematics education. Why to deny ethnomathematics, which is clearly alive in the professions, in communities, in extant cultures and in cultural history? Who is afraid of it?

When we teach ethnomathematics of other cultures, for example, the mathematics of ancient Egypt, the mathematics of the Mayas, the mathematics of basket weavers of Mozambique, the mathematics of Jequitinhona ceramists, in Minas Gerais, Brazil, and so and so, it is not because it is important for children to learn any of these ethnomathematics. It is because there is a deep educational reason for this.

Like in language, if we domain only one language, we are less equipped to succeed in the modern World if we have some proficiency in other languages. And it is a known fact that knowing other languages is a positive factor in bettering the domain of one's own language.

The main reasons for ethnomathematics in the curriculum are:

1. to de-mystify a form of knowledge [mathematics] as being final, permanent, absolute, unique. There is a current misperception in societies, very damaging, that those who perform well in mathematics are more intelligent, indeed "superior" to others. This

erroneous impression given by traditional mathematics teaching is easily extrapolated to religious, ideological, political, racial creeds;

2. to illustrate intellectual achievement of various civilizations, cultures, peoples, professions, gender. Mathematics is absolutely integrated with Western civilization, which conquered and dominated the entire world. The acceptance, forced or voluntary, of Western knowledge, behavior and values, can not be associated with ideas like "the winner is the best, the losers are to be discarded". More than any other form of knowledge, mathematics is identified with winners. This is true in history, in the professions, in everyday life, in families, in schools. The only possibility of building up a planetary civilization depends on restoring the dignity of the losers and, together, winners and losers, moving into the new. This requires respect for each other. Otherwise, the efforts will be from the losers to become winners, and from the winners to protect themselves from the losers, thus generating defensive confrontation.

Ethnomathematics practices in school favour respect for the other and solidarity and cooperation with the other. It is thus associated with the pursuit of PEACE. The main goal of Ethnomathematics is bulding up a civilization free of truculence, arrogance, intolerance, discrimination, inequity, bigotry and hatred.

REFERENCES

D'Ambrosio, Ubiratan. 1998. "Mathematics and Peace: Our Responsibilities." *Zentralblatt für Didaktik der Mathematik/ZDM*, 30(3): 67-73.

D'Ambrosio, Ubiratan and Marianne Marmé, 1998b: Mathematics, peace and ethics. An introduction, *Zentralblatt für Didaktik der Mathematik/ZDM*, Jahrgang 30, Juni 1998, Heft 3.

D'Ambrosio, Ubiratan. 1999a. "Ethnomathematics and its First International Congress." *Zentralblatt für Didaktik der Mathematik, ZDM*. 31(2): 50-53.

D'Ambrosio, Ubiratan. 1999b. "Literacy, Matheracy, and Technoracy: A Trivium for Today." *Mathematical Thinking and Learning,*1(2): 131-53.

D'Ambrosio, Ubiratan. 2001. "Mathematics and Peace: A Reflection on the Basis of Western Civilization." *Leonardo*, 34(4): 327-32.

D'Ambrosio, Ubiratan 2004. "Ethnomathematics and its Place in the History and Pedagogy of Mathematics", *Classics in Mathematics Education Research*, eds. Thomas P. Carpenter, John A. Dossey and Julie L. Koehler, National Council of Teachers of Mathematics, Reston, VA, 2004; pp.194-199.

Judge, Anthony. 2000. "And When the Bombing Stops: Territorial Conflict as a Challenge to Mathematicians." *Union of International Associations*. Retrieved January 25, 2002, at http://www.uia.org/uiadocs/mathbom.htm

Pugwash 1955. *Pugwash Conferences on Science and World Affairs*. Retrieved January 25, 2002, at http://www.pugwash.org/

Sriraman, Bharath & Törner, Günter. 2007. Political Union/ Mathematics Education Disunion: Building Bridges in European Didactic Traditions. (In press) in L. English (Editor). *Handbook of International Research in Mathematics Education (2nd Edition)*. Lawrence Erlbaum & Associates.

Steen, Lynn Arthur, ed. 2001. *Mathematics and Democracy: The Case for Quantitative Literacy*. Princeton, NJ: National Council on Education and the Disciplines.

United Nations. 1948. *Universal Declaration of Human Rights*. Retrieved January 25, 2002, at http://www.un.org/Overview/rights.html

UNESCO. 1990. *World Declaration on Education for All*. Retrieved January 25, 2002, at http://www.unesco.org/education/efa/ed_for_all/background/jomtien_declaration.shtml

Ziman, John. 2006. No Man Is An Island, *Journal of Consciousness Studies*, vol. 13, n° 5, 2006; pp.17-42; p.17.