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How Third World Countries Can Take Advantage of Globalization – A Mexican Experience in Learning and Research

Jaime Jiménez

*Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas,
Universidad Nacional Autónoma de México,
Mexico*

1. Introduction

This chapter shows how a number of university professors, not inserted into the “mainstream” science takes advantage of some features of *globalization* to help non-conventional students to get a PhD degree in sciences, putting in practice an innovative way of learning and research aimed to prepare new scientists and, concurrently solve specific research problems detected by the students in their own geographic region.

They created the Innovation and Educational Development Centre (Centro de Innovación y Desarrollo Educativo, CIDE) in the 80's (CIDE, 2003). The CIDE model is an eclectic amalgam of several advanced proposals that emerge from innovative, new, and alternative education models: open education, teaching at a distance, and problem-based learning. The Centre brings together all three of the above methods in a unique combination that aims to educate students to learn, by doing research, on specific topics and problems brought about or discovered by the students themselves.

CIDE is an attractive educational alternative for students, who are not as comfortable following conventional education methods, or whose age and occupation does not allow them to engage in a formal graduate program. One of the main features of this model is the intensive use of the ICTs along with powerful and sophisticated search engines. This allows users to get in touch with the frontier literature in their fields of specialty, and also communicate with top scientists engaged in up-to-date research.

This learning/research model responds to the need to make scientific research more participative, including social sectors that have a stake in the application of scientific findings. The results of this effort are very promising since the PhD graduates obtain a good education, contribute to solve local/regional problems, and engage in “mainstream science” research networks. The conclusion is that globalization offers opportunities to countries in the process of development to enhance their possibilities of progress that benefit sectors of the population that could not be benefited by globalization otherwise.

The world is experiencing an enormous acceleration in the interchange of goods and services due in great part to the *globalization* in general and the *globalization of the economy* in

particular. Goods and services spread around the world coming from unsuspected countries. As we progress into the XXI Century it becomes clear that people's advancement is strongly tight to the way we acquire and apply *knowledge*. Those countries with advanced technology have a competitive advantage over those whose technology is lagging behind.

Although cheap labor force still plays a role in the selection of countries where 'maquila' is carried out, it gradually will lose importance as automation takes over. Since the end of the XX Century it became fashionable the assertion that society as a whole was approaching a new era, the *era of knowledge*, meaning that every human activity would be permeated by the *frontier knowledge* used, either currently available worldwide or produced within some organization/institution bounds. Indeed, the most important factor for the progress of the world's inhabitants is neither capital, nor labor force but the *knowledge* they put into their products and services (Jiménez, 2008).

What is behind the era of knowledge motto? Several phenomena compose this current global trend, namely: *the globalization of the economy, the fierce competition for world markets, the vertiginous technological and innovation development, having a special place the information and communication technologies, the 'reification' of science and technology, and the assertion that 'knowledge is power'* (Jiménez, 2009).

In a world that is in continuous change, we observe new ways of scientific cooperation, new purposes for developing S&T, new impetus and organization for research innovation. Countries traditionally behind in the production of knowledge, although still far away the big scientific powers, are now at the forefront, such as China, South Korea and to a lesser extent India. With the advent of the new ICTs alternative opportunities arise for scientific development in the economic South such as those in Asia, Africa and Latin America.

New "invisible colleges" (Wagner, 2008) connect scientists both North-South and South-South, enhancing research interests across hemispheres. Some new research is responding to current local or regional problems and opportunities in less developed countries. Since it is research responding to initiatives from "bottom-up", is dissociated from what global markets demand, thus making science more both socially accountable and responsible (Jiménez *et al*, 2011).

Much has been written about the *technology gap* and the *digital divide* between the countries that "have" and those that "have not". However, not all the progress related to the explosion of the information and communication technologies has been of disadvantage for the economic South countries. Some wise use of these technologies has produced positive results in segments of the population not in the upper privileged part of the social pyramid, as shown in the following sections.

2. The Centre for Innovation and Educational Development (CIDE)

In the decade of the 80's, a university professor had the idea to support higher education geared to research with alternative methods, in the official universities of the Mexican provinces. He and his colleagues were convinced that:

The education imparted in universities was not appropriate for the learning of students. Mexico needed to produce more scientists to cover national needs and the official system was unable to carry out that work by itself (CIDE, 2003).

They set themselves the task of helping students in the provinces to “learn to learn” with alternative methods which included: *problem-based learning* methodology, consisting of reversing the pedagogic process of knowledge transmission from teacher to student, to a process of knowledge creation which starts-off with the student confronted with a real problem, where the professor acts as a guide and facilitator of the learning process. *Problem-based learning*, as any suitable methodology, has shown some inconveniences as expressed by Fenwick & Parsons (1997), however regardless some setbacks, the method is quite reliable and has produced, in our experience, positive results. The CIDE model bases its methodology on the advances made by the cognitive sciences, which demonstrate that learning is achieved – especially concerning higher learning and mastering abilities– when emphasis is changed from *teaching to learning*, based on the student’s *individual and group learning* activities.

This method considers the students’ heterogeneity of conditions, which makes it necessary to design non-uniform programs, adapted to the special circumstances of the individual. The model guarantees the democratization of education, providing the student equal access, regardless of his/her personal situation, as well as individualized attention, liberating education from the dogmas of traditional pedagogy so that the student is able to go through an individual process and design his/her own learning, reaching intellectual independence through the permanent exercise of critical judgement (Jiménez and Escalante, 2007).

With the aim of following-up on the advances of the participants’ research, *socialization of knowledge* sessions are regularly organized where students exchange experiences regarding both the learning method and the progress of their research projects.

The socialization of knowledge is one of the innovating contributions of the CIDE, since, in contrast with other systems based on learning, the student has the opportunity to present his advances, air doubts, receive critiques, not only from his adviser, but also from other students that have different levels of advance. He/she receives feedback at once from all participants that want to contribute, complement, or help solve important inquiries, based on their own experience, and ways to solve the problems posed by the students research.

The socialization of knowledge takes place in monthly meetings, which are attended by students of each region. The meetings occur normally in facilities provided by host institutions that are normally the place of work of a professor and/or a student. They are two intense workdays of 10 to 12 hours each, Saturdays and Sundays.

At the end of the contributions/comments session, the adviser provides his expert opinion as well as his own contribution to the work of the student, collects his advances, in agreement with a previously accorded schedule, and sums up with general considerations on the results (Jiménez and Escalante, 2007).

The observations that peers make are both of form and content. The teacher-adviser plays an important role in the academic life of the student. Through his advice, allowing the student to become independent in the construction and approach of his object of study, the teacher-adviser becomes a counsellor and interlocutor, aiding the student to fulfill those activities that will conduct him to learn and demonstrate that he has the attributes that identify him as a Master or Doctor in Science. As part of the evaluation process, the teacher-adviser certifies the formation of the student as he validates the fulfillment of his work program (Jiménez and Escalante, 2007).

We have observed through the realization of inquiries, that the feeling of belonging to CIDE is strong, since participants express having had the opportunity to be part of a scientific community committed with its objectives.

CIDE's methodology brings together the most advanced proposals that emerge from innovating, new and alternative education which has recently materialized in the concepts of *open education* and *distance education*.

In essence, the defining characteristics of open and distance education, based on the model of one of the most prestigious institutions in the field, the *Open University of the United Kingdom* (2011), are freedom in registration, of place of study, of method, and of ideas. They provide learning opportunities to all individuals that lack economic means and education certification, regardless of lack of prior education or social and economic status, or place of residence.

However, alternative education must convince other social institutions that its quality is equivalent at least to the education imparted by traditional institutions that offer education in face-to-face environments. The assumption behind the above is that to achieve social objectives of equality in access, both open and distance education have to be of high quality (Cookson, 2002). Torres Barreto (2006) enlists the principal pedagogic-cognitive characteristics that these models exhibit:

- The system must gear the student to pinpoint, interpret and analyse his goals, both in the initial moment as well as during his interaction with the instruction program.
- The system must formulate learning objectives so that they will become the basis for the selection of pedagogic methods, including the evaluation, so that they can be fully known, accepted or modified by the students.
- The system must facilitate the participation of all those that want to learn without imposing traditional entrance requirements upon them and eliminate the degree or other certification as the only reward to be obtained for study.
- With the object of obtaining the flexibility required to satisfy a broad spectrum of individual needs, the system should allow the effective and optional use of sound, television, film or printed media as vehicles for learning.
- The system must recur to task assignment and evaluation principally to diagnose and analyse to what extent learning objectives have been accomplished. In other words, the system must be based on the student's own competences.
- The system must be able to overcome the distance between teaching staff and students, utilizing that distance as a positive element for the development of learning autonomy.

As the same author asserts, it is not just about one more variation of traditional academic modalities, a semi-schooled, bi-modal type or integrated model variation, in which within one same system, face-to-face and off-site students share the same programs and the same teachers. The really open and innovating education system needs an organizational and administrative structure that is different to face-to-face modes.

The regional scientific communities in Mexico, described in section 4, put precisely that in practice, and in addition, they gear the student to concentrate on a specific object of study of interest to him, that is associated to a field of work in which the student is engaged. Thus, CIDE's strategy responds to the most immediate social needs, emphasizing the principle of

direct participation of stakeholders, including those that receive the benefits of science, in all levels of decision.

CIDE offers students an educational experience geared to the acquisition of a higher degree, mainly in the earth and life sciences based on applied research. This opportunity allows them to complete their studies to those who for different reasons have not, and then be in a position to start or enhance their scientific careers. Students work from their home, place of work, or wherever they can find a space to fulfill their experiments and/or their “advanced markers.”¹

CIDE has no physical infrastructure. Professor-advisors do not receive a salary. Students and advisors meet once a month for two full days to socialize knowledge and advance the students’ projects. Students usually already teach full time in educational institutions. CIDE attracts students that are unable, for different reasons (age, workload, family obligations), to join a conventional PhD program. This situation leads to the formulation of individualized programs.

CIDE’s explicit objectives in the production of knowledge are the following (CIDE, 2003):

- To develop an innovative model of research where projects are linked to social needs.
- To reach an internationally competitive level in the results of research through scientific production in visible publications.
- To produce reliable, precise and repeatable research results with scientific relevance, within the limits set by measuring standards.
- To promote inter-institutional agreements that will make achievements of institutional educational objectives possible.
- To produce scientific knowledge that will aid national development by the search for solutions to the problems related to the biological environment.

3. Brief CIDE’s history

In the beginning, the idea of CIDE is advanced by Dr. Miguel Arenas, a professor of the Autonomous Metropolitan University-Xochimilco, located in Mexico City, to put in practice a model of innovative education in diverse universities throughout Mexico, based on the acknowledgement that the demand for higher education for the first 20 years of the XXI Century, would not be able to be satisfied through traditional educational systems.

After a number of failures, Dr. Arenas finally obtains an agreement with the University of Colima, in the state of the same name, in Mexico, to have his model established side by side the traditional program, as an alternative graduate program. After one generation, however, the University of Colima decides to end the relationship with Dr. Arenas’ group, and suspends the program. Some of the graduates however, established already in higher education institutions in other parts of the country, some even at Colima, give following to the idea, and struggle to have it revived.

¹ “Advanced markers” are academic “products”, as named by CIDE. These consist of experimentation reports and briefs, bibliographic reviews and essays, which are required from students, as per a previously agreed-upon program, that constitute “proof” of his/her research capabilities.

In 1984, a group of these professors at the Autonomous University Antonio Narro in Torreón, Coahuila, formalize the creation of CIDE, and are able to have the program established in that institution as part of the educational offer. Unfortunately, the experiment followed the same fate experienced by the University of Colima, and the program was closed definitively, although the students that were already enrolled were able to complete the program and obtain a degree from that institution.

CIDE thus continued as a virtual network of concerned professors aware of the lack of opportunity and access to graduate education in formal institutions for individuals unable to attend face-to-face programs. It is not until 2005 that CIDE finally obtains official recognition through the State of Sinaloa's Ministry of Public Education and Culture, when it associates with the Justo Sierra Studies Centre (Centro de Estudios Justo Sierra, CEJUS), another alternative education experiment, in an arrangement that was to provide benefits for both organizations. While it allowed CIDE to obtain official recognition, it satisfied the latter's aspiration to extend its educational offer to include higher education and graduate studies.

CEJUS, founded in 1978, is in itself another experience in innovating education which merits special mention, where this author has participated for more than 30 years. The Centre, located in the middle of the mountain range in the State of Sinaloa, Northwest Mexico, was created as a result of the demands of the local Parents' Association to improve the quality of elementary education for their children. In subsequent stages, their demand broadened to include pre-school as well as post-elementary education. In part, their goal was to prevent the flight of their youth, as they were forced to abandon their community if they wished to continue studies, and relocate in the state's capital or other nearby urban area. At the present time, with the assistance of CIDE, the CEJUS now boasts the "University of the Mountain Range", offering from bachelors' to Master's and Doctoral degrees in agricultural and life sciences. For more information regarding this important educational experience, see Jiménez & Ramón (1989), Jiménez (1992), Jiménez & Escalante (1999), Zúñiga-Barrón (2004), and CEJUS' own publication concerning its origins (Comité de Planeación Educativa, 1980).

4. Regional scientific communities (Jiménez, 2008)

CIDE constitutes itself a *learning community* whose basis is scientific activity, scientific methodology, and access to a technological platform (for instance EndNote®² and other Internet tools) of the highest order made possible by current advances in informatics and communications.

CIDE's objective is to *form regional scientific communities*. The community is formed on the basis of a group of "brains" whose members share an interest in scientific development, and put all their efforts to attain that objective. Generally they are individuals, and their decision is based on personal interests, that belong to educational institutions, research centres or private enterprises. In the words of one of their founders:

We are above all interested in generating brains who are already involved in a professional activity (business, farm, teaching, agriculture, laboratory analysis, etc.), (López-Pérez, 2004).

It is clear that these communities do not emerge from universities, even when they are involved in research, since they exhibit different objectives.

² From Thomson ResearchSoft, a division of Thomson Scientific.

These communities have given rise to virtual regional research centres, that is, facilities that are negotiated by CIDE's own members through contacts, as laboratories, to conduct experiments as needed by students, meeting rooms for the socialization of knowledge, or informal meetings. This was the case in the first institution where the program was offered, the University of Colima, where CIDE was able to use the institution's Laboratory of Biotechnology, to produce important scientific results that were published in international journals. Following is a list of the regional scientific communities that have been established and some of their lines of research.

- Colima (1982). The community has produced in the laboratory facilities more than 20 doctoral theses that have been published in international journals. Their fields of research are: adaptation to high temperature climates and droughts, vegetable domestication, biological fertility of the soil, ecology of the rumen, plant-pathogenic interaction, in-vitro production of thyroid cells.
- Torreón (1999). Research is conducted on portal hypertension of chickens, use of chromium in animal feed, degradation of cell walls by rumen organisms, immunology, dengue and malaria, animal reproduction, caloric shock proteins, pollination with bees.
- Sinaloa (2001). Work is conducted on phyto-remediation and phyto-extraction of gold, entomo-pathogenic nematodes, biotechnology applied to tuberculosis, determination of costs for the production of scientific data, bio-sensors, production of shrimp in farms, plant-pathogen interaction, construction of underground dams, territorial re-ordering, production of alternative species, populations genetics of crocodiles, eco-tourism.
- Puebla (2001). Research is conducted on prionic proteins, tuberculosis.
- Nayarit (in formation process). Research is conducted on tuberculosis, scientific principles of homeopathy.

CIDE is a social system of peculiar characteristics. It has been operating throughout more than 30 years, generating positive results. According to López-Pérez (2004), CIDE's objective, *the formation of regional scientific communities*, has gradually been reached. According to the same informant, by the year 2004, 77 individuals have graduated from CIDE with Masters and Doctorate degrees. This is not, nor does it pretend to be, the solution to the problems of high level human resources formation for the country, however, it is a viable alternative for professionals who need to reach a higher academic degree but cannot undertake traditional graduate programs. Moreover, since it has proved its efficacy, CIDE's model should be adopted by conventional higher education institutions.

5. CIDE'S emphasis on the use of the Information and Communication Technologies (ICTs)

The *digital revolution*, as many other revolutions, has raised enormous expectations to the point that the 'World Summit on the Information Society' (WSIS) in Geneva organized by the United Nations in December 2003, in a *Declaration of Principles* has put its hopes that the digital revolution was: to harness the potential of information and communication technology to promote the development goals of the *Millennium Declaration*, namely the eradication of extreme poverty and hunger; achievement of universal primary school education; promotion of gender equality and empowerment of women; reduction of child mortality; improvement of material health; to combat HIV/AIDS, malaria and other

diseases; ensuring environmental sustainability; and development of global partnerships for development for the attainment of a more peaceful, just and prosperous world (WSIS, 2003, as cited in De Miranda, 2009).

Actually the *digital revolution*, as part of the *globalization* the world is enduring, has not lived up to such high expectations; however some clever professors in the Third World, have learned to take advantage of the capability of connecting via Internet with data banks of various kinds containing current scientific information available in the globe.

Indeed, given the contemporary importance of the use of up-to-date information, a basic methodological principle that this learning method encourages is the use of powerful search engines to identify information located in the frontier of knowledge. This practice guarantees that their research projects and actions are solidly grounded on data reported in the current and highly visible specialized literature.

The student's general topic of interest, expressed with a word or a combination of words is used as keywords to search relevant information in Internet, with the assistance of the bibliographic tools. Through the powerful Internet navigators, the most recent, no more than five years old, articles concerning the topic in question are identified, selecting, in addition, those published in the most prestigious journals, as ranked by the Science Citation Index (SCI). From here, the student selects a number of articles, placing special emphasis on reviews. A review provides the "state of the art" of the discipline, a synthesis of the most recent and relevant research in the student's area of interest.

A second step, still in the construction of the object of study, consists of carrying out what CIDE denotes as "horizontal reading" and "macro-reading" of the texts. "Horizontal reading" consists of placing side by side the selected articles and inspecting the different parts of each with the aim of detecting regularities or repetitions. In the title, introduction, and references, "horizontal reading" identifies "keywords" that denote specific objects of research, objects of study, or concrete experiments. On the one hand, this provides an idea of the most current objects of study in the specialized literature, and on the other, it identifies leaders on a specific object of research. This is detected by a simple rate of most cited authors within those articles.

"Macro-reading", for its part, consists in carrying out a more precise inspection of the original articles selected and the leaders in the field, once the "hottest" objects of study are identified, with the aim of extracting the essential part of the object of study selected by students. That is, without reading the entire article, identify in the introduction what is said about a fact, and what the article proposes to do. Subsequently, students go to the part that contains the development of what is proposed in the introduction and extracts the work's conclusion, thus contributing to their own work.

Once students are armed with this information, they proceed to conduct their experiments, as required for attaining a bachelors' degree. For the master's degree, they apply a proven experiment to a local problem, and for the doctoral degree, they contribute with original knowledge that emanates from a local problem that had not been contemplated in the relevant, current specialized literature (Jiménez, 2008).

The use of the most advanced electronic means to support the students' research activities is notable. First, most among these is the software program called EndNote®, which is a

system of administration of bibliographic resources, which considerably speeds up the search and construction of bibliographic notes. With the aid of this program, students have access to the largest data bases on academic information, accessed by way of keywords, author, or title of the article. In addition, the program builds a file of bibliographic notes for future reference, a process which takes place in an automatic manner. The program outputs a list of the most cited authors on a particular topic, that is, the topics of greater scientific relevance at the time.

With the use of this technology, students can have access even to manuscripts that have not been published yet (for instance, articles in the hands of the authors that have been accepted and programmed for publication at a later date). Since the program includes authors' affiliation, CIDE students are able to establish personal contact with leaders in a particular field of knowledge or research thematic, creating their own "network of experts", thus making reality what Caroline Wagner baptized as *the new invisible colleges* (Wagner, 2008).

One of the advantages of this personal contact is the possibility of asking for the authors' print-copies of past papers, at no cost. Some students have reached such closeness as to collaborate, co-authoring articles, with the most renown scientists in their field of research.

6. Results

A number of PhD students have obtained their degree and are doing research in "mainstream science". Concurrently, they become advisors to new students who are willing to take the same track, thus enhancing the benefits of this innovative way of learning and research. For the past five years the number of sites where this academic experiment takes place has gone from three to eight, most of them in the Northern part of the country.



Since its association with CEJUS, CIDE has granted several doctoral degrees in fields that stand out for their quality at the forefront of biological, medical, and innovative applied technologies. Table 1 shows data of the examination date, name, age, and sector of work of seven of the graduates. The average age of graduates is 48 years, showing that these are not ordinary PhD students, but persons who, after engaging in professional work, decided to go for the degree and made an extraordinary effort to achieve their objectives. Likewise, 86% of the graduates work in the public sector.

A brief description of some dissertations recently defended (July, 2008) presented at CEJUS-CIDE follows:

Rocío González's dissertation was on "Molecular identification of *Coccidioides* SPP in the Comarca Lagunera Region, in North-eastern Mexico: a new endemic area for Coccidioidomycosis". The Coccidioidomycosis is a lung mycotic illness, endemic of the Southwest USA, Northern Mexico and several semi-arid regions in Central and South America. Dr. González's research was able to identify an endemic area of the disease located in the "Comarca Lagunera" region, Northeast Mexico. The identification of the endemic area helps diagnose the illness correctly, often mistaken as pneumonia, thus giving patients the right treatment, and saving many lives.

Víctor M. Wilson's dissertation in phyto-mining is titled "Hyper-accumulation of gold chemically induced in eight vegetable species". In 1998, it was discovered that gold absorption may be induced in plants. This procedure known as "induced hyper-

accumulation” has drawn the attention of both scientists and entrepreneurs. Mexico, with a long mining tradition did not have a team of scientists to do research in “phyto-mining”. Víctor contacted the only two existing specialists in the world, one in New Zealand, the other in Switzerland. With the advice of the experts, Víctor experimented with eight plant species. Three yielded a profitable gold “crop”. With his results, Víctor was able to defend his dissertation and get the doctoral degree. Now he is considered a world specialist in phyto-mining.



CEJUS-CIDE PH D'S

	EXAMINATION DATE	NAME	AGE (YEARS)	PLACE OF WORK
1	JULY/2008	ROCÍO GONZÁLEZ	48	PUBLIC HEALTH INST.
2	JULY/2008	VÍCTOR M. WILSON	40	PUBLIC UNIVERSITY
3	JULY/2008	ÁNGELES VERDUZCO	59	INDEPENDENT
4	NOV/2008	ROSA XICOHTÉNCATL	52	PUBLIC UNIVERSITY
5	NOV/2008	CARMEN REZA	38	PUBLIC UNIVERSITY
6	NOV/2008	NORA FERNÁNDEZ	53	PUBLIC UNIVERSITY
7	AUGUST/2009	MARCOS BUCIO	47	PUBLIC UNIVERSITY

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Table 1. CIDE’s first seven PhD graduates since its association with CEJUS.

Marcos Bucio Pacheco made an important project with transcendental significance for the global warming issue. Dr. Bucio worked on tele-detection, via satellite imagery, of clorophyllic stress in an arid corridor in the state of Sinaloa. He composed a periodic series of satellite images that led to important implications for global warming. Dr. Bucio began work on this project after he detected a kangaroo rat population, i.e. a desert rodent, some 300 kilometres beyond the desert boundaries in the state of Sinaloa. Dr. Bucio’s work provided accurate statistical data on changing climatic conditions for a period of three decades beginning with the 1970s.

6.1 Going from local to global

CIDE’s model enables students to get in contact with top people in their field of interest, making use of the information and communication technologies. These contacts enable graduates to participate in international conferences, sometimes in collaboration with “global” scientists, thus gradually inserting into mainstream science. The model promotes knowledge production *from the bottom-up* by recognizing locally felt problems of regional communities and working on the solutions, thus making it more socially responsible. Table 2 shows examples of renowned international contacts made by some of the graduates during their dissertation research.

CEJUS-CIDE PH D’S CONTACTS			
NAME	FIELD	IMPACT	INT. CONTACTS
ROCÍO GONZÁLEZ	Mycotic Disease	Regional/Global	Dr. Demostenes Pappagianis. Faculty of Medicine, U. of California, Davis
VÍCTOR M. WILSON	Phyto-minery	Regional/Global	Dr. Christopher W. N. Anderson. Natural Resources Inst., U. of Massey, New Zealand.
ROSA XICOHTÉNCATL	Animal Genetics	Local/Regional	Dr. Wilfred Goldmann. Roslin Inst., Edinburg, Scotland.
MARCOS BUCIO	Global Warming	Regional/Global	Mario Molina, Nobel Prize, MIT.

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Table 2. Examples of “global” contacts made by PhD students in the course of their dissertation research.

7. Conclusions

Globalization does not necessarily mean a widening of the gap between the industrialized countries and the countries in the process of advancement. There are opportunities for less-developed countries to take advantage of the world explosion of ICTs and the networking possibilities it implies, at a relatively low cost. The example described in this chapter is just one of the forms of using modern technologies to the benefit of communities apparently left behind from the general progress.

It is interesting, and to a certain extent paradoxical, to notice that the professors who sustain the CIDE model are not themselves inserted into "mainstream" science. However, they have the ability to help students approach to higher and visible levels of academic recognition. The "secret" is that they both intelligently and generously designed and implemented an academic model to take advantage of some features of *globalization* to help non-conventional students to get a PhD degree in sciences, putting in practice an innovative way of learning and research aimed to prepare new scientists and, concurrently solve specific research problems detected by the students in their own geographic region. The professors dedicate one weekend per month to attend students, and during the week days, they revise the students' academic products to offer feedback to them during the socialization of knowledge events.

The CIDE learning and research model combines open education, teaching at a distance, and problem-based learning methods to educate students to learn, by doing research, on specific topics and problems usually brought about or discovered by the students themselves in the locations where they live. In the process of research, students interact with scientists at the frontier of knowledge thus creating themselves their own network that also includes national scientists. This type of new network is highlighted by Caroline Wagner as a product of the *globalization* of the ICTs, that connects scientists not only North-South but also South-South, bringing benefits to more segments of the world population.

In synthesis, CIDE's experience demonstrates that it is possible to reach desired objectives with a system whose parts enjoy ample flexibility, without the need for a costly physical and human infrastructure. The "glue" that brings together the different parts of this system is, convincingly, the motivation that each member has for reaching his/her particular objectives as well as CIDE's general objectives.

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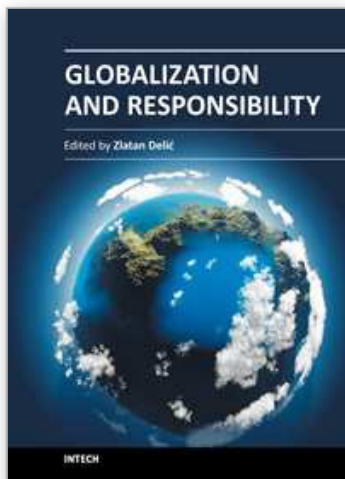
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The book "Globalization and Responsibility" consists of 8 chapters. The chapters in the book offer a decentered and dynamic terminology. They show that globalization consists of not only an objective process, but also of a lot of statements that define, describe and analyze the different experiences of the process. The chapters are written by authors and researchers from different academic disciplines, cultures and social contexts, therefore different experiences and scientific analyses on the consequences of globalization have been unified, starting from the multicultural and social epistemology to ethics of responsibility. Each chapter can be read separately, but in a complex, interconnected global universe of intertextuality of our world.

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University Campus STeP Ri
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Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821

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