

Chapter XX

Improving University Education in Computer Science through Community Extension and Volunteering Activities

F. JAVIER DIAZ¹, CLAUDIA BANCHOFF T², VIVIANA HARARI³, VIVIANA AMBROSI^{4,6}, IVANA HARARI⁵ and MARCELO RAIMUNDO⁷

^{1,2,3,4,5,7}La Plata University, ⁶Comisión de Investigaciones Científicas, La Plata, Buenos Aires, CP 1900, ARGENTINA. E-mail: {jdiaz, cbanchoff, vharari, vambrosi, iharari, mraimund} @info.unlp.edu.ar

The Computer Science School of the UNLP has long embarked in the establishment of extension and volunteering projects that allow students in computer science degree courses to become involved in social and environmental responsibility activities. Framed within the current international tendency toward focusing on the skills acquired by university students, this article provides an analysis on how certain skills and competences tend to improve in students that take part in extension projects. It describes the projects with special emphasis on the work of its main “collaborators,” the students, guided by the teachers of our School, focusing on the importance of encouraging a sense of social and environmental responsibility through these actions. The final section presents the results of an evaluation conducted on the impact of participating in these projects on the students.

INTRODUCTION

Since 2007, the Computer Science School of La Plata University, Buenos Aires, Argentina (UNLP) has been working on social and environmental extension projects, which call on students of the computer science courses to participate and collaborate actively. The year 2006 saw the incorporation of several courses introducing Computing for Senior Citizens (since 2009, a joint activity with the University Program for elderly people called: “Universidad para Adultos Mayores Integrados – UPAMI”, now segmented this courses into four levels) and a computing course for 17 young adults of communal kitchens in La Plata enabling them in the computing tasks that area requested

to employment applications for their first work position. The later course gave satisfactory results, but showed us the need for taking these activities to the neighborhoods where these students lived (since the social context has a series of special characteristics that directly affect their relationship with their teacher.)

In 2007, the school undertook the project “Reducing the Digital Divide in Underprivileged Sectors of Society.” Student and teacher volunteers traveled to social diners in order to introduce computing concepts to children and teenagers with limited economic resources, mainly supporting their activities in the school. These courses focused on basic PC operation concepts, but also on showing the computer as a tool to assist learning in other disciplines. Because the diners lacked the necessary computing resources, the activities took place in nearby Internet cafes.

In 2009, a growing concern about what to do with obsolete or unused computer equipment that turned into e-waste gave rise to another project. The Computer Science School began working on environmental and social awareness and the reuse, repair and recovery of WEEE (Waste Electrical and Electronic Equipment).

In 2010, these two projects were successfully merged, which resulted in the donation of the reconditioned computing equipment to the training locations, providing the formerly-excluded diners with both the computing training and the proper resources.

In these projects, the student volunteers can take on different roles. They came from different disciplines, such as Computer Science, Engineering, Education and Social Communication. Engaging them in these activities with a social cause, complements the learning of Computer Science contents with other multidisciplinary aspects, ranging from ethical, technical, social and environmental education to communicational and pedagogical training.

Some of the most salient activities in which our volunteers engage are: inspecting the received equipment and securely erasing the hard drives, taking apart the unused equipment, selecting reusable parts, putting together new PCs, selecting and installing both office tools and educational free software applications, configuring the new equipment with free software and thin clients, and adapting the software for multiple types of hardware. The students also prepare and teach the classes, setting up presentations and proposing curricular activities to motivate and receive feedback, setting up and maintaining a Wiki that contains class materials, designing and maintaining the website, following the projects, and organizing promotion and awareness campaigns, as well as sessions and talk presentations in schools and other locations.

This paper presents these initiatives which were approved in successive call for volunteering projects and projects dealing with social issues done by the National Ministry of Education of Argentina and by the Presidency of the National University of La Plata (UNLP) These projects involved over 50 student volunteers. The following pages will describe the university extension and volunteering projects and analyze their impact in the skills and competencies developed by the participating students.

It is most gratifying to take the school to underprivileged social sectors to attend to social, environmental, educational and technological matters, while converging an ethical education for the computer science student with a social commitment and environmental awareness, who understands how computer science can be applied for the reduction of the digital divide in the least privileged sectors and collaborates in environmental causes.

This comprehensive training allows our students to acquire competences that help them take a more active role in a society where citizen involvement is essential in solving structural problems.

DIGITAL LITERACY AND WEEE REUSE: TWO COMPLEMENTARY PROJECTS

For several years, the Computer Science School has been working on reducing the digital divide in multiple sectors of our society. This goal contemplates both the cases of people excluded from technology and prevented from interacting in the information society, for generational and socioeconomic reasons. Thus, work is focused on training senior citizens, who were left out of the information society for generational reasons, and children and teenagers of underprivileged sectors of our society, who have no access to a computer to complement their academic activity. Currently, five levels of the courses on literacy for senior citizens are being imparted (up to the use of web 2.0 social networking tools). The experience also includes a Conexión Educativa's show 'Informática para adultos'. Conexión Educativa is the third largest satellite TV network and the shows produced were also distributed in other Latin America countries and Spain. This show was nominated for a 2011 Asociación Argentina de Televisión por Cable (ATVC) award in the Educational track.

Although multiple projects have been presented to each call, all of them have the same goal: to take computing literacy to the most underprivileged sectors of our society, especially to those surrounding our city, La Plata. In the beginning, the addressees were children and teenagers, and later the scope was extended to include their families. Although training in every level is oriented toward students learning how to use a computer and the services provided by the Internet, there are different orientations according to age groups.

Another line of work began to get closer to the literacy project and finally came to complete it with environmental awareness actions.

The fast development of the electronic industry has generated an increase in equipment and component production-consumption levels, which has also led to an accelerated accumulation of unused and obsolete equipment. Argentina is one of the leading Latin American countries in ICTs – it is estimated that, currently, around 100,000 tons [7] of e-scrap are produced in Argentina per year. The lack of an act specific to WEEE¹ management, together with a lack of awareness in the general public regarding the toxicity of some of their components (which leads to their disposal in garbage dumps) and their proper treatment and disposal motivated us to contribute to a solution from the School.

We began with awareness activities, with the main focus on the reuse of the equipment to lengthen its life cycle and reduce its environmental impact. For this purpose, we donated the recovered equipment as a solution to the problem related to a

¹ In May 2011, the Senate gave preliminary approval to the Minimal Budget for Waste Electrical and Electronic Equipment (WEEE) Management Act (Presupuestos Mínimos para la Gestión de Residuos de Aparatos Eléctricos y Electrónicos – RAEE) presented by Daniel Filmus and debated for three years [8].

lack of proper facilities for computer literacy training (the activities used to take place in nearby cybercafés with very limited resources).

This reuse of the recovered equipment provides the possibility of supporting digital divide reduction projects in underprivileged sectors of society, which gives our environmental awareness actions a practical dimension. We know, however, that ours is a small contribution and that the real problem still has to be dealt with and solved by the government and society as a whole.

The school actively calls for the community to donate unused computers in order to restore it and donate it to institutions. As a work strategy, the school organizes environmental awareness talks to communicate the risk of disposing improperly of electronic or computer related waste. Donations are received periodically through a well defined work scheme. This makes us aware of the great concern this topic generates in the general public.

To this day, our team has been able to donate equipment to many different institutions, putting together entire PCs out of recovered materials and installing free software in them. In particular, there is a strong collaboration with the Lihuen GNU/Linux [12] development team. Lihuen GNU/Linux is a Debian-based distribution especially adapted for educational environments. In cases where the computers have very little computing power or memory, the team works with thin clients, which also run on free software. The institution to which the equipment is donated is in charge of acquiring the server and the resources necessary to set up the network. If they are unable to buy this equipment, they wait for a company to donate them (usually by some Corporate Social Responsibility program). In some cases, our volunteers also participate by setting up the network, although in some other occasions this task was performed by the staff of the institution.

To date, a total of 25 donations have been delivered. Most of them included PCs and their set up and, in some other cases, consisted of hardware components for different purposes, such as robotics tests or the production of art pieces. These donations were requested by students of our university, from different academic units as part of an academic requirement.

As regards training, the team of teachers and collaborators, which includes students, graduates and administrative staff of the School, takes part in updating the content of the courses as well as in delivering them. When the courses first began, the teachers elaborated guides for each level, and the contributions of the student volunteers continue to update them with new activities.

Given the characteristics of the training provided, both the teachers and the students have had to adapt to the sometimes precarious conditions of the locations. It is important to emphasize that, with the focus clear, our team has always found a viable way to successfully complete the training sessions.

THE PARTICIPATION OF COMPUTER SCIENCE STUDENTS IN THE PROJECTS

Both projects are maintained due to the collaboration, hard work and dedication of all the actors involved, but the work of the university students is fundamental for their continuity and development. Nonetheless, it is fundamental to include in this perspective the role the University gives to the overall formation of contemporary professionals.

As of 2011, there were 55 students participating, out of which 35 were involved in the literacy project and 20 were in the e-waste reuse project.

It is worth emphasizing that a high percentage of the students have been involved in these social practices for as long as 2 years, which shows their strong commitment to the initiatives.

Aside from their academic activities, our student volunteers dedicate most of their time to their activities within the projects, which are related to their professional goals and are generally planned in advance with the teachers. Sometimes, however, the students are faced with situations that have not been planned, and they must make their own decisions (enhancing motivation skills and their role engaging the children in the proposed activities).

Some of the most salient activities of the students involved in the digital literacy project are:

- Researching theoretical and practical material on Computing.
- Participating in the preparation of the material with the teachers.
- Researching free software educational tools that help consolidate knowledge from other disciplines such as Mathematics, Chemistry and History using a computer.
- Planning the classes with the teachers.
- Delivering the classes.
- Participating in the organization of conferences and awareness talks.
- Participating in the elaboration of a WIKI with information on the project and its achievements.

Regarding the computing equipment reuse project, the students participate in the following activities:

- Testing, classifying, repairing and reusing the received equipment, using the issue tracking system (GLPI²) to manage the information.
- Participating in the organization of e-waste collection campaigns.
- Interacting with the group that maintains the Lihuen operating system for its installation and the solution of general hardware conflicts.
- Participating in donations and setting up the PCs.
- Setting up and configuring thin client networks.
- Analyzing hardware reuse alternatives.
- Participating in the procedures and documentation required.
- Developing and maintaining the website and spreading the word on the project through social networking sites.
- Participating in the organization of conferences and awareness talks.
- Organizing and delivering PC repair courses as a way to teach a first trade and allow job placements, as well as to take the experience to technical secondary schools, using the equipment and tools available.

² GLPI: Inventory and Incidence Management Software <http://www.glpi-project.org/>

In the case of the students that give the trainings, not only do they learn how to teach the topics, but also to face different kinds of audiences and, as was mentioned previously, to make micro decisions in order to solve certain problems. The students also learn to interact with people who live in different conditions than the ones that surround them.

These activities contribute to the education of the students in relation to matters that are not specific to their degrees, but which are fundamental to a comprehensive education to live in today society.

EVALUATING THE IMPACT OF THE PROJECTS ON COMPUTER SCIENCE STUDENTS

The computer science students that participate in the projects have direct interaction with the professors and directors. This helps build a collaborative team with horizontal communication where everyone works toward the common goal of completing the project activities.

Both in daily work and in the periodic meetings, comments, opinions and doubts of the students are taken into account, which allows the teachers and directors to understand their feelings and watch their efforts in balancing their higher education and their responsibilities within the project.

To systematize the observations on the impact of the students' participation in the projects, a survey was conducted consisting of 16 items, mostly open questions. The survey was emailed in July 2011 to all the students involved in the projects (closed and ongoing), and 20 responses were obtained from 6 female and 14 male students between the ages of 22 and 28.

This survey was aimed at inquiring into multiple dimensions of their experience in the projects, to analyze the impact this experience has had in their personal and professional training:

1. How positive do you consider your experience in the projects to be/have been?
2. What do you value the most out of the projects?
3. Did they alter your view of society?
4. In what measure have they contributed toward your professional training?
5. What do your family and friends think about your involvement in the projects?
6. What is your opinion of the teachers involved in the projects?
7. What is your opinion of the social commitment of the university and school with the community?

DESCRIPTIVE RESULTS

Regarding the experience of participating in the project, all of the students surveyed think of it as positive, half of them adding the adverb 'very'. As to why, most answered:

- that participating in the projects makes them face the reality of our country;
- that the projects are a way of contributing to a change;
- that they construct a space for education and learning, both for the community they are aimed at and for themselves, since they grow personally and have social contact with other sectors of society. This demands that they learn to behave and express themselves differently than in an academic context;
- that they constitute a way to give back to society what it contributes to free and public education (this was stated more than once);

- that they provide contact with a “humanistic” perspective;
- that they have acquired valuable professional experience – in the case of the digital divide project, because of the teaching involved, and in the case of the e-waste project, because of the acquisition of hardware-related knowledge, and
- that they are more self-confident than they used to be.

Regarding what computer science students value the most out of the projects in which they participate, they mentioned social and environmental commitment, human bonds, social and family integration, personal development and opportunities for all the participants and educational quality.

Regarding whether their participation in the projects changed their perception of the social reality, most (75%) of the participants in the digital literacy project surveyed answered yes, stating that it is not the same to hear about it in the media than to see it with their own eyes. They stated that they lived situations that were unusual in their own contexts. This allows them to see and understand other social realities.

In the case of the e-waste project, the students added that, despite knowing about the problem, participating added another dimension for them and made them reflect on consumerism and how this situation can be reverted.

Generally, it is noted that the family and friends of the participants had a positive reaction to their involvement and were sometimes so interested in the projects that it led to the addition of new volunteers.

In the digital literacy project, there were cases of initial disapproval because of fear of certain danger situations due to the neighborhood where the activities focused, in order to relieve the students about these concerns the participants in the project are taken to the premises by taxicabs.

Among the most emphasized values in relation to the teachers behind the projects, the students mentioned willingness and effort. In terms of attitude towards the project: commitment, dedication, selflessness and spirit. In terms of the relation with the team: generosity, trust, openness.

Two interesting phrases are worth emphasizing: “*The professors teach us to teach and not underestimate other people*”, and “*The professors feel and believe that we can really improve the lives of these people and, through this, society as a whole*”.

It is evident that the attitudes transmitted by the professors serve as a moral compass to the participants and as virtues essential to project leadership.

If we consider the students' assessment regarding the commitment of the University towards the community, most of them believe this kind of projects to be beneficial, and add that:

- Most of the students should go through this experience as a way to return to society what it has given to public education; most of the students emphasize the idea that the University should be in service of social needs.
- Through these projects, the university can act and be part of the solution to social and environmental problems.
- The university not only forms professionals of excellence, but also men and women who are committed to social causes.
- It is very important that the community can see specific work with outcomes that improve persons live in different neighborhoods.

- These projects help change the perception of both parties and bring the university closer to disproving the myth that making bridges to shorten the divide in our society is out of our reach.

There is, then, a relation between these projects and a comprehensive formation of the participants, and a positive assessment on the link between the University and the community.

Finally, considering the impact of the experience in terms of personal development and new skills gained, all the students answered that their participation in these projects helped them learn how to plan and coordinate activities and make decisions on the spot to improve the task. The vast majority also stated having acquired new competences in team management, independence, and oral expression, while some also expressed that they have noticed an improvement in their time management skills.

SUMMARY

One of the main goals of the UNLP is to form professionals that are aware of environmental issues and the need for projects that reduce the divides that affect our society. For this reason, it is essential to generate activities outside the classroom, where the students can acquire competences for their professional and personal lives that respond to the needs of our current society. This already important axis becomes more relevant when working in a technological field within a hard science.

For this reason, socially and environmentally oriented projects were defined, that not only provide ICT literacy in underprivileged sectors of society, but also the equipment necessary for the task.

Reusing the recovered equipment for social and educational purposes provides the possibility of sustaining digital divide reduction projects and gives a practical dimension to actions towards digital literacy and environmental awareness.

This article presents the actions undertaken by the Computer Science School of La Plata University to revert the digital divide, involving the students of the computer science degrees offered by this institution.

A community is created among professors, students and other staff who volunteer many different roles and responsibilities, to introduce ICTs to the most vulnerable sectors of our society.

All this effort generates a high level of gratification both in the recipients of these actions and in the collaborators that make them possible.

Especially in the case of the students, their participation in these social initiatives allows them to complement the highly specific computer science learning with the formation of a responsible, ethical and committed human being.

The results of the surveys clearly show that the projects allow their participants to approach reality outside the academic, to take part in it in order to transform it, to form persons inside and outside academia, to widen the cognitive horizon and to encourage a certain retribution ethic that questions the individualistic perspective usually encouraged in university institutions, not merely based on altruism, but to return the efforts that the population makes to sustain public education.

ACKNOWLEDGEMENTS

We would like to thank the students, professors and staff who participated in both projects for their commitment, willingness and predisposition.

REFERENCES

1. Official Website of the Computer Science School, La Plata University: www.info.unlp.edu.ar
2. Official Website of La Plata University: www.unlp.edu.ar
3. J. Díaz, I. Harari, C. Banchoff Tzancoff, V. Harari, "Reduciendo la Brecha Digital en Sectores de Bajos Recursos," *XVI Congreso Argentino de Ciencias de la Computación CACIC 2008*, La Rioja, Argentina, 2008.
4. "Programa de Voluntariado Universitario. Secretaría de Políticas Universitarias. Ministerio de Educación".
http://www.me.gov.ar/spu/guia_tematica/VOLUNTARIADO/vu____proyectos.htm
5. "Proyectos de Extensión subsidiados y acreditados por la UNLP. Año 2008".
http://www.unlp.edu.ar/articulo/2009/5/15/proyectos_de_extension_subsidiados_y_acreditados_ano_2008
6. "Proyectos de Extensión subsidiados y acreditados por la UNLP. Año 2010".
http://www.unlp.edu.ar/uploads/docs/dictamen_de_la_comision_de_extension..%5B1%5D.pdf
7. V. Tufró, "Destino final de los equipos electrónicos obsoletos de usuarios corporativos de TIC en Argentina". RELAC IDRC/SUR. January, 2010.
<http://www.es Scrap.com.ar/descargas/informe-raee-arg.pdf>
8. D. Filmus, "Proyecto de ley sobre Presupuestos Mínimos para la Gestión de Residuos de Aparatos Eléctricos y Electrónicos (RAEE)". <http://www.ar.enfa-sys.com/news/imagenes/PDF/Ley-RAEE-Filmus.pdf>
9. G. Fernández Protomastro, "Estudio sobre los circuitos formales e informales de gestión de Residuos de Aparatos Eléctricos y Electrónicos en Sudamérica Información con datos de Argentina, Chile, Bolivia y Venezuela".
http://www.basel.int/centers/proj_activ/tctf_projects/001-2.pdf
10. E-Waste Project. <http://e-basura.linti.unlp.edu.ar>
11. Lihuen Project. <http://lihuen.linti.unlp.edu.ar>
12. G. Brewis, J. Russell, C. Holdsworth, "Bursting the Bubble: Students, Volunteering and the Community," Bristol: NCCPE, 2010.
https://www.publicengagement.ac.uk/sites/default/files/NCCPE_Bursting%20the%20Bubble_FullReport.pdf
13. M. Hill, and D. Stevens, "Measuring the Impossible? Scoping Study for Longitudinal Research on the Impact of Youth Volunteering," London: Institute for Volunteering Research, 2010. <http://vinspired.org/resources/17>

Ivana Harari is has a Bachelor in Computer Science from La Plata University (1992). She has been an Adjunct Professor of the Computer Science School,

since 1998. She co-directs the project Reducing the Digital Divide in Underprivileged Sectors of Society, and the Accessibility Department of the same School.

Viviana Ambrosi received the degree of Scientific Computist from La Plata University (1986). She is the Chief of Practical Applications of the Computer Science School. She directs the projects Informatics: Trades and Academic Internships and E-Waste. She also directs the Environmental Awareness Department of the same school.

Viviana Harari received the degree of Scientific Computist from La Plata University (1982). She has been an Adjunct Professor of the Computer Science School, since 2005. She directs the project Reducing the Digital Divide in Underprivileged Sectors of Society, and the Community Relations Department of the same School.

Claudia Banchoff has a Bachelor in Computer Science from La Plata University (1982). She has been a Full Professor of the Computer Science School, since 2009. She directs the project Free Software in Schools, and is the current Secretary of Extension of the same School.

Javier Diaz has a Bachelor in Applied Mathematics and Scientific Computist.. He is the Dean of the Computer Science School at La Plata University (UNLP), the Director of the Computer & Network Center of La Plata University and the Director of the Laboratory of New Technologies in Computer Science (LINTI) of La Plata University.

Marcelo Raimundo is Professor of History and PhD candidate in History at the University of Buenos Aires (UBA). He is an Adjunct Professor of La Plata University (UNLP). He has carried out research on various topics relating to the use and impact of ICTs in different sectors of society.