BIOMIMICRY: A NECESSARY ECO-ETHICAL DIMENSION FOR A FUTURE HUMAN SUSTAINABILITY

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This article reflects on the concept of "global citizenship" from a transdisciplinary methodology and a biomimetic approach. A sustainable human image appears with this epistemological symbiosis, that constitutes the DNA of a genuine tool of civilizational transformation. On the one hand, the transdisciplinary methodology is opened to the multi-referential conception of the three pillars proposed by Basarab Nicolescu (2008): levels of reality, logic of the included middle, and complexity. On the other hand, the concept of biomimicry approached by Janine M. Benyus (2012) identifies nine operating principles of life in order to mimic nature in the reformulation of new sustainable human production systems with the biosphere. The aim of this study is to identify international agreements on environmental and sustainable development, to elaborate some contribution in the post-2015 eco-political-educational strategic framework led by the United Nations with the Sustainable Development Goals. With the purpose of strengthening ties between education and sustainability through symbiotic bridges between nature and culture, the work identifies the vital axises that constitute the interdependence of ecosystems to make a biomimetic application in the social, political, and educational structures of human systems. Then, this paper is an innovational research that seeks to integrate the eco-ethics as a practice in the "Global Citizenship Education" proposed for UNESCO for next decade 2015-2025.

Key Words: biomimicry, transdisciplinary, Future Human Image, Eco-Ethic, Sustainable Development Goals, United Nations, Global Citizenship Education, UNESCO, Big History, worldology.

The Post-2015 Sustainable Development Agenda led by the United Nations

In 2000, the Millennium Summit of the United Nations in New York was an important milestone for intergovernmental cooperation that we could compare with own constitution of the United Nations in October of 1945, when humanity was threatened to become a huge atmosphere of "radioactive ash." The dawn of the third millennium would begin with the agreement of 189 Member States to achieve eight global goals of human development for 2015: the Millennium Development Goals (MDGs). This was a historic agreement where the sovereign states reaffirmed the commitments made in previous conferences in Stockholm (1972), the work of the "Brundtland Commission" and the report *Our Common Future* (1987), the Earth Summit (1992), the Action Program of Barbados (1994), the Summit for Social Development in Copenhagen (1995), the Kyoto Protocol (1997), as well as other

meetings of remarkable connotations. Thereby, the MDG are the object of study and analysis in the global political framework throughout 2015. The final reports of the UN will help us to achieve a deeper understanding about the transnational issues that characterize the current planetary civilization beyond their national borders. In addition, the international debate will also be focused in the new Sustainable Development Goals (SDGs) led by the United Nations because for the year 2030.

The uncontrolled exploitation of natural resources is an international issue where different geopolitical actors (international institutions, Nation-States, non-governmental organizations of civil society, local and regional administrations, etc.) research and analyze for decades the transnational phenomena that affect the lives of global citizenship. Economic competition characterized by irrational growth of industrial societies has highlighted the unsustainability of the capitalist production system for future generations. We cannot maintain the current capitalist socioeconomic order because it is incompatible with the planet´s limits. In words of the moral philosopher and coordinator of the Transdisciplinary Research Group about Socio-ecologic Transitions[1] Jorge Riechmann [*Riechmann*, 2014: p.24]: "*There are not natural resources and ecologic space enough to extend the way of production and consumption dominant today in United States, European Union or Japan to the entire planet*". Therefore, the global economic crisis is actually a crisis of planetary civilization. The global citizenship of the 21st century needs new tools to understand reality, and tools to transform it. For this reason, I consider the epistemological symbiosis between transdisciplinary methodology and a biomimetic approach constitutes the DNA of a genuine tool of civilizational transformation.

SDGs are a challenge of global governance without historical precedent requiring new multidimensional synergies of *glocal* character between global citizens in every corner of the planet. It is required an effort of international cooperation of the plural unity in the human diversity and the promotion of a planetary-cosmic personality [*Bazaluk*, 2013; *Bazaluk*, 2014] with a sense of belonging to a supranational community with common destiny. The complexity of SDGs will demand new political formulas with a strategic action plan in all levels, because they are systemic, interbounds, and interdependent goals: as the same neuronal connections of our brains. In this sense, I am agreeing with the article "Neurophilosophy in the Formation of Planetary-Cosmic Personality", where Ukrainian philosopher and cosmologist Oleg Bazaluk [*Bazaluk*, 2014: p.12] considers that "*for planetary-cosmic personality there are no boundaries of conventions and stereotypes. The only acceptable criterion for evaluating its activities is a «benefit for civilization», which mind brings during the realization of its «mission».*" This planetary-cosmic personality is in harmony with the aim to achieve the SDGs. The era of globalization is in a continuous evolution, like life on Earth or in the universe itself. The network society of 21st century is still expanding multidimensionally at different levels of reality (local, regional, national, and international): generating an extensive network of universal interdependence of political, economic, technologic, ecologic, and cultural phenomena [*Castells*, 2000].

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[1] To know more about the socio-ecologic and transdisciplinary work, check the following link: http://transecos.org/

The Need for Global Citizenship Education in the Post-2015 Development Agenda

As discussions around the post-2015 development agenda are consolidating, the international education community is calling for an education that promotes not only cognitive skills but also those values, attitudes and skills that are necessary for forging a more peaceful, just, inclusive and sustainable world. As debate over the post-2015 education agenda reaches the decision point, attention is turning to implementation mechanisms that will allow the new targets to be reached. Ahead of the World Education Forum in Incheon (May 2015), the Oslo Summit on Education for Development (July 2015), the Financing for Development Conference in Addis Ababa (July 2015), the UN High-Level Summit in New York (September 2015), and the COP 21 Paris Sustainable Innovation forum (December 2015), the "*Second UNESCO Forum on Global Citizenship Education — Building Peaceful and Sustainable Societies: Preparing for post-2015*" has considered GCED in the context of the post-2015 education agenda including consideration of the emerging Framework of Action, and the role of GCED for peace. This is in line with the proposal of the EFA Steering Committee and that of the Open Working Group for Sustainable Development Goals for the post-2015 development agenda, in which GCED is proposed as one of the targets of the education goal.

The concept of "global citizenship" or "world citizen" has been the subject of study and debate since the Stoic philosophical movement approached it in the Greece of the third century BC, in the Hellenistic period. During all this time, many authors over the world have explored its meaning, practices, and applications. Throughout the *Big History* [*Christian*, 2010] of mankind on Earth, every society or human culture has developed their own ways to organize and manage life, and with that, their own learning-teaching processes and institutions. Without a doubt, the traditional concept of national citizenship is changing under the influence of multiple processes associated with globalization, because it creates economic, social, and cultural changes beyond the national borders. Since the beginning of the 21st century, the idea of global citizenship has been marked by two major schools of thought: one that supports the economic globalization and debates about international business, such as the G20 and the World Economic Forum; and one that criticizes this trend and aims for an *alter-globalization* [*Rossiaud*, 2012], such as the World Social Forum with Noam Chomsky, Adolfo Pérez Esquivel, Ignacio Ramonet, Walden Bello, Sebastão Salgado, Boaventura de Souza Santos, and Joseph Stiglitz to the head. However, the notion of "global citizenship" acquired momentum when the UN Secretary-General launched his Global Education First Initiative (GEFI) in September 2012, recognizing the role of education in fostering global citizenship by making it one of GEFI priorities, next to access and quality of education. On one way or another, people and institutions around the world are questioning the value and meaning of Global Citizenship Education (GCED) in the current context of globalization. If it is true that education cannot offer immediate solutions to current *glocal* problems, it helps to solve them in the medium and long term. Then, UNESCO has undertaken pioneering and foundational work in order to advance the understanding of GCED, provide intellectual guidance and technical support for its implementation.

One of the biggest challenges of GCED will be, in fact, the process of directing humanity towards new forms of cooperation and democratic social organization, which integrate the cultural diversity in an ecology of knowledge [*Santos*, 2014], and which develop just and sustainable relationships with the environment. For that reason, GCED is a central objective of UNESCO's education programme, drawing on work in related areas such as peace and human rights education, education for sustainable development and others. But, how could we adopt new human productive systems that do not conflict with the limits of ecosystems to achieve a real sustainability? How could we create a GCED which respects the defining historical and cultural characteristics of each community, and at the same time address the post-2015 targets from a planetary-cosmic critical consciousness? Could the GCED be able to build transnational bridges interconnecting the nations and peoples of the world without falling into the cultural homogenization of humanity? Could the GCED overthrow the political walls of the Nation-States to open frontiers to an authentic and true global citizenship who can move freely without subdue our brothers and sisters from the South, who die every day trying to arrive to North countries?

Unfortunately, there is not a magic formula to answer these questions. The problem to create a GCED in the 21ˢᵗ century represents a paradigmatic civilizational challenge which is closely interlinked with the achievement of the SDG. In fact, this is the vision explicitly expressed by Ministers, heads of delegations, leading officials of multilateral and bilateral organizations, and senior representatives of civil society and private sector organizations; gathered at the invitation of the Director-General of UNESCO in Muscat, Oman, from 12-14 May 2014, for the Global Education for All (EFA) Meeting. In the "2014 GEM Final Statement" of the Muscat Agreement" [*UNESCO*, 2014a] the following articles can be read:

5.- We acknowledge that future education development priorities must reflect the significant socio-economic and demographic transformations that have occurred since the adoption of the EFA goals and the MDGs, and the changing requirements in the type and level of knowledge, skills and competencies for knowledge-based economies. Therefore, we recognize that there is a strong need for a new and forward-looking education agenda that completes unfinished business while going beyond the current goals in terms of depth and scope, as well as to provide people with the understanding, competencies and values they require to address the many challenges that our societies and economies are facing.

6.- We reaffirm that education is a fundamental human right for every person. It is an essential condition for human fulfilment, peace, sustainable development, economic growth, decent work, gender equality and responsible global citizenship. (...)

8.- (...) The post-2015 education agenda must be flexible enough to allow for diversity in governance structures. It must continue to promote sustainable development and active and effective global and local citizenship, contribute to strengthening democracy and peace, and foster respect for cultural and linguistic diversity.

14.- We further commit to using this Statement for ongoing national, regional and global consultations on the post-2015 education agenda, to be approved

at the World Education Forum 2015, which will be hosted by the Republic of Korea in May 2015. Our expectation is that this will be an integral part of the global development agenda to be adopted at the UN Summit in New York City in September 2015 [*UNESCO*, 2014a: p.2-4].

From all those commitments, addressing the concept of "global citizenship" in the future post-2015 educational agenda that WEF will adopt in September requires a new "*reading the world*" [*Freire*, 1992] through the indicators that EFA and MDG programs will provide us in their final reports. The complex challenge to build a global citizenship in the current era of information [*Castells*, 2000] is a problem that goes beyond the ontological essence of human race, implying a triple epistemological, political, and educational reform [*Morin*, 2011]. Thinking about the value and meaning of GCED in current globalized era requires studying the *liquid life and humanity in movement* [*Bauman*, 2007], and consequently, the understanding of GCED as a process in continuous expansion, change, and evolution. To do this, we must address the complexity, multidimensionality, and interdependence of global dynamics (economic, political, cultural, social, educational, etc.) from an eco-ethical vision that proposes creative alternatives to change the relations between human beings and nature. To make this "reading the world" that serves to restructure the future of humanity as a species on Earth transversely, it is illustrative to make a compilation synthesis identifying agreements, conventions, and international conferences most distinguished of the eco-politic-educational project that UNESCO and UN are outlining in the last 25 years along their international, national, regional, and local partners:

- *World Conference on Education for All* in Jomtien (Thailand), 5-9 March 1990. With the mission to make primary education accessible for all children and reduce the illiteracy for the year 2000, delegates from 155 countries and representatives of 150 governmental and non-governmental organizations, adopted the "*World Declaration on Education for All*" (EFA), with special emphasis in the *Framework for Action: Meeting Basic Learning Needs*.
- *United Nations Conference on Environment and Development* in Rio de Janeiro (Brazil), 3-14 June 1992. Adopted by more than 178 Governments, *"Rio Declaration"* was most popular for its *"Agenda 21"*, because it contained "an action plan -at global, national, regional, and local levels- to establish a world alliance of environmental cooperation" [*United Nations*, 1992].
- *Barbados Programme of Action* in the island of Barbados, 25 April — 6 May 1994. The conference reaffirmed the principles and commitments of sustainable development concretized in Agenda 21 and translated them into specific policies of action.
- *World Education Forum* in Dakar (Senegal), 26-28 April 2000. In cooperation with UNDP, UNFPA, UNICEF, and World Bank, UNESCO coordinated more than 1,100 participants from governments (164 representatives), development agencies, civil society, and private sector to work together in achieving the EFA goals. Through the *"Dakar Framework for Action"* 6 regional targets were identified to meet them in 2015:

1. Expanding and improving comprehensive early childhood care   and education, especially for the most vulnerable and disadvantaged children.

2. Ensuring that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to and complete free and compulsory primary education of good quality.

3. Ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life skills programmes.

4. Achieving a 50 per cent improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults.

5. Improving every aspect of the quality of education, and ensuring their excellence so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills [*UNESCO*, 2000: pp. 15-17].

6. Eliminating gender disparities in primary and secondary education by 2005, and achieving gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality.

- *United Nations Millennium Summit* in New York (USA), 6-8 September 2000. Heads of State and Government of 189 Member countries of the UN General Assembly defined an historic commitment for the 21st century´s cooperation horizons. The Millennium Declaration would establish a global political framework with the major challenges that humanity is facing in the dawn of the third millennium. Recognizing the need to translate this commitment into action, the UN General Assembly approved the Millennium Development Goals (MDGs) in 2001: 1) Eradicate extreme poverty and hunger. 2) Achieve universal primary education. 3) Promote gender equality and empower women. 4) Reduce child mortality. 5) Improve maternal health. 6) Combat HIV/AIDS, Malaria and other diseases. 7) Ensure environmental sustainability. 8) Promote global partnerships for development.

- *World Summit on Sustainable Development* of Johannesburg (South   Africa), August 26 to September 4, 2002. With more than 21,000 participants, including 104 Heads of State and Governments, national delegates, NGOs leaders, business and other major groups, the ecologist´s discussion was focused on raising sustainable development awareness.

- *Mauritius Strategy of Implementation (MSI)* in Port-Louis (Mauritius Islands), 10-14 January 2005. The result of the Mauritius Meeting was the adoption of the "*Mauritius Strategy*", where new priorities of strategic action were established around 19 areas derived from the 14 thematic of Barbados Programmer of Action.

- *United Nations Economic Commission for Europe* in Vilnius (Lithuania), 17-18 March 2005. Member States adopted the UNECE Strategy on ESD in order to promote ESD in the region. The Strategy was a practical instrument to incorporate key themes of sustainable development into the region's education systems.

- *The United Nations Conference on Sustainable Development* in Rio de Janeiro (Brazil), 20-22 June 2012. In "*Rio+20*", the Member States would launch the document "*The Future We Want*" to develop a set of Sustainable Development Goals (SDGs), which would be based on the Millennium Development Goals and would converge with the post-2015 Development Agenda. In this occasion, my proposal "*the value of global education as engine of change to poverty eradication and to achieve a sustainable development*"[2] would be the most voted upon the civil society around all the world.

- *UNESCO World Conference on Education for Sustainable Development* in Bonn (Germany), 31 March — 2 April 2009. The conference was organized by UNESCO and the German Federal Ministry of Education and Research, in collaboration with the German Commission for UNESCO. With more than 150 countries attending the conference, the "*Bonn Declaration*" would make an evaluation of achievements done during the first half of the Decade of Education for Sustainable Development (ESD). Participants shared best practices in the field and developed mechanisms to enhance cooperation in the implementation of the UN Decade, especially focused in the dialogues and cooperation North-South and South-South.

- *Global Education First Initiative (GEFI)*. The Secretary-General of the United Nations would launch GEFI in September 2012 to accelerate the progress towards EFA and education-related MDGs goals. The initiative had three priority areas: 1) put every child in school, 2) improve the quality of learning, 3) foster global citizenship.

- *Technical Consultation on Education for Global Citizenship (GCED)* in Seoul (Republic of Korea), 9-10 September 2013. Organized by UNESCO and the Republic of Korea (i.e. Ministries of Foreign Affairs and of Education, and the Asia-Pacific Centre of Education for International Understanding -APCEIU-). The meeting was focused on identifying habilitation requirements to offer education for global citizenship at the national and global level.

- *1st UNESCO Forum "Global Citizenship Education: preparing learners for the challenge of the twenty-first Century*" in Bangkok (Thailand), 2-4 December 2013. Jointly organized by Division of Education for Peace and Sustainable Development of HQ, UNESCO Office in Bangkok — Asia and Pacific Regional Bureau for Education, Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP) and Asia-Pacific Centre of Education for International Understanding (APCEIU). As result of technical discussions on GCED, UNESCO [*UNESCO*, 2013] would issue the document "*Global Citizenship Education: An Emerging Perspective*", which presented common perspectives emerging from the consultation on the following three questions: 1) Why global citizenship and global citizenship education now? 2) What is global citizenship education? 3) What needs to be done at the global level to support and promote global citizenship education? [*UNESCO*, 2013]: 1).

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[2] To know more about the proposal on global education at Rio+20, check the following link: http://www.globaleducationmagazine.com/educarparavivir/?p=514&lang=en

- *Global Education for All (EPT) Meeting* in Muscat (Oman), 12-14 May 2014. In *the Muscat Agreement* would be specified with the ambit of post-2015 educational agenda:

  > 7.- The post-2015 education agenda should be clearly defined, aspirational, transformative, balanced and holistic, and an integral part of the broader international development framework. It should be of universal relevance and mobilize all stakeholders in all countries. Education must be a stand-alone goal in the broader post-2015 development agenda and should be framed by a comprehensive overarching goal, with measurable global targets and related indicators. In addition, education must be integrated into other development goals [*UNESCO*, 2014a]: 2).

- *UNESCO World Conference on Education for Sustainable Development (ESD)* in Aichi-Nagoya (Japan), 10-12 November 2014. The *"Aichi-Nagoya Declaration on EDS"* would serve to demand the urgent need to expand and strengthen the EDS to enable current generations to meet their needs while allowing future generations to meet their own:

  > We, the participants, EMPHASISE the potential of ESD to empower learners to transform themselves and the society they live in by developing knowledge, skills, attitudes, competences and values required for addressing global citizenship and local contextual challenges of the present and the future, such as critical and systemic thinking, analytical problem-solving, creativity, working collaboratively and making decisions in the face of uncertainty, and understanding of the interconnectedness of global challenges and responsibilities emanating from such awareness [*UNESCO*, 2014b]: 2).

- *Second UNESCO Forum on Global Citizenship Education (GCED) — Building Peaceful and Sustainable Societies: Preparing for post-2015* in Paris (France), 28-30 January 2015. Organized by UNESCO Headquarter, included 150 participants from Permanent Delegations to UNESCO, GCED experts, teachers and education practitioners, research institutions and universities, the private sector, media, policy makers, UN agencies, civil society organizations, youth representatives, and other development partners. The Second Forum took place at a very strategic time, right after the UNESCO regional consultations on EFA and post-2015 and before the World Education Forum (WEF) in May 2015 in Incheon (Republic of Korea) where new educational targets will provide inputs to the Framework for Action on Education post-2015.

This short analysis covers the most important events that United Nations and UNESCO have developed over the last 25 years, where they have harbored the common perspective to change the direction of world-society toward new sustainable development horizons, present and future. This is a persistent common perspective in the global policy framework that will seek the convergence of specific educational goals for the future during this year 2015. In this sense, the GCED is the continuation of the United Nations Decade of Education for Sustainable Development (2005-2014),

hence our proposal integrates a transdisciplinary methodology to understand the multidimensionality of the human condition/identity, and biomimicry as a symbiosis between ecosystems and human systems (and more specifically between sustainability and education). As the WEF will be the precursor for educational proposals of the UN High-Level Summit of September in New York, one could say that the challenge of achieving the SDGs represents an open opportunity for the emergence of transcultural and transnational education in harmony with the environment, in order that new generations *"co-evolve as global citizens on the planet".* People need to feel like citizens of the world from a perspective of common humanity in the *Homeland-Earth* [*Morin and Kern*, 1993], because the problems of our time (and their future consequences) can never be understood in an isolated manner through a Cartesian epistemological approach, which separates and reduces phenomena within the context of national boundaries and monodisciplinarity. By contrast, future post-2015 educational goals should promote the notion of education as a universal, complex, dynamic, transdisciplinary, multidimentional, and multi-referential phenomenon changing and evolving constantly. In other words, GCED must think in the future human imagine developing a *planetary-cosmic personality* [*Bazaluk*, 2014] and a *cosmodern consciousness* [*Nicolescu*, 2014] which understand the human freedom and dignity in its earthly, physical, and cosmic condition [*Morin*, 1999], without falling in cultural homogenization. For this reason our proposal aims to integrate an educational worldview where a transdisciplinary methodology and biomimetic approach make up the DNA of a new transcultural tool that serves to support the GCED proposed by UNESCO.

Transdisciplinary Methodology: Linking the Levels of Reality

The purpose of our work is to provide a panoramic picture of current *glocal* problems of human unsustainability; integrative eco-ethical worldview can potentially contribute to achieve the SDGs. In this research, philosophical and cosmological levels are linked to human production systems because the transdisciplinary nature of eco-ethics requires the presence not only of the unity of natural and social sciences, but a holistic image of humans in the universe. At the dawn of the third millennium, the understanding of human condition/identity on planet Earth needs an adequate and appropriate contextualization in the universe. When we analyze the connections between the microcosm and the macrocosm, we perceive that human beings are not involved in chaos and arbitrariness, but belongs to the large network of interdependencies, complementarities and reciprocities that constitute life [*Capra*, 2005]. The emergence of life on Earth, around 3,8 billion years ago, was a complex process of exceptional natural phenomena, inherent in all living systems. A process which is expressed through unlimited creativity: mutation, gene exchange, and symbiosis [*Capra*, 1998]. From a cosmo-biological perspective, we can understand a new conceptual dimension of life, where all living beings share same basis of genetic code: the twenty amino-acids and four phosphatic bases. In fact, the diversity of living beings is caused by the combination of this cosmo-bio-genetic basis. The atomic particles that compose life on our planet -and that compose us-, are born in the first seconds of the cosmos: our carbon atoms were created in a sun before of current one and our molecules were formed on Earth [*Morin*, 2011]. This trans-dimensional

perspective has a deep ecological and spiritual sense for our worldview because the human evolutionary adventure is the latest stage of life on Earth. The modern human being is a vertebrate animal, mammal, belonging to the primates, which emerged 200,000 years ago. In recent centuries he has imposed its anthropocentric, industrial and capitalist vision to the detriment of Pachamama (an Indigenous goddess known as earth mother). We consume around 120% of the natural resources that Earth Mother regenerats annually [*Margulis*, 2002]. Our consumer behavior is immersed in a fatalistic dynamic with a destiny to climate change (deforestation, loss of biodiversity, ozone, etc.), and our own self-destruction as a species.

There is an urgent need to get beyond the cognitive fallacy that the mental structures of social Darwinism and capitalist postulates of the 19th century have historically constituted, because they only understand natural and social systems as warmongers and competitive processes whereby species diverge from each other. The Darwinian concept of adaptation to the environment has become outdated with the scientific demonstration of the Gaia Theory [*Margulis and Lovelock*, 1989], which recognizes the Earth as an autopoietic whole, where living and nonliving systems intertwine in the same net of interdependence. In this way, the evolution of living organisms is linked with the environments' evolution: adapting mutually in a unique process of co-evolution. The co-evolution recognition as an ontological phenomenon has deep philosophical implications that involve a revolution in the current civilization model of values. We cannot maintain the current capitalist socioeconomic order because it is incompatible with the planet's limits. The global economic crisis is actually a crisis of planetary civilization characterized by exploitation and depletion of natural resources. "The only way to continue learning from nature is safeguard its patrimony, the source of new ideas" says Janine M. Benyus [*Benyus*, 2012: p.24] in her book *Biomimicry*, adding that "biomimicry becomes more than just a new way of looking at nature: its becomes a career and a ransom" [*Benyus*, 2012: p.24].

Thus, GCED proposed by UNESCO requires a new methodology outside of the positivist thought of the nineteenth and twentieth centuries, which reduces and separates the relationship between subject and object, that is, *the hidden middle between human beings and nature*. In this sense, the pioneering work *"The Manifesto of Transdisciplinary"* published in 1996 by physicist Basarab Nicolescu (President of CIRET[3]), is a proposal in perfect harmony with the paradigm shift that information age of network society [*Castells*, 2000] is demanding to achieve the SDGs. It represents a new epistemological approach which understands human being as an integral part of the autopoietic cosmic whole, and also houses the ethical imperative to develop a culture of peace. In fact, the International Congress organized by UNESCO and CIRET *"Which University for Tomorrow? Towards A Transdisciplinary Evolution of the University"*, celebrated in Locarno (Switzerland), participants would submit to the attention of Mr. Federico Mayor Zaragoza (Director-General of UNESCO at

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[3] The International Center for Transdisciplinary Research (CIRET) is a non-profit organization, located in Paris and founded in 1987. The aim of our organization is to develop research in a new scientific and cultural approach — the transdisciplinarity — whose aim is to lay bare the nature and characteristics of the flow of information circulating between the various branches of knowledge. The CIRET is a priviledge meeting-place for specialists from the different sciences and for those from other domains of activity, especially educators. For more information, visit: http://ciret-transdisciplinarity.org/

the time) programs of action and cooperation between Member States. A statement with recommendations that addressed the specifics of the new transdisciplinary methodological vision that would end up germinating with the *UNESCO´s Transdisciplinary Project "Toward a Culture of Peace"4* in full symbiosis with the *UN International Decade of Culture of Peace and Non-violence for the Children of the World (2001-2010)5*. In this context of new epistemological approaches, Nicolescu would present his three pillars of transdisciplinary: *levels of reality, logic of the included middle and complexity*. According with the last version found in his book "*From Modernity to Cosmodernity. Science, Culture, and Spirituality*" (2014), such axioms are the following ones:

1. The ontological axiom: There are different levels of Reality of the Subject and, correspondingly, different levels of Reality of the Object.

2. The logical axiom: The passage from one level of Reality to another is ensured by the logic of the included middle.

3. The epistemological axiom: The structure of the totality of levels of Reality appears, in our knowledge of nature, of society, and of ourselves, as a complex structure: every level is what it is because all the levels exist at the same time [*Nicolescu*, 2014: p.207].

By examining the three methodological pillars of transdisciplinarity proposed by Nicolescu, we see the first two get their experimental evidence from quantum physics, and the third axiom is also opened for human sciences. In this third axiom opened to the human sciences is highlighted the influence of "complex thinking" promoted by Edgar Morin in his book "*The Seven Complex Lessons in Education for the Future*", written in 1999 under invitation of Gustavo López Ospina, Director of UNESCO´s Transdisciplinary Project- "*Educating for a Sustainable Future*". In this visionary work, Morin affirms that "teaching the human condition means teaching the cosmic, physical, and earthly condition of the individual-society-species" [*Morin*, 1999: pp. 21-23]. Since these visionary intellectual horizons, all education pretending to be universal must take into account the different levels of epistemological and ontological reality that constitute the multidimensional identity of the individual-society-species: as *individual* in a local and specific community; as citizen of a determinate *society* belonging to a particular State/Nation; and as same cosmo-bio-genetic *species* in constant process of evolution. A human identity opened to the infinite diversity of global citizenship in its own unity as species. At the same way that own ontology structures the nature in different levels of Reality, humans have different strata, levels, and plans of gnoseological perception that structure and concretize their historical complexity in their cosmological context, hence we can also add the identity in the Cyber-Space-Time: the virtual identity. This educational perspective is also presented in the planetary-cosmic personality proposed by Bazaluk [*Bazaluk*, 2013; *Bazaluk*, 2014], who is also in harmony with M. Montessori pedagogical approach: "*The real importance of the M. Montessori methods is in need of cosmic education impact on the developing subconscious neural ensembles*" [*Bazaluk*, 2014]. More significantly, this cosmic consciousness has the purpose to link all levels of reality, reintroducing us as "transforming agents" [*Montessori*, 1994].

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4 Check http://www.unesco.org/cpp/sp/proyectos/cppinfo.htm

5 Check http://www.fund-culturadepaz.org/spa/DOCUMENTOS/InformeMundial_Culturade Paz_2001-10.pdf

Thus, GCED pedagogical programs must model the human formation through the adjacent complexity in all levels of identity that human race is composed, without falling in reductionist, one-dimensional or homogenize logics. Our identity is composed from multiple dependencies. It is an original construction of multiples relationships. Every culture is more or less hybrid, mixed, made of crosses, retro-feeds... There are not finished or perfect cultures. Each culture carries with its sufficiencies, insufficiencies, functionalities, dysfunctionalities... "Eco-bio-anthropo-social conceptual loop is a loop in which the thought of natural complexity should allow developing the thought of social and political complexity" [*Morin*, 1983: p.120]. Therefore, it is necessary to promote a structural epistemological transformation that facilitates the development of a complex thought capable to build a new kind of identity for the emerging global citizenship. A global identity based on the idea that humans are part of nature (governed by natural laws), whose historical approach addresses the past of people, life, Earth, and the universe. That is, a transdisciplinary perspective whose dynamic approach understand complexity of social relations of our time with nature, in harmony with the *Big History* spearheaded by David Christian in his book "*Maps of Time*" [*Christian*, 2010] and theoretically founded by Fred Spier in his work "*Big History and the Future of Humanity*" [*Spier*, 2011].

For the epistemological development of global identity is necessary overcome the antagonistic logics between the contraries that structures of thought derived from Newtonian classical mechanics have caused: subject vs. object, globality vs. locality, liberalism vs socialism, rational vs emotional, affectivity vs effectivity, etc. For this reason it is necessary to understand the second axiom of Nicolescuian transdisciplinarity, that is, the *logic of the included middle* that Stephane Lupasco [*Lupasco*, 1994] would demonstrate mathematically, because it represents the *epistemological key* to pass from one level of Reality to another adjacent. Relied on the quantum revolution, the logic of the included middle would overcome the classical logic principle "*principium tertii exclusi*" proposed and formalized by Aristotle, whereby the disjunction of one proposition and its negation is always true. The ontological structure of nature´s subatomic reality is manifested with striking phenomena: inseparability of subject and object, wave-particle duality, quantum superposition, complementarity, uncertainty principle, wave function, discontinuity, non local causality, indeterminism, etc. In this way, the logic of the included middle would revolutionize the cognitive structures of classical thought -derived from mechanistic concepts of classic physics-, because it would get relieve the existing belief of just one level of ontological reality that served as epistemological configuration for the formulation of materialist theories, religious dogmas, and political ideologies that devastated the twenty century because they thought they were in possession of the whole, and therefore, of *absolute truth*.

Translated into the educational world that concerns us, where neoliberal globalization has turned education into a purely commercial element (unable to be distinguished from any other field of commercial and financial reproduction) and meritocratic (PISA reports promoted by OCDE represent a good example of competitiveness and international *validity*), I consider that organization of knowledge derived from the postulates of quantum mechanics represents a bridge between the old logical paradigm tending to reduction, simplification, and

contradiction; and a new logical paradigm that tends to a holistic understanding of complexity, contradiction, and interdependence. A good example is the pioneering work that Fritjof Capra published in 1975, "*The Tao of Physics*", where he makes an exploration of the parallels between modern physics (especially Quantum Theory and the Theory of Relativity) and eastern mysticism (Hinduism, Buddhism, Chinese thought, Taoism, and Zen). That is, a comparison between the Western rational modern knowledge and Eastern ancestral intuitive knowledge that demonstrates how nature has always been present in the rich philosophical and theological framework of mankind during his trans-historic path on planet Earth. Therefore, the logic of the included middle offers an opportunity to build a new philosophical-epistemological approach that goes beyond to the ontological essence of the individual-society-species, representing a creative tool to build new transnational, transpolitical, transcultural, and transreligious conceptions capable to prevent future conflicts and to achieve a sustainable development. In words of Nicolescu:

> The present instant is, strictly speaking, a non-time, an experience of relation between Subject and Object; thus, it contains potentially within itself the past and the future, the total flow of information and the total flow of consciousness, which cross the levels of reality. The present time is truly the origin of the future and the origin of the past. Different cultures, present and future, develop in the time of history, which is the time of change in the state of being of peoples and of nations. The transcultural concerns the time present in *transhistory*, a notion introduced by Mircea Eliade, which concerns the unthinkable and epiphany. The transcultural is the necessary condition for the existenc of culture. The complex plurality of cultures and the open unity of the transcultural coexist in the cosmodern vision. The transcultural is the spearhead of cosmodern culture. Different cultures are the different facets of the human being. [...] The multicultural allows the interpretation of one culture by another culture, the intercultura permits the fertilization of one culture by another, and the transcultural ensures the translation of one culture into various other cultures, by deciphering meaning that links them and simultaneously goes beyond them [*Nicolescu*, 2014: p.14].

Since such cosmodern vision, I propose that existing debate on GCED does not have to find solutions for the increasingly complex problems that arise in the current economical system of the world-society of the third millennium. GCED should promote the transformation of capitalism´s production system inspired by biomimicry approach. Affirming that economic growth is good for itself, postulating that human quality levels can be measured by GDP and GNP of a country, represent an intellectual fraud of danger consequences in the era of global ecological crisis. While it is true that capitalist system has brought enormous material benefits, its functionalist view subordinates everything to the maximum economic profit and the indiscriminate consumption at the expense of nature. It does not work to debate between communism, anarchism, socialism, capitalism or any other political theory of social organization derived from classical mechanics mental structures (where there is just one level of reality), but to mimic our own nature: "if we want to get along with Gaia, it is precisely how we must see ourselves, as one vote in a parliament of

thirty (or perhaps even a hundred) million seats, a species among species" [*Benyus*, 2012: p.24]. Why the human species continues mortgaging the future of millions of species by its absurd logic of irrational consumption, which involves the exploitation of natural resources? Why do we believe in the epistemological illusion of unlimited economic growth when it has never existed any living species in nature which grow endlessly to infinity?

Undoubtedly, the creation of a true GCED which pretends to achieve the SDGs implies a radical rupture with the political-economic and socio-educational structures of the past, because there is no doubt that technocratic education, still in vigor, is the consequence of alienating the social organization model that capitalism has imposed, after the Industrial Revolution, in order to reduce students to submissive consumers and passive citizens [*Collado & Galeffi*, 2012c.]. Promoting a GCED that encourage the compliance of the SDGs will require a *poly-logical understanding*[6] [*Galeffi*, 2001] that understand the interlinks between micro-local-simple and macro-global-complex phenomenon. In words of Educator for Peace Alicia Cabezudo:

> Global Education is not only about global themes, world problems and how to find solutions altogether — it is also about to envision a common future of Peace and Justice for All connecting micro-macro perspectives. And how to make this vision real and possible starting from our small spot in the world. (...). If Global Education shift the focus onto the transformation from a culture of reproduction and domination to one of partnership we are changing the general rules — transforming the value system underlying the global economy to make it compatible with the demands of human dignity we all ask for [*Cabezudo*, 2014: p.22]

Consequently, I propose that GCED epistemological approach promotes, on the one hand, the development of a *planetary-cosmic consciousness* [*Nicolescu*, 2014; *Bazaluk*, 2013; *Bazaluk*, 2014] that embraces the supra-identity of "*Homeland-Earth*" [*Morin and Kern*, 1993] through learning the "*Big History*" [*Christian*, 2010; *Spier*, 2011], which implies the recognition of human, life, Earth, and universe history. On the other hand, I also propose that GCED promotes an eco-ethic through the study of biomimicry, which inspires to understand the interdependence of ecosystems to make an organizational-procedural-structural application in human systems.

Effectively, Newtonian logic of classical mechanics only allows us to observe reality in just one level, the level of reality 1. From this level of reality 1 is impossible come to a logical reconciliation between natural systems and human systems, because they are two contradictories process of structural organization that they destroy themselves, as happens between matter and antimatter. Hence the importance ensured by the logic of the included middle to achieve a coherent conciliation of the logical contradiction. Biomimicry is represented by the state "T" (*quantum*), that is, the quantum propriety to be wave ("A") and particle ("no-A") at the same time. In this way, following the philosophical postulates derived from quantum mechanics, we find the level of reality 2, where biomimicry appears as conciliatory element of openness to new

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[6] The poly-logical perspective, according Galeffi (2001), includes the coexistence of multiple logics in human knowledge processing, bringing together different plans of formation of Real without the monological reduction to a single plan of Reality, as it happens in western modern rationalism.
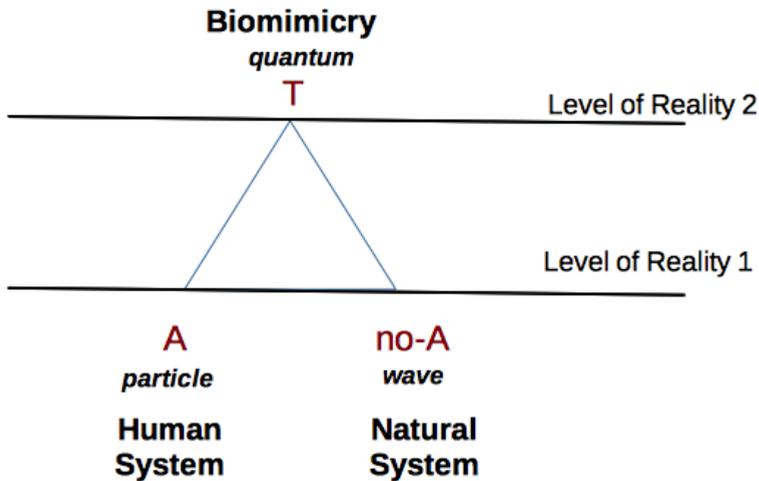
Figure 1. Representation of biomimicry concept in the logic of the included middle. Own
elaboration from Nicolescu [*Nicolescu*, 2002: p.51]

multidimensional and multi-referential horizons for the formulation of knowledge
theories available to find solution for the current unsustainability.

Biomimicry: A Necessary Eco-Ethical Dimension for a Future Human Sustainability

Human irrationality in patterns of consumption and production of the current
capitalist system are unsustainable and are also causing serious consequences in
the environment: climate change, desertification, destruction of natural resources,
pollution of water and air, global warning, etc. In this sense, if we reclaim the principle
of biomimicry as political, educational, and epistemological proposal to achieve a
sustainable development, it should be made a small mention with the intellectual
work of some thinkers who have proposed to learn from nature to build a more
just, democratic, and better integrated with the biosphere society. A good example
is the British biologist and ecologist Barry Commoner [*Commoner*, 1973], with the
formulation of the basic "laws" of ecology:

1. *Everything is connected to everything else*. There is one ecosphere for all living
organisms and what affects one, affects all.

2. *Everything must go somewhere*. There is no "waste" in nature and there is no
"away" to which things can be thrown.

3. *Nature knows best*. Humankind has fashioned technology to improve upon
nature, but such change in a natural system is likely to be detrimental to that system.

4. *There is no such thing as a free lunch*. Exploitation of nature will inevitably
involve the conversion of resources from useful to useless forms [*Commoner*, 1973:
pp. 33-45] (own translation).

In his later book "*Making Peace with the Planet*", Commoner [*Commoner*, 1992:
p.15] notes that techno-sphere prevalent in industrialized societies "is in war" with
the biosphere, causing a global ecologic crises impossible to be hidden. Basic laws

of ecology that harbor a strong link of similarity with the notion of "ecoliteracy" or "ecological literacy" developed by Capra [*Capra*, 1998; *Capra*, 2005], consist of the understanding the five organizational principles of ecosystems to build sustainable human communities: 1) Interdependence. 2) Cyclical nature of ecological processes. 3) Tendency to associate, establish links and cooperate as essential characteristics of life. 4) Flexibility. 5) Diversity. In short, Capra [*Capra*, 1998: p.20] argues that "understanding the life must be seen as the scientific vanguard of the paradigm shift, from a mechanistic world conception through an ecological conception", postulating that human systems should be governed by the key criteria of a living system: a) *organizational pattern* or configuration of relationships that determinate the essential characteristics of the system; b) *structure* or physical embodiment of the organizational pattern of the system; c) *vital process* or involved activity in the continuous physical embodiment of the organizational pattern of the system [*Capra*, 1998: p.175]. In words of Capra:

> Reconnecting with the web of life means rebuilding and maintaining sustainable communities in which we can satisfy our needs and aspirations without diminishing the chances of future generations. For this task we can learn a lot from ecosystems, true sustainable communities of plants, animals, and microorganisms. To understand them, we must turn first the basic principles of ecology; we must, so to speak, become ecologically literate. Being ecologically literate, being "ecoliterate", means understanding the organizing principles of ecological communities (ecosystems) and use these principles to build sustainable human communities. We need to revitalize our communities including education, business, and policies [*Capra*, 1998: p.307] (own translation).

Furthermore, according to the Capra´s *eco-literacy*, also deserves special attention the six basic principles for the ecological reconstruction of economy that Jorge Riechmann [*Riechmann*, 2014: p.211] suggests from the concept of biomimicry: 1. Homeostasis or "steady state" in biophysics terms. 2. Living from sun as energy resource. 3. Close material cycles. 4. Not carrying too far the materials. 5. Avoiding xenobiotics as POPs (Persistent Organic Pollutants), GMO (Genetically Modified Organisms). 6. Respecting diversity. Principles which according to Riechmann [*Riechmann*, 2014: p.35], imply an "inflection toward eco-socialism":

> Ecological Theory describes how biotic communities go for a process of development (or *ecological succession*) from youth to maturity (or *climax*). The interesting thing for us is that this maturity state is characterized by stability, decrease of net production of biomass (more energy is consumed in respiration), decrease of entropy, complexity (increased information), closing cycles of minerals, increased nutrient conservation, and increasing the global efficiency in the use of energy and nutrients. So, it does not seems unreasonable to derive -by biomimicry-, from the maturity ecosystem concept, the idea of economic homeostasis or steady state (in biophysical terms) to human systems [*Riechmann*, 2014: p.212] (own translation).

In other words, what Riechmann [*Riechmann*, 2014] defines as *economic homeostasis or steady state* means stop growing economically to focus more on qualitative development. At the same way as there is no living species in nature which

grow all time, the economy (as transversal axis of human systems) must steady, only consume necessary natural resources and focus on human capabilities in a broaden form. This means stop using the GDP and GNP as a compass to guide progress, because they do not take into account the number of hours that parents devoted to their children, or insecurity in the streets, or the quality of education, quality health systems, etc. In addition, those countries with a high GDP have done it by destroying the environment, as has been the case of China or Taiwan in the last years. An economic vision that, in short, is in harmony with the line of thinking of the philosopher and economist Amartya Sen [*Sen*, 2000], awarded the Nobel Prize in Economics in 1998:

> If instead of focusing our attention only on income poverty we focus on the global idea of a lack of skills, we can understand better the poverty and freedoms of human lives from a different basis of information (which implies a kind of statistics that the prospect of income tends to set aside as a benchmark for analyzing the economic and social policy) [*Sen*, 2000: p.37] (own translation).

Although in this article I have no interest in discussing the development of appropriate indicators to measure the development and welfare of global citizenship, I want to note that, since 1990, the theoretical assistance of Amartya Sen and Martha Nussbaum resulted in the annual publication of the Human Development Report by UNDP. A first step would cause a broad socio-political debate of global nature characterized by the birth of new sophisticated index, as *Human Development Index, Gender Empowerment Index* and *Gender Development Index, Capability Poverty Index, Index of Sustainable Economic Welfare, Genuine Progress Index,* etc. A socio-political debate that would arrive to all corners of the world with the strong contrast provoked in the comparison of the numbers from the United Nations and the doctoral thesis of Mattew Bentley in 2003. The United Nations [*United Nations*, 2003] estimated that 2,800 millions of citizens (46% of the world population) subsisted on less than $2 per day, of which 1,200 million (20% of the world population) did with less than a dollar per day. In contrast, Bentley [*Bentley*, 2003] estimated as "global consumer class" to 1,700 million people (28% of the world population) living in the European Union (350 millions), USA and Canada (270), China (240), Japan (120), and India (120). In such sense, we live in the *world risk society* [*Beck*, 2008] where "the total world consumption of natural resources is already about 20% higher than the annual rate of recovery" [*Riechmann*, 2014: p.2011]. A question of human inequality that clashes with the idea of justice of Amartya Sen:

> Distribution of the benefits of global relations depends not only on domestic policies, but also in a variety of international social arrangements, as trade agreements, the rules of the industrial property, global health initiatives, international educational agreements, facilities for the dissemination of technology, the treatment of accumulated debts (often caused by irresponsible military rulers in the past) and the control of conflicts and local wars. All these are questions eminently debatable that may be propitious issues for the global dialogue, including criticisms come from near and far [*Sen*, 2010: p.442] (own translation).

Responding to with Sen´s reflection, I consider that GCED should stimulate a global dialogue that addresses these issues from new virtual and physical modalities. Certainly, the use of measuring indexes of quality of life, which take into account

environmental conditions, will promote a critical and planetary consciousness through global solidarity reflections that, ultimately, will favor the creation of new social organization proposals associated with the principle of biomimicry. Having mentioned just a few examples of authors who have proposed that human economy shouldmimicthe"naturaleconomy" ofecosystems, Iconsiderthebiomimeticapproach is one of the most innovative responses in recent years to protect the environment and improve the quality of life through new sustainable habits of consumption and production. The term *biomimicry* comes from the ancient Greek βίος (*bios*), life, and μίμησις (*mīmēsis*), imitation. In the nineties, the term biomimicry would be used in disciplinary fields of material sciences, cosmetic research, and robotics, until the American science writer Janine M. Benyus popularized it with her book "*Biomimicry: Innovation Inspired by Nature*". Since then, biomimicry emerged as a new science that considers and values of nature as model, measure, and mentor [*Benyus*, 2012: p.13]: looking for the inspiration and imitation of the natural process to be applied into social systems, and thus find innovative solutions to complex problems (such as SDGs). "Biomimicry uses an ecological standard to judge the correctness of our innovations. After 3.8 billion years of evolution, nature has discovered what works, what is appropriate, and what endures" notes Benyus [*Benyus*, 2012: p.13], affirming that biomimicry "begins an era based not on what we can extract from the natural world, but what it can teach us" (ibidem). In this line of thought, Benyus founded the "Biomimicry Institute" (http://biomimicry.org/) and recognized nine basic operational principles of Life in the Nature that can be used as example of beneficial model for human behavior. In words of Benyus:

The communities of living things maintain a dynamic stability, as a choreography, juggling the resources without accumulating waste. After decades of persevering study, ecologists have begun to understand the hidden similarities between many interconnected systems. From their notes, we can begin to guess a canon of laws, strategies, and principles that resonate in every chapter of this book:

> Nature runs on natural sunlight.
> Nature uses only the energy and resources that it needs.
> Nature always fits form to function.
> Nature recycles everything.
> Nature rewards cooperation.
> Nature depends on and develops diversity.
> Nature requires local expertise and resources.
> Nature avoids internal excesses.
> Nature taps into the power of limits [*Benyus*, 2012: p.22] (own translation).

The nine principles of Life from Nature identified by Benyus [*Benyus*, 2012], invite us to reflect and compare the inherent characteristics of ecosystems with the culture of human production. From the reports of the Club of Rome in 1972, *The Limits to Growth*, the situation in which we are currently in the biosphere has worsened dramatically. Anchored in production models where reign the "planned obsolescence" to increase consumption, we continue without considering that biosphere is finite, with natural resources that have limits to regenerate, and that degradation (entropy) is manifested through the second law of thermodynamics. "There are alarming

indicators about the brutal climate imbalance that we have implemented, and which consequences will be terrible (ecocide more genocide, if you want to express it in a synthetic formula)" notes Riechmann [*Riechmann*, 2014: p.333]. With such future prospects, there is no doubt that our grandchildren will suffer, during the second half of this century, the climatic consequences of global warming caused by our consumer culture and irrational production.

Consequently, future goals for 2030 of SDGs force us to act urgently to transform the current view of environmental degradation for a feeling of belonging to a common heritage that we must protect and regenerate. For this reason, following the political sociology of education that Carlos Alberto Torres [*Torres*, 2009; *Torres*, 2005] proposes to make a "*transformative reading of the world*", GCED should constitute a transformative tool that promotes new symbiosis between ecological sustainability and human rights through the notion of common identity with a large ecosystem: the *Homeland-Earth* [*Morin and Kern*, 1993]. A line of thought in harmony, among others, with the work done by UNESCO Vietnam under the program "Man and Biosphere". In words of the current Representative of UNESCO to Vietnam, Katherine Müller-Marin: "Bioliteracy is the ability to understand the language of life. A bioliterate citizen seeks a continuum of understanding, enabling individuals to develop their knowledge and innovative potential in order to coexist fully with their surrounding community and natural environment" [*Collado*, 2014: p.13].

From this bioliteracy vision which harbors the hope to plant a better world, GCED must disseminate in pedagogical contents the idea of biomimicry to inspire global citizens to observe and learn from nature, rather than exploit and destroy it. Sustainable development is not a goal, but a continuous process of proper management with all natural goods of the biosphere. For this reason, the nine principles of life from nature that Benyus [*Benyus*, 2012] identifies, are in fact, a source of ecoliteracy inspiration [*Capra*, 2005] to create new forms of eco-ethical conduct with respect to life. As such, we have to make a small synthesis of them to develop deeper conclusions:

1. *Nature runs on natural sunlight:* the energy absorbed by almost all natural communities comes from the nuclear fusion that sun makes at 150 million kilometers. "The solar, wind and tidal energies, as well as biodiesel, all derive from the current sunlight" [*Benyus*, 2012: p.321]. When we burn fossil as oil, natural gas or coal, we are using the old sunlight which remained trapped (compressed in an environment without oxygen) in the bodies of animals and plants of the Carboniferous period. When the combustion is made, we are completing "the decomposition process suddenly, pouring the coal stored into the atmosphere in large quantities, ignoring the ecosystem precept of n*o big flows*" (ibidem). Taking into account that our biosphere is a closed and autopoietic system, this attitude would be equivalent to burn the furniture inside our home with the windows closed. Unfortunately, fossil fuels are too cheap and the current consumer society, addicted to energy, goes to full exploitation of these natural resources. A good example would be the leaves, which perform photosynthesis (biochemical decomposition of solar energy in nutrients) "with amazing 95% of quantum efficiency" [*Benyus*, 2012: p.319], four times more efficiency than solar panels built by human.

2. *Nature uses only energy and resources that it needs:* While it is true that second law of thermodynamics converts energy into heat, and a portion of energy is no longer usable, nature knows how to get energy efficiently through different ecosystem connections. In order to make an optimum use of limited habitat, each organism has found a niche and only uses what it needs to survive and evolve. Thus, the lessons of natural systems can guide us to establish new uses for energy. We must consider what we are maximizing (production) and focus more on optimization, as natural systems do when they invest their energy in maximizing diversity to become more efficient in the process of recycling organic nutrients and minerals [*Benyus*, 2012: p.322].

3. *Nature fits form to function:* nature is a highly cooperative system made by dense interactions between its components. The whole ecosystem network has been built in the limits of available resources and as a result, the entire ecosystem has reached an internal coherence of intricate organic patterns which form is adapted to the function. The nature optimizes rather than maximizing. On the contrary, our industrial ecosystems "continue betting on higher rates of productivity and growth, for a maximum flow of material extracted from Earth and converted into shiny new items. 85% of manufactured goods quickly becomes waste" [*Benyus*, 2012: p.323]. Indeed, the current globalization economy defines its success by fast growth and creates the illusion to measure progress and human development by indicators such as GDP and GNP. By contrast, organisms co-evolving in nature adapting themselves into the changes of others, that is, making that structure play several functions in its environment. "The lesson is that we have to delay the material manufacturing and put the emphasis on quality and not quantity of new items" (ibidem).

4. *Nature recycles and finds uses for everything:* "One of the key lessons of ecology systems is that when a system accumulates biomass (total weight of living matter), it needs more recycling to avoid collapse" [*Benyus*, 2012: p.312]. The existence of trophic chains in ecosystems has a circular organizational scheme where producers, consumers, and decomposers have evolved together in a closed loop to prevent the loss of resources: "all waste is food, and everyone is reincarnated into the body of other" [*Benyus*, 2012: p.313]. The problem of human culture of production and consumption is that it continues accumulating biomass without a network of closed loops. In this sense, Benyus [*Benyus*, 2012] explains several examples of "zero waste economy" in European Nordic countries (especially Denmark) where there are small trophic networks of industrial ecology with closed loops, where the exchange of information and the mutual wish to utilize the waste causes that all manufactured products coming from market, re-entering into the production system through legislation recovery and reimbursement systems.

5. *Nature rewards cooperation:* in mature ecosystems the cooperative strategies among organisms are as important as competition. According to the endosymbiosis hypothesis of Lynn Margulis [*Margulis*, 2002], the symbiosis between two species is a fundamental element of evolutionary progress from billions of years ago. Natural ecosystems operate in a complex symbiotic network of mutually beneficial relationships and when they grouped a large

number, they make up organs and organisms. In fact, the endosymbiotic theory postulates that our body is actually a combination of unicellular organisms that have conformed a huge pluricellular organism. Translated into the human production system, the Japanese industrial ecologist Michiyki Uenohara, notes that "we have plenty *arteries* (main tracts where flow products from the industrial heart to the body of economy), but we also need *veins*, return tracts of used products to purify and reuse their materials" [*Benyus*, 2012: p.318]. The lesson learned, therefore, is to build an economy where the arteries and the veins have the same importance, what would imply the imitation of ecological systems of closed loops that reuses the resources. According with Benyus [*Benyus*, 2012: p.319], an example of pre-competitive cooperation is constituted by the American brands Chrysler, Ford, and General Motors, developing partnerships for the manufacture of standard material that allow them to reuse parts of each other.

6. *Nature depends on and develop diversity:* the enormous development of diversity in nature is due to their experience of billions of years in "trial and error". Nature is characterized, in consequence, by the multi-referential approach that randomness produced by the entropy (rupture of the order) has enabled with its flexible opening to new anomalies. This eco-biological flexibility has enabled a large variety of animals and plants over billions of years around the entire habitat of planet Earth. Therefore, the lesson we learn from nature is that our industrial system must be flexible to be adapted to the emerging needs of global citizenship, and be as diverse as its own environment to respect regional, cultural, and material uniqueness of the place.

7. *Nature requires expertise and resources:* generally, natural ecosystems are connected in a relatively closed manner in the space-time. There is a rich biodiversity in the local ecosystems where many local species co-evolve together to be adapted to the changes. Unfortunately, the current capitalist trend is a global economy without frontiers where manufactured goods are produced in far countries geographically separated. In this sense, we must learn from the local knowledge and experience that indigenous people have, because "the idea of an adapting economy to the land and take advantage of its local attributes would bring us closer to the organisms that have evolved until become local experts" [*Benyus*, 2012: p.339].

8. *Nature avoids internal excesses:* "The biosphere (the layer of air, land, and water that sustains life) is a closed system, meaning it is not imported or exported materials (apart from the naughty meteorites)" [*Benyus*, 2012: p.332]. The autopoietic character of the biosphere get that life maintains the necessary conditions to regulate itself through a constant exchange between organisms (photosynthesis, respiration, growth, mineralization, decomposition, etc.). Unfortunately, the global industrial system is an opened system where "nutrients" become "waste", without any significant recycling process. This exploitation dynamic of natural resources and pollution is changing drastically the natural process because they cannot recycle the huge amounts of CO_2 emitted into the atmosphere (currently 355 of each million of molecules). The only answer is an industrial ecosystem that can be integrated in the biosphere without harming it.

9. _Nature taps into the power of limits:_ nature has learned that living with finite resources is a powerful resource of creativity. In nature there are internal feed-back mechanisms which optimize the use of resources of the environment in constant balance, with moderation and without devastating it. That means not mortgaging the future because, otherwise, it would die. The lesson is that our current production system cannot continue to push the limits of the planet. Nature teaches us to flourish within biological limits, without being in continuous predatory expansion. On the contrary, we must "adapt *human systems to ecosystems (biomimicry), managing greater efficiencies (eco-efficiency) and act on the demand with self-containment measures (generalized demand management)*" [*Riechmann*, 2014: p.28].

The nine principles of life from nature that Benyus [*Benyus*, 2012] identifies are incompatible with the current capitalist socio-economic order. "It could even be said that capitalism is the metaphorical antithesis of the natural process of life: in it prevails exclusion, squander, deregulation, what we call today as *relocations*, as well as unaware speculative flows to real production of goods and services" notes the natural philosopher Luciano Espinosa [*Espinosa*, 2007: p.66] compared to natural systems of the biosphere where "operate inclusive circuits of all member of the network, which are attached to the ground, tied to the satisfaction of the basic needs and the constant recycling of matter and energy" (ibid). This comparison lead to suppose the eco-ethic understanding of their own life in its multidimensional complexity. An eco-ethic understanding that should be promoted by the GCED to face the global techno-economic dynamics that are destroying life on Earth. GCED should aim to establish itself as the political, educational, and epistemological tool able to modify the socio-ecologic metabolism through new symbiosis between natural ecosystems and human cultures systems of production.

To do this, we must address the principle of biomimicry in a broader sense, "to understand the operating principles of life in its different levels (particularly the eco-systemic level) with the goal to *rebuild human systems in order to fit them in the natural systems harmoniously*" [*Riechmann*, 2014: p.171]. Then, we could define the GCED metaphorically as *a living organic structure* in constant process of adaptation and co-evolution with the environment. Therefore, GCED should not only think about how to integrate the eco-bio-ethical principles of biomimicry in the political structures and the national/regional/local educational curricula. GCED should also think about how to apply them in terms of networks. Since the scholarly microcosm embodies the macrocosm of social structures, the common future of humanity among the planet Earth requires a true political, epistemological, and educational transformation which implies the emergence of a new civilizational paradigm characterized by the change of hierarchies to networks in the social organization field.

This vision of social organization around networks provides a new perspective to understand better the natural ecosystems, which are organized as networks of networks [*Capra*, 1998]. Ecological literacy should also include adults, media, and policy makers. In this regard, it is important the Article 16.B of the Declaration of Aichi-Nagoya on ESD, where the Director-General of UNESCO is requested to continue to "harness partnerships and mobilise networks including the UNESCO ASPnet, UNESCO Chairs,

Centers under the auspices of UNESCO, the World Network of Biosphere Reserves and World Heritage Sites, as well as UNESCO Clubs and Associations" [*UNESCO*, 2014b]: 2). Undoubtedly, all these associations partners should develop and interact in form of networks, as a "*constellation of twinned NGOs-Schools*" [*Collado*, 2013a], to face the *glocal* challenge to build a GCED which promotes a cosmodern perspective of the human condition/identity in the Homeland-Earth, as well as the formulation of new biomimetic systems of economical production sustainable with the environment.

Linking Eco-Political-Educational Networks with UNESCO: A Constellation of Twinned NGOs-Schools?

I believe that one of the goals of current educational systems is to build new peaceful and sustainable meeting points between the cultures and civilizations that co-exist in the *Homeland-Earth* [*Morin and Kern*, 1993]. As it is stated in UNESCO's Constitution "*since wars begin in the minds of men and women, it is in the minds of men and women that the defenses of peace must be constructed.*" In the current global context, this vision is more relevant than ever and sets the background for UNESCO's current engagement in GCED. In this sense, as we have mentioned before, there is an important eco-political-educational network with different centers, associations, and institutions in charge to promote the ideals of UNESCO -as expressed since its Constitution-, to act in favor of peace and international cooperation by promotion of education, science, and culture. Perhaps, the best known project by its quantitative and qualitative connotations at *glocal* level is the Associated Schools Project Network (ASPnet). ASPnet was created by the Resolution 1.341 at the end of November 1953, with the aim to set up "education for living in a world community: coordinated experimental activities in schools of Member States" [*UNESCO*, 2003: p.7]. The report "UNESCO Associated School Project Network (ASPnet): Historical Review 1953-2003" describes the ASPnet evolution over its first five decades, and the official website of the project (http://en.unesco.org/aspnet/) tells us that there are more than 10,000 schools in 181 Member States seeking to meet the goals of Education for All (EFA) defined in the Dakar Framework for Action. ASPnet´s work follow four main study themes: 1) World concerns and the role of the United Nations system; 2) Education for sustainable development; 3) Peace and human rights; 4) Intercultural learning. Moreover, UNESCO Chairs develop activities of research, innovation, dissemination, and training with development programs of higher education through networks of inter-university cooperation. The initiative was approved in 1992 by the General Assembly of UNESCO in its 26th session, which stated UNITWIN Program for conducting interdisciplinary projects between twinned universities. According to the website of UNESCO, there are currently around 850 institutions in 134 countries seeking to achieve the goals of EFA and MDGs through ESD activities. Something similar is happening with the World Network of Biosphere Reserves and World Heritage Sites, specially with regard to monitoring the implementation of the Madrid Action Plan for Biosphere Reserves, whose purpose is to promote, develop, and share knowledge and learning related to ESD, as well as strengthen cooperation between intersectional platforms (ESD, climate change, post-crisis or disaster situations, etc.). Another pillar of collaboration and regional/national/international mobilization are the 4,000 UNESCO Clubs and Associations, conformed by volunteers groups of

different ages and socio-professional status who act as activist of the civil society in service to UNESCO ideals of cooperation in more than 100 countries.

All these networks of partners make up, as a whole, the concept of "*Constellation of Twinned NGO-Schools*" [*Collado*, 2013a], which is characterized by the intention of expanding the horizon opened by the GCED through the creation of a Cybernetic-Space-Time (CST) where UNESCO acts as *gravitational force* to develop altruist educational projects of cooperation in all the corners of the *Homeland-Earth*. CST represents, effectively, the propitious level of reality for the GCED proposed by UNESCO can develop new educational networks of transnational cooperation in worldwide. For this reason, the proposition "*Constellations of Twinned NGO-Schools*" represents a specific proposal that aims to contribute to the SDGs by 2030 through a virtual network of awareness promoted by the associations partners mentioned above. In the proposal of "*Constellation of Twinned NGO-Schools*"[7] [*Collado*, *Galeffi* and *Ponczek*, 2014a] the Member States of the United Nations would make a national/regional/local campaign to attract schools, universities, associations, and institutions interested in participating in programs of cooperation and development, and all countries will send a list/database to UNESCO (something which has already been underway for decades as we have seen). To this end, schools would have to make a detailed description with their defining characteristics (number of students, which languages are learned, public or private status, etc.), as well as related information of their cities, neighborhood and/or community in which their students-citizens live (i.e. geographical situation, demography, weather, etc.). In addition, each NGO-School should have its own website to be accessed in a common database of UNESCO to facilitate free interconnections and twinning between other NGO-Schools. At the same time, each student would have his/her own profile to be interconnected with other students around the world. Would it be possible that own students explain festivities and traditions of their people to other students for a better understanding of cultural differences from the early age (avoiding the "pollution" of the medias controlled by the groups of economic power)? Would it be possible to imagine *glocal* nodes of eco-political-educational action which work together to achieve the SDGs by 2030? It would be, in short, a specific proposal for the Framework of Action on Education post-2015 relies in the advances that telecommunications revolution has brought us with information and communications (ICT) to expand and reinforce partnerships and networking opportunities with emphasis on teachers and educators belonging to UNESCO associations networking mentioned. A proposal which main goal aims to contribute to the SDGs by 2030 through a virtual network of awareness promoted by the GCED. A proposal in harmony with the report: "*Global Citizenship Education: An Emerging Perspective*" issued after the *UNESCO Forum on Global Education Citizenship: Preparing Learners for the Challenges of the 21st Century*":

> 3.1.3. There is a need to support youth-led initiatives. Partnerships with civil society are also needed. Utilisation of new ICTs is critical. New approaches may meet with reservation and/or resistance. An emerging perspective on global

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[7] We have defined more this concept in "The Constellation of Twinned NGOs-Schools: A New Transdemocratic Horizon in the Global Citizenship Education Proposed by UNESCO for the Post-2015 Sustainable Development Agenda", published in Future Human Image 1 (2014), pp. 110-126.

citizenship education, however, maintains the need for stakeholders and actors to be open to different, but effective venues and solutions. (...)

3.2.2. Global citizenship education must reflect the voices of diverse stakeholders from different regions, sectors and populations. A network of stakeholders, who could meet for periodic discussions, can help continually renew interests and reconstruct the objectives of global citizenship education. A strong network and expertise must be made available at all levels — global, regional, national and community levels, via all means of communication and interaction [*UNESCO*, 2013: pp. 5-6].

Cosmic Reflections on Future Human Image

The main objective of the article has been to elaborate a specific proposal for the emerging Framework of Action on Education post-2015 in the previous period of the World Education Forum of May 2015 in Incheon (Republic of Korea). With the intention to reinforce bonds between education and sustainability through symbiotic bridges between nature and human culture, my proposal aims to create the foundations of a new theoretical-epistemological-methodological model that contribute qualitatively in the open debate for the implementation of GCED in the post-2015 Development Agenda:

2.2.11. The debate also relates, in part, to the question of how to promote, simultaneously, global solidarity and individual national competitiveness or how to bring together local and global identities and interests. In countries where identity is a sensitive issue and solidifying the national identity itself is a challenge, room for promoting a sense of citizenship at the global level could be limited, although this does not necessarily belie a lessened desire of the individual members of these societies to connect and interact globally. Similarly, citizens showing concerns about, and taking actions for, the communal benefits of the globe, could be believed to cause challenges to local/national authorities if their actions are perceived to be in conflict with local/national interests [*UNESCO*, 2013: pp. 4-5]

Obviously, reflecting and discussing new proposals concerning the SDGs and GCED carries many questions and approaches. My main intention is not to address the GCED and propose specific biomimetic and transdisciplinary pedagogical contents, but to promote the emergence of a new paradigm of civilization taking nature as guiding ecological model (but without becoming an imperative mandate that overrides human freedom for other social spheres, because in nature there are also an implacable predation among living things). Therefore, my contribution to the post-2015 Development Agenda has to be understood as an awareness proposal in continuous evolution, opened to reinterpretation, complements and considerations. In this sense, doing a recapitulation of the explained reflections throughout the article about education, sustainability, and the post-2015 Development Agenda, my proposal addresses SDGs and GCED from a triple theoretical-epistemological-methodological field that promotes:

1. The development of a new *cosmodern consciousness* that embraces the supra-identity of the *Homeland-Earth* through learning the *Big History.* The emerging global citizenship must learn to contextualize human beings, life,

Earth, and universe history from transdisciplinary methodological approaches. This implies examining the multidimensional identity of the emerging global citizenship through a *cosmic-planetary* approach that conceives the human condition complexity as individual-society-species: contextualizing cosmic and astro-biologically the human *species* to understand we all are ontologically equal beings (with the same molecular composition of DNA); with a rich cultural and spiritual diversity that characterized every *society* according their phenomenological and hermeneutical historical context; and with interests, motivations, and dreams radically different between *individuals*. A human condition/identity that is also interconnected in the CST through mobile devices in their virtual identity condition. This *cosmodern* vision that contextualize the human condition/identity multidimensionally is a real transformative tool for the GCED because it promotes the emergence of a new planetary civilization capable to write its own *transhistory*. A political, educational, and epistemological transnational process which involves to write the history together without cultural hierarchies in the space-time: taking into account the contributions of postcolonial theory to development education [*Andreotti*, 2007]. In short, this transdisciplinary approach represents the formation of real "*worldlists*", a term created by the Argentine writer Ernesto Sábato to express the urgent need to rely on people who are alert to the most urgent and global problems. So, inspired by this author, the thinkers Edgar Morin, Emilio-Roger Ciurana, and Raúl Motta [*Morin*, 2003a] assert that planetary education must foster a worldology of everyday life to understand the *transcendental unity* of the individual-society-species: the *unitas multiplex* (diversity in unity and unity in diversity).

2. The SDGs fulfillment: organizing knowledge from a biomimetic and transdisciplinary perspective that studies the *unity-diversity* of human condition along its co-evolution with the environment. An environment constituted by living and non-living systems who are intertwined in the same network of universal interdependence that distinguishes them in their existence, independence, creativity, and individual identity through an ecological relationship where all phenomena are interrelated in their different levels of *glocality*. In other words, the purpose of strengthening the ties between education and sustainability means implementing the biomimetic vision in the pedagogical contents of the GCED to create new identity models of planetary character in ecological and spiritual harmony. Biomimicry is a meeting point between societies called "primitive" and the called "hyper-technological", because it has an ecological and spiritual corpus which plays the symbiogenetic role between nature and human culture. According to the Mexican anthropologist and economist Cristina Nuñez-Madrazo[8] [*Nuñez-Madrazo*, 2012: p.109], "transdisciplinary educational experience for sustainability includes the spiritual dimension as a core for creating relevant knowledge within our societies, at local and global levels". The process of human identity development is a significant dialogical relationship between knowing and doing, mediated by the individual consciousness, which implies "go beyond rationalism, dualism and

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[8] Cristina Nuñez-Madrazo is Director at the Eco-literacy and Dialogue of Knowledge Center and Director of Transdisciplinary Studies in the University of Veracruz in Mexico.

fragmentation of knowledge (ibidem)." Thus, the past and the future are present in the spiritual and scientific research, being complementary inquiries of a common reality conformed by the undivided wholeness between consciousness, matter, and energy [*Maturana and Varela*, 2001]. As such, the GCED must combine formal, non-formal, and informal education to create a convergence framework between outer knowledge that nature offers us (ontological framework), and the inner spiritual knowledge of mankind (gnoseological framework). Psychosomatic experiences between body and mind, as ancient philosophical traditions show us, help us to establish and develop sacred connections between Nature and Life [*Collado*, 2014]: promoting sustainable human socio-economic practices with the environment. Therefore, GCED requires the synergy between transdisciplinary methodology and the biomimetic approach to achieve the SDGs. A theoretical-epistemological-methodological synergy that Canadian specialist in transdisciplinary studies of consumption, home economy, integral thinking, and moral leadership Sue McGregor would sense in her article "Transdisciplinary and Biomimicry":

> In summary, transdisciplinary problem solving from a biomimicry perspective means recognizing organic patterns and natural connections, understanding the causes and effects of competing and interrelated components, and then making appropriate modifications.(…) From a biomimicry perspective, people inherently adapt, deconstruct and recreate as needed, a process that mirrors the actions of living organisms. (…) The fit between biomimicry and transdisciplinarity is elegant, ripe with hope and potentialities. Within its iterative solution-creation process, biomimicry aims to produce both new knowledge and technical artifacts (innovations) (…) If transdisciplinary solutions to world problems necessitate a holistic coupling of the human and the natural, as well as inclusion of many voices and perspectives, it makes sense that transdisciplinary gain inspiration from biomimicry, with its focus on nature. (…) Transdisciplinarity based on the principles of nature (biomimicry) is promising. It supports visionary approaches to solving complex messy problems that require people to "rethink and reorient human´s relationship with the planetary environment" [*McGregor*, 2014: pp. 97-99].

3. The constitution of "*Constellations of Twinned NGO-Schools*" in virtual and physical networks. GCED must increase the formation of virtual and physical networks between the partner associations that are already *spinning gravitationally* around the UNESCO´s ideals of international cooperation and culture of peace (as the UNESCO ASPnet, UNESCO Chairs, Centers under the auspices of UNESCO, the World Network of Biosphere Reserves and World Heritage Sites, as well as UNESCO Clubs and Associations). On the one hand, the GCED proposed by UNESCO should group the millions of *stars* (schools, NGOs, universities, etc.) in *constellations* (twinning) through a large virtual database in the Cyber-Space-Time (CST). The creation of a big telematic platform, where worldwide people can share their ideas and actions to achieve the SDGs by 2030, would represent the beginning of a new civilizational paradigm characterized by networks of action between education and sustainability. While it is true

that there may be many difficulties and problems (economic, teacher training, new types of bullying, etc.) for the fruitfully installation of the Internet in all the corners of the world, there is no doubt that ICT revolution, and the social network in particular, is creating a public opinion and a global citizenship cyber-culturally interconnected. In words of Amartya Sen:

> The voices that can make the difference come from several sources, including the global institutions and less formal exchanges and communications. These articulations are not, of course, perfect for all global arguments, but they exist and really work with certain effectiveness, and they can became more effectiveness through the support of institutions that help to disseminate information and to improve opportunities for discussions that transcend borders. The plurality of sources enriches the scope of global democracy in the light of this perspective. Many institutions have a role here, including the United Nations and its agencies, but also include the committed work of civil organizations, many NGOs and some sections of the media [*Sen*, 2010: pp. 441-442] (own translation).

Indeed, the perception of a living world as a network of relationships is generating the formation of new virtual and physical spaces with similar goals of SDGs, but the adherent energy of their organizational structure dissipates in many cases or does not achieve the desired potential. Therefore, the creation of *"constellations of twinned NGO-Schools"* constitutes a heterotopical[9] [*Foucault*, 1984] theoretical framework that promotes the optimization of existing projects through a complex network of networks, both in the CST and the "real life". "The nowadays challenge is the strengthen of this participation process in progress, which depends largely on the search for global justice" says Sen [*Sen*, 2010: p. 443]. In my opinion, the CST represents the level of reality propitious to develop and promote a planetary consciousness and a feeling of common responsibility for all global citizenship with the SDGs. Hence that implementation strategic of GCED in the Framework of Action on Education post-2015 in the WEF should reflect seriously about the possibility to create a new virtual macro-space where can converge the cyber-activism played by millions of people. A virtual platform that would be in harmony with *Delors Report* (1999) on 21st century education (*learning to know, to do, to be, and to live together*), and with the eighth millennium goal: *develop a global partnership for development*.

On the other hand, besides the virtual cooperation in the CST, the concept of *"constellations of twinned NGO-Schools"* also has two aspects of *physical presence* of learners to train empirically the next generations of global citizens in meaningful learning, summarized with the creation of:

- *An International Volunteering Service* which operates as awareness instrument of humanistic and philanthropic train for global citizens, as engine of change and socio-ecological complaint to achieve the post-

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[9] In political sciences, heterotopia is a concept elaborated by philosopher Michel Foucault to describe the co-existence of different Utopias which function in non-hegemonic way at the same time and space.

2015 SDGs. Would it make sense that Member States signed at UN the common commitment to achieving the SDGs and, in parallel, instruct their citizens in military service? By contrast, the creation of an "*International Volunteering Service*" (fruit of "constellations of twinned NGO-Schools" coordination), for students-citizens who finish their secondary education, would develop a direct critical consciousness with sociological, political, and educational praxis [*Torres*, 2005] of individuals to face the *glocal* challenges of 21st century *world risk society* [*Beck*, 2008]. Thus, global citizenship would get out of the "media bubble" that reduces poverty to a mere newspaper headlines to experience it in firsthand.

- *New University Studies of "Worldology".* The need to create a new kind of social-planetary organization that cause new civilizational horizons in harmony with the environment requires new multi-, inter-, and transdisciplinary epistemological approaches to solve *glocal* problems of the SDGs. SDGs are interrelated and systemic goals that must be addressed as a whole through new university studies (degrees, masters, and doctorates) promoted by the inter-university cooperation of *constellations of twinned NGO-Schools*. *Worldology* would be an innovative proposal to train global citizenship from a theoretical, epistemological, and methodological openness that houses all branches of academic and non-academic knowledge: promoting a psychosomatic experience between the inner and outer knowledge. Could we create new *multiversities* where the emerging global citizenship could learn without disciplinary bounders the bioethical commitment with all forms of life?

They all are, in short, proposals in harmony with an eco-ethical dimension for a future human image. In essence, they mean the reconceptualization of schools in their social function as neurophilosophical [*Bazaluk*, 2014] builders of the future generations´ citizens. For this, we would have to empower all educational actors (schools, teachers, students, families, medias, etc.), saving them from academic drift and moving them into a global social reality, where 40,000 people die every day from cause stemming from extreme poverty. Therefore, the proposals exposed before have the intentionality to help and expand the open horizon of SDGs and GCED proposed by UN and UNESCO, with the aim to create and develop altruistic educational projects of cooperation in all the corners of the *Earth-Homeland*. In this cosmic-planetary perspective, the idea to create a *constellation of twinned NGO-Schools* operating technologically as a global network of communities' means giving them specific biomimetic pedagogical contents to be applied in their natural and human environment. Following the kinds of practices that govern in nature (variable according to the geographical area where the schools are located) as an integral model in the GCED, we would have a reticular pedagogical conception, that is, allowing the insertion of each community in the networking relations of their nearest environment, and after with their far environment. Thus, we would have an educational program where children would learn to assess how nature proceeds in its environment (following the nine principles of life from nature identified by Benyus), and how they

can mimic those natural proceedings in their human relations: how they can interact inclusively, how they can recycle, how they can use solar energies, etc. Indeed, the biomimetic approach is a bridge between children who are living in societies more interconnected with nature and those who are living in the called "rich countries", who are distanced greatly from the natural habitat. Biomimicry is the meeting point between called "primitive" and called "hyper-technological" societies that, united by the concept of constellations of twinned NGO-Schools, could develop a cosmodern consciousness capable to achieve the post-2015 goals.

In abstract, I am talking about proposals that seek to expand the complex debate we face when we talk about GCED and SDGs. A global governability challenge without historical precedents where solidarity and human cooperation are the symbiotic key to integrate eco-ethics as the civilizational meeting point to achieve a sustainable future human image. We are in the historical conjunction that Edgar Morin (2003a) defines as "*the stone age of planetary civilization.*" Therefore, it is necessary to *foresee* the future to be ready when it arrives, because there are no doubts that quantum computers, Artificial Intelligence, nano-technology, contact lens with Internet access, the genetic mutation of DNA, and travels in space will radically change our habits in a short period of time [*Kaku*, 2011]: contextualizing mankind in the *cosmodern paradigm* [*Collado, Galeffi* and *Ponczek*, 2014b]. The time has come to walk together towards this new civilization paradigm. Readers are encouraged to follow through with any thinking inspired by the reflections presented in this transdisciplinary and biomimetic work. In South Africa there is a symbolic proverb that says, "*If you want to go fast, go alone. If you want to go far, go together*". Are you ready? The challenge starts now. I invite everyone to meet me on this path bound for a transformation of current system of capitalist production, where new eco-ethical dimensions for a future human sustainability take place.

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