Title: A multicultural Doctorate course on Information and Communication Technologies for Development

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Abstract

The goal of this contribution is to share our experience in organizing and participating to the "ICT4SD: Information and Communication Technologies for Sustainable Development" [1] doctorate course.

The course was held at the International Graduate School on Information and Communication Technology (ICT) [2] of the University of Trento (Italy) during the 2005/2006 academic year and it was promoted by the local chapter of the NGO Ingegneria Senza Frontiere (Engineering Without Frontiers) [3].

The main goal of the course was to provide PhD students with an understanding of the main issues associated with the use of ICT for Sustainable Development, by encouraging students to think critically about the relationships between Technology and Development through an awareness of the challenges they could face when appropriate technologies must be conceived, designed and implemented in emerging/developing regions.

ICT4SD has gained a recent interest in several countries around the world, with courses both at undergraduate and master level; to the best of our knowledge this is the first doctorate course in Europe on this topic.

The lecturer, Prof. Villarroel Ortega, has a great experience in the field of Telemedicine in emerging regions and is the ICT Director of ISF Spain.

The international context of the Graduate School on ICT in Trento allowed the setup of a multicultural class: out of the 25 attendants, almost half of them were from emerging regions like Algeria, Argentina, Byelorussia, Brazil, India, Mexico and Pakistan.

The entire course was conducted with participatory methods, where traditional classes were alternated by group activities and open discussions moderated by the lecturer.

Classes were therefore enriched by the different points of view and real experiences of people coming from emerging countries, a fact that was of great benefit especially to Italian students whose cultural attitude was often showing a somewhat distorted vision of development challenges and of the reality of emerging regions. The great participation to the course as well as the feedback provided by the attendants suggests that these issues are of huge interest to engineers and computer scientists, mainly due to their desire of better understanding the impact of ICT on both social and economical aspects of World development.

1. Introduction

Information and Communication Technologies (ICTs) are related to human development through their ability of empowering people in emerging countries(*) by offering fundamental tools to "create jobs, transform education, health care, commerce, politics and more. They can help in the delivery of humanitarian assistance and even contribute to peace and security", like stated by United Nations Secretary-General Kofi Annan, at the launching of the UN ICTs Task Force in November 2001 [4]. Moreover, among the commitments of the Millennium Declaration adopted in September 2000 by the UN member states, was "to ensure that the benefits of new technologies, especially information and communication technologies, are available to all" [5].
In the Action plan of the World Summit on the Information Society (Geneva 2003-Tunis 2005) [6] we find examples of important targets, such as all villages to be connected by 2010, with a community access point by 2015; 100% of the world's population to be within wireless coverage by 2015; all of the world's population to have access to domestic radio services by 2010.

On the educational side, new needs for changing and improving science and technology education are arising. Koïchiro Matsuura, Director-General of the UNESCO, introduced the need for a Reform of Education [7], highlighting that the application of science, engineering and technology to social and economic development requires adequate human and institutional capacity and continuous capacity-building. He denounced the big decline of interest among young people in science, with fewer people entering science and engineering courses. He suggests to make these technical courses more engaging through the use of project-based and problem-oriented learning, teamwork and continuous assessment. This new way of teaching will help changing the practice of science and engineering, which has major implications in sustainable development projects. Edgar Morin, ex director of the École des Hautes Études en Sciencies Sociales, in 1999 in Paris proposed to teach a knowledge able to criticize itself and promoting a general intelligence suitable to any context, global and multidisciplinary, flexible to interact with several complex elements.

We support all the above mentioned considerations and thoughts and we have decided to bring them into practice by proposing and organizing a PhD course entitled: "Information and Communication Technologies for Sustainable Development (ICT4SD)", at the International Graduate School on ICT, University of Trento, Italy.
Some of the authors had had the opportunity to attend abroad or to get to know about similar courses around the world. The proposal was deeply discussed with Prof. Villarroel from ISF (Ingenieria Sin Fronteras) Spain, and was presented to the Dean of the School, Prof. Petri, and to the Committee Board to be voted. It was accepted and introduced as Doctorate course (20 hours lectures, 3 credits) among the General Courses section into the Manifesto of Studies of the Academic Year 2005-2006.

We acknowledge the success of the proposal to the wide open minded and innovative Graduate School of the University of Trento, which is one of the few International PhD

programme offered in Italy in ICT, attracting students from many countries in the world and promoting intercultural exchange and diversity. A fundamental role was also played by the Trento chapter of ISF, that has been always present in the university life to promote and offer a new paradigm of technical education based on global skills and care for people and sustainability.

In order to help students and academic staff to become more familiar with the contents of the course, a few seminars were scheduled in the 3 months before the start of the course, on topics such as Digital Divide and the projects and education activities of ISF in Trento and in Italy. Email addresses and references of the participants were collected and they were contacted for follow-up meetings with the ICT group of ISF Trento (part of it is made up by some authors of this paper), that was in charge of co-organizing and tutoring the course. These meetings were focused on a reading suggested in advance and were informal and open; they proved to be very successful and people were enthusiastic of having the opportunity to learn and discuss about themes that had in mind but never expressed opinions about to others.
The seminars and meetings before the course also stimulated the students and contributed to create a friendly atmosphere in the successive class.

This paper starts with an overview of the state of the art in the existing educational programmes on ICT4D, secondly it describes the contents and goals of the course in Trento and gives a highlight on the outcomes and results in terms of students' satisfaction and response to their expectations and it ends with suggestions for possible improvements for future editions.

2. State of the art

Information and Communication Technologies for Development (ICT4D) is a recent subject in academic education. One of the first courses on the subject was the one held by Prof. E. Brewer and Prof. Richard Newton at the University of California Berkeley in Fall 2003 [8]. The course was open to both undergraduate and PhD students and its focus was on the applications of ICTs in the emerging regions context, with a strong bias towards field studies and deployments of the envisioned solutions also thanks to the support of enterprises, often present as speakers at the lectures, who were interested in sponsoring projects in those areas. The last editions of this course have evolved along these last years, however its main focus remains on using ICT for the economic growth of emerging regions. Almost during the same time period, the Open University of Catalunya, in collaboration with ISF–Spain, started a postgraduate course on “Technology for Human Development” [9], whose aim was to provide people having an engineering or technical background with an extended view of the problems related to development cooperation. The course, which has evolved to a Master degree course in 2005, is characterized by the strong influence of the “Human Development” framework promoted by ISF-Spain, which departs from the purely economic-oriented policies applied by international organisms (like World Bank, WTO, etc), which didn't meet expectations in most of the poor countries. Inside this postgraduate course, one of the authors of this paper, V. Villarroel, has been holding a module on “ICT4D”.

Other courses on this subject raised up in 2005 in UK and Spain, targeted mainly to undergraduate students, e.g. the course held by Prof. Tim Unwin at Royal Holloway, University of London [10], or the course on "Telecommunication Engineering for Development Cooperation" given in Universidad Politecnica de Madrid [11].

Finally in 2006, two Masters of Sciences and the first Graduate Programme in ICT4D have started, in KTH (Stockholm), Computer Science Dpt [12], in Manchester University, School of Environment and Development [13], and in Royal Holloway, University of London [14], respectively. These examples clearly show that there is a boom in the interest for ICT4D recently and hence the academic offer is starting to flourish.

3. Course objectives and topics

The course on Information and Communications Technologies for Sustainable Development at the University of Trento was taught in Summer 2006 by Prof. Villarroel, with some tutorship provided by the remaining authors of the paper. Prof. Villarroel was invited to Trento to give this course not only for his decennial activity on this specific subject but also because he's one of the most experienced teacher on ICT4D in Europe and gained significant in-field experience as national coordinator of many ICT projects in ISF Spain. The class was given in English due to the peculiar context of the Graduate School in the University of Trento, where about half of the enrolled PhD students were not Italian.

The goals of the course were to provide students with an understanding of the main issues associated with the use of ICT4SD as well as to let students gain awareness of emerging regions communities and the technical challenges they face. In particular the debates which took place in class were aimed to encourage students to think critically about the relationships between technology and development.

The content of the course followed this schedule: at the beginning an introduction to the development challenges and the role of ICTs was provided, by mentioning the millennium goals outlined by the United Nations. Then a definition of Digital Divide was given and several indicators were presented. This first part was followed by an overview of appropriate ICTs for Human Development such as low-cost Information Technologies, as well as pros/cons of Free, Libre and Open Source Software (FLOSS) in the context of developing countries. The lecturer then presented several case studies, among them the EHAS project currently under development in Latin America [15].

Standard lectures on these items were alternated by group activities in the class followed by open debates on real examples and projects. The final exam was a group project on issues freely chosen by the students and agreed with the teacher.

4. Outcomes of the course

The proposal of a doctorate course in ICT4SD got a very positive response from PhD students of the Trento ICT International Doctorate School. Precisely, 25 PhD students

enrolled for the course and this is a very good result since it represents about 50% of the students of the whole School [2].
We believe this fact shows an increasing interest from "engineers and scientists" in reasoning and discussing the impact which the technologies they create and deploy have in the real world, starting from the consciousness that technology is not neutral. This is the case also for scholars in ICT that is sometimes considered a quite abstract science and hence with little impact on the real physical world, especially if compared with Environmental Engineering, for example.
The composition of the attending students is a very interesting point: almost half of the PhD students came from emerging regions such as Algeria, Argentina, Belarus, Brazil, India, Indonesia, Mexico, Pakistan, Russia.

Thanks to the feedback from the students, collected both as anonymous surveys and personal conversations, we were able to acquire many useful insights that will undoubtedly help us in organizing better courses on this topic in next years. We would like to share these insights and lessons learned with the hope that they will be helpful to others as well.

The first point we would like to mention refers to the expectations the students had before the course. To our partial surprise, we were able to identify clearly different expectations between students coming from emerging regions and Italian students and also, as was instead expected, different levels of awareness of the situations of emerging regions and the role ICTs can play in them.
For example, it was fascinating for Italian students to learn about the situation of rural India through videos and analysis of indicators, while this information was less interesting and already known for students coming from India who had lived there for 20 years. This fact made the course much more challenging for the lecturer, especially when opening discussions in the classroom.
As a consequence, students coming from emerging regions expressed a preference for moving as soon as possible to the "what can I do" part, exploring past projects and ideas and discussing about what worked and what didn't and why. Instead, Italian students, more unaware about the situation and life conditions of specific emerging regions, had the desire to know about these aspects before learning how ICT can be applied in those contexts. The tension between these two different expectations was anyway always constructive and led to discussions and to enriching mutual exchanges of different points of view.

The multicultural aspect of the classroom was a very significant point and clearly suitable for a horizontal kind of learning. A large part of the course was organized as works in smaller subgroups, in which discussion was easier, followed by a report to the entire class for a global discussion, summarization and closing remarks of the lecturer. The discussions (both in the subgroups and the plenary ones) were particularly interesting since the different cultural approaches came out due to different real personal experiences and interests.
A suggestion we received from the students after the course was to give even more attention to the analysis of real case studies and past experiences. In fact, one of the critiques was that sometimes the class discussions resulted a bit unfocused, with the students simply exposing their views and opinions without anybody having time to acquire real knowledge about the situations, adopted solutions and reasons behind projects choices. As a consequence, some students suggested to assign the topics for discussions before the

start of the course. Moreover some students also remarked the importance of the introductory seminars we organized before the course as a mean to get acquainted with a new topic in a pleasant and smooth way.
Another aspect that could be improved in next editions of the course is related to the duration: it was suggested to stretch it to at least two entire weeks, while the 2006 ICT4SD course was compressed in a single week only.

Finally, we would like to mention that the exam consisted of reports produced by the students in groups and this methodology was very appreciated because it allowed every student to better understand a desired specific topic and to interact more with the other fellow-students. Moreover, one of these final reports [16] has been submitted to the 9th IFIP International Conference on Social Implications of Computers in Developing Countries [17].

5. Conclusions

The proposed course in ICT4SD received a very positive response from PhD Students of the ICT International Doctorate School of the University of Trento, both in term of numerical participation and reported satisfaction.
This is the sign of the increasing interest of scientists and engineers in reasoning and discussing about the impact of the technologies they create and deploy in the real world.
We are exploring the possibility of redesigning and extending the course in order to offer it both to graduate and undergraduate students, possibly as part of the final Master project.
We also believe we should seize the day and make a proposal for organizing a course on ICT4D topics at European level. Networking all the experiences developed in the last few years in Europe about ICT4D would allow to offer a high-level course that could be physically spread across Europe so that real experiences and views can get shared and mutually exchange to the great benefit of all the participants.

Bibliography

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[3] http://www.isf-trento.org
[4] http://www.unicttaskforce.org/welcome
[5] Resolution adopted by the General Assembly, 8 September 2000, http://www.un.org/millennium/declaration/ares552e.htm
[6] http://www.itu.int/wsis/implementation/index.html
[7] http://portal.unesco.org/sc_nat/ev.php?URL_ID=3667&URL_DO=DO_TOPIC&URL_SECTION=201&reload=1161087304
[8] http://www.cs.berkeley.edu/~brewer/ict4b/
[9] The old web page has been removed, but a good reference to the content of the course can be find here:

http://www.uoc.edu/masters/esp/cooperacion/ingenieria_cooperacion/P_accion_hum.html
[10] http://www.ict4d.org.uk/
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Footnotes

(*) "Emerging regions" will be used in the text as synonym of developing/poor countries.