

## CHAPTER 5

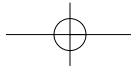
# CREATING THE INFORMATION INFRASTRUCTURE FOR ONLINE DISTANCE LEARNING

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### 5.1 Introduction

The “School of the Future” of the University of São Paulo (USP), Brazil’s largest higher education research institution, is an interdisciplinary center of investigation with focus on the impact of the new information technologies on teaching and learning in general, and on the innovative potential these technologies have for all levels of capacity-building. Inaugurated in 1989 as a departmental laboratory of the School of Communications and Arts of USP, it was transformed in 1993 into a University-wide laboratory, subordinated to the Office of the Dean of Research. Financially self-sustained, it is guided by a humanistic approach to its mission, namely, the development of new models for the transformation of the present teaching/learning paradigm, with the support of solutions in the fields of open and distance education, and seeking to create differentiated, unconventional learning environments and didactic materials. The laboratory’s goal is to conceive, implement and promote original research projects which, using the resources of the world of Informatics and Telecommunications, contribute decisively to the optimization of the teaching/learning process possibilities. Proactive and pro-cooperative, it carries out activities which seek to bring together the University, schools, the business world, governmental agencies, non-governmental organizations and civil society in general. At present, over seventy professionals, from undergraduate students to post-doctoral fellows coming from different domains of knowledge, work together in an environment akin to the *skunkworks* model.

In addition to adding to the national and international store of scientific knowledge, through the production of books and articles in specialized journals, theses and dissertations, the laboratory supports the international Portuguese-language learning community through various ongoing projects. Since it is not a teaching, degree-awarding, unit of the University, it has concentrated its efforts over the years in the creation of the “infrastructure” for distance learning. Perhaps this role can be better understood if we think of Internet-based distance learning as having, basically, three general categories: (1) those activities that have the structure of a “course,” regardless of its duration, format or degree of mixture with face-to-face components; (2) those learning activities which *do not* have a course structure – such as remote access to virtual-reality environments, or the control, through the web, of sophisticated scientific equipment, or, and perhaps most commonly found, “virtual commu-



nities" of learning or practice; (3) repositories of digital content – virtual libraries, museums, herbariums, or collections of learning objects of all kinds – and which may or may not have as a "front-end" a users guide for the content, an "tool agent" tool which facilitates self-directed, non-formal, just-in-time learning. All these three general structural forms can involve collaborative activities among the learners, and it is this very powerful feature of web-based learning (interactivity and deeply-involving learner collaboration across time zones and political and natural boundaries) that is in great part responsible for its rapid growth. But since all three of the aforementioned categories can make use of effective learner collaboration, it, in itself, is not a structural category. The School of the Future at USP, then, has concentrated much of its work in the categories of the second and third types (especially virtual learning communities and digital repositories), and, in addition, it has developed several projects in the fields of "telecenters," and the preparation of school teachers in the appropriate use of the new information technologies.

## 5.2 The Virtual Library for the Portuguese-Speaking Student – BibVirt

[www.bibvirt.futuro.usp.br](http://www.bibvirt.futuro.usp.br)

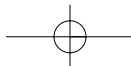
**Coordinator: Ana Paula Leite de Camargo, Bach.**

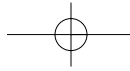
Originally started in 1997 as the "Virtual Library for the Brazilian Student," this project was planned to be an on-line, multimedia solution to the dire lack of school libraries, public libraries and bookstores in Brazil, and was initially sponsored by the AT&T Foundation, the International Council for Open & Distance Learning – ICDE, and the São Paulo State Secretariat of Culture. In 2003, it broadened its scope to include materials, and to attract users, from the seven other countries in Europe, Africa and Asia where Portuguese is the official language (and, as well, to support the studies of the more than one million Brazilians and their children living in Japan, United States and elsewhere). Its contents are available free of charge, 24 hours per day, seven days per week, through the Internet.

Students, teachers and the general public can easily access the Virtual Library, where they find a vast repository of literary and historical works in the Portuguese language (in unabridged versions), graphics, images, sounds and videos related to learning in primary, secondary and technical schools, and post-secondary institutions, and for self-directed learning as well. These basic, "open educational content" resources help enrich a teacher's curricular and extra-curricular educational activities, augment a student's motivation while supporting the development of his or her heuristic skills, as well as providing learners with multimedia content either for on-screen study or to be included in individual or group school projects. With an average of 20,000 different users per day, the Virtual Library has been consistently voted by Brazilian internauts as one of the top three educational websites in the annual I-Best competition – the Oscar of the Brazilian Internet –, and has also been awarded by the State Secretariat of Culture of the State of São Paulo.

The Virtual Library already has in its archives:

- More than 500 e-books of Brazilian and Portuguese literature in the public domain;
- More than 50 videos (documentaries);





- 1,500 examples of clip-art;
- Hundreds of historical drawings and pictures of the colonial past, indigenous culture and flora and fauna;
- Audio files of historical speeches by important figures in politics, science and culture;
- About 100 audio-books for persons with visual deficiency;
- Para-didactic materials for teachers, related to the appropriate employment of the audiovisual materials to be found in the on-line collections.

Although originally planned to be used by students in early education, subsequent studies of the library's users revealed that almost a third of the regular users are university students, and about 5 percent of users are located outside of Brazil.

### 5.3 The Virtual Laboratory for Learning Science – LabVirt

[www.labvirt.futuro.usp.br](http://www.labvirt.futuro.usp.br)

**Coordinator: Dr. Cesar Augusto Amaral Nunes**

LabVirt is a project which seeks to combine the most recent advances in the understanding of cognitive processes with the use of technology in education, especially the creation of "learning objects," both interactive and otherwise. Hence, it incorporates into the process of teaching and learning, and in a natural manner, both collaborative tasks and "learning by doing." The term "learning by doing" is understood here as the utilization/application of knowledge at the same time that it is acquired. This occurs when the learner generates a product that requires the acquisition and development of knowledge. In the case of the LabVirt, the products which stand out most are the simulations of problem-situations, generally situations from everyday life. These situations are created by the students themselves and correspond to the curricular topics with which their teachers normally work; that is, there is no attempt to cause a rupture with the curriculum. However, the very nature of the activity (the creation of a problem-situation contemplating the content which is being learned, and which will be transformed into a simulation for the Internet) generates creative, interdisciplinary proposals connected to reality, and which take into consideration student interests.

High school students have a central role in the LabVirt. They are the ones who create the new digital resources, learning objects, which will be "published" on-line and accessed by other persons. When they realize that they have this role, they become motivated, critical, concerned with the user, with the messages they issue, with the correctness of their representations, and with the quality of their products. They begin to become not only "receivers," but also "agents" in the production of knowledge. They have a sharply-defined critical sense, and many of them know notable examples of technological products. Therefore, when they create their simulations, animations and interactive games, they have a high expectation regarding their final results. They come to have a clear idea that sophisticated products require technical knowledge and skills which normally are not developed within the traditional system of "schooling", not only for a lack of "space" in the curriculum. On the other hand, the skills and knowledge necessary for the production

of rich and interactive interfaces are developed in university courses. Here, an important component of the LabVirt at USP comes to the fore: students in schools work collaboratively with university students. Some university students work giving support to the development of the ideas and conceptions of the student-produced storyboards, with utilization of the curricular subjects in the schools. Others work in the production of interfaces, graphic design, animations and programming. It is *this* connection which gives gratification to all those involved in the process, generating products of great quality and recapturing the pleasure of creating and learning.

This form of using technology, with the learning motivated by the collaborative production of problem-situations, would have been unthinkable only a few years ago. It depends essentially on the facilities of collaboration and access-to-content offered on the Internet, generating, in the case of the LabVirt, a true learning community, and involving students in high schools and universities. Through the generous support of the Vitae Foundation, the Telefonica Foundation and Microsoft, it has been possible in recent years for LabVirt to produce scores of learning objects in the fields of physics, chemistry and mathematics, all of which involved the participation of students from public high schools in São Paulo, and all of which are made available without charge on the project's site.

The team involved in the physics area had researchers from the School of the Future and from different University departments belonging to the Schools of Communications and Arts, Education and Polytechnic of USP, and brought together 6 post-doctoral researchers, 6 web designers and 6 programmers, 45 public high schools in the state of São Paulo, 60 teachers of physics, 4,000 participating students who sent approximately 270 scripts for the development of learning objects (over 200 of which have already been produced and are available at the LabVirt Web site), and 150,000 students involved in the beta-testing of the objects.

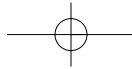
The team involved in the chemistry area involved 14 researchers related to School of the Future and the Institute of Chemistry (USP), 6 web designers and programmers, 26 public high schools in the state of São Paulo, 33 chemistry teachers, 3,000 active students sending scripts (a total of 130, of which 108 have been produced and are available on the LabVirt Web site), 80,000 students involved in testing the beta versions, 13 editions of the virtual magazine *H+*, and 60 student questions answered by the "Chemistry Consultant." There is a significant number of students actually using the simulations already produced, both in physics and chemistry, but no special effort has been made as yet to quantify this factor of impact.

## 5.4 The Sciences and Technology Teaching Laboratory – LECT

[www.lect.futuro.usp.br](http://www.lect.futuro.usp.br)

**Coordinator: Dr. Marcela Elena Fejes**

The Sciences and Technology Teaching Laboratory (LECT) consists of a multidisciplinary team that performs, since 1992, research in science education, with the challenge of incorporating the new communication technologies and information processing into innovative teaching approaches. Its experience in the implementation of different scientific research projects specifically developed for students, with ages varying from 7 to 17, has been carried out in public and private Brazilian schools, as well as in some foreign schools.



All the projects developed have as common features the solution of daily problems, “hands-on” experiences, the use of the Internet for inter-school collaboration and information-sharing, and are related to different scientific fields, such as botany, zoology, thermodynamics, environmental planning, health, astronomy, nutrition chemistry and others. Communication with the members of this scientific community composed of young learners is through on-line distance education, using all available methods such as e-mails, chats and forums. All participants share their research results, which are open to everyone through the project site. The project holds an annual face-to-face meeting of young scientists, in order to share experiences and to enable them to present their original work.

### 5.4.1 Current projects

**Birds** – An approach to nature through the observations made by students on the characteristics of the birds near their school; and, using recycled material, the analysis of the feeding preferences of hummingbirds, with the on-line exchange of information and discussion among students in participating schools.

**Dandelions** – Using the “lion’s tooth” flower, students carry out experiments of vegetable physiology, such as observing seed germination in different periods of the year, analyzing seed dispersion and the “cosmopolitan” behavior of the species, and mounting “virtual herbariums.”

**Ecology of Water** – This project allows high school students to analyze the quality of streams and rivers near their school. The observation of characteristics important in the study of physics and chemistry, together with the observation of the presence of bacteria, are some of the test-activities carried out by the students.

**Solar Energy** – In this project the students use alternative forms of energy, such as solar energy, capturing it through special, simplified collectors, and then using it for simple, measurable experiments at school, comparing the results in different geographic locations through web-based discussion.

**Finlay** – This project mobilizes students and teachers to collect data for combating the mosquito responsible for a disease called “dengue.” Beginning with a search in nearby homes for the mosquito larvae, the students in participating schools report their results to SUCEN (a specialized Federal health agency), which identifies the *Aedes’ Larvae aegypti* found by the students, and then proceeds rapidly to the dangerous insects’ extermination.

**Frogs** – This project features the study of thyroid hormones in the organism of bullfrog tadpoles. The close study of the metamorphosis of the tadpoles is done during a whole semester, and students follow the comparative development and results through Internet-based reports and discussion.

**Fruits** – This project involves students in primary and secondary schools in activities related to the study of chemistry. They follow the maturation of fruits under different storage conditions through the analysis of vitamin C, tanine and sugar concentration.

**Carnivorous plants** – This project has as its goal knowledge of the importance of heterotrophy nutrition in carnivorous plants, through the systematic observation of different species and plants fed with and without insects.

**Sky** – This project allows the student to obtain basic knowledge of Elementary Astronomy, such as the apparent movement and action of the Sun and the different seasons. This is accomplished through the daily and weekly measuring of the shadow produced by the sun's striking a 1 meter broomstick placed perpendicular to the ground in the schoolyard, and the comparative exchange of information on the web between students in participating schools.

**Amazonia Transversal** – The students compare the biological parameters of two different rivers of the Amazon Basin complex and a river in the State of São Paulo, or they can also compare the biological activity of any river near their school.

**Agenda 21** – This project invites students to discuss subjects related to the environment and the possibility of sustainability. Students, teachers, school employees and community volunteers are encouraged to elaborate for the school an "Agenda 21," reflecting concerns for the 21<sup>st</sup> century, and then executing their own proposals and discussing them online with students and teachers in other schools.

**Dalia** – A project that discusses cloning processes and the differences between the sexual and asexual reproduction in different vegetal species.

**Meteorological Station** – This is a proposal for students to build different simple meteorological instruments and it invites them to discuss the effect of the influence of human beings on the atmosphere.

**Forms of the Earth** – This project considers the study of the historical context of a scientific phenomenon that produced a major controversial debate in the eighteenth century: is the Earth a real sphere, considering the direction of the equator or the polar regions?

Once again, activities like the ones described above demonstrate that distance education can operate without the structure of a course. Such activities, normally of short duration, can be "inserted" within an established and conventional course structure, or they can serve as "stand-alone" learning resources.

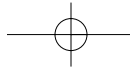
To date, the science projects (16 already developed and 14 actually implemented), are directed at public and private schools offering K-12 Education, and have reached over 100,000 students. Three hundred and sixty school teachers have received special training in the implementation of the projects, and some ninety schools (mostly in Brazil, but also in Japan, USA, Sweden, England, Argentina, Aruba, Israel and Saudi Arabia), of different levels of study, have participated in one or more of the projects

## 5.5 The Telemar Virtual Learning Community

[www.projetotelemareducacao.com.br](http://www.projetotelemareducacao.com.br)

**Coordinator: Silvia Fichmann, Mest.**

Telemar is Brazil's largest telecommunications company. It operates in about half of the national territory, including some of the most sparsely-populated areas of the country, and involves some of the school districts with the lowest performances in academic evaluations. In 2001, the Telemar Institute, the company's social responsibility entity, asked the School of the Future of USP to develop a virtual learning community composed of public schools in small towns in the states where the company operated. The mission of



this virtual learning community would be “to promote the sustainable development of human beings and society and the democratization of knowledge and technology, aiming at the social and digital inclusion of communities with a low Human Development Index (HDI 0.65).” Today, in 2006, the project is fully underway, involving students, teachers and community members in sixteen different states (Alagoas, Amapá, Amazonas, Bahia, Ceará, Espírito Santo, Maranhão, Minas Gerais, Pará, Paraíba, Pernambuco, Piauí, Rio de Janeiro, Rio Grande do Norte, Roraima, and Sergipe).

In towns with population below 30,000 inhabitants, Telemar selects public schools with “middle school” status (5<sup>th</sup> to 8<sup>th</sup> grades), and donates to each one a laboratory with ten computers, a printer, a scanner, a web camera, a microphone and speakers, as well as free Internet access (broadband, if structurally possible; otherwise, narrowband). In towns where there is no electricity, solar energy is used to power the computers and radio is used for two-way Internet access.

The School of the Future of USP was given the task to prepare all of the teachers in the selected schools in the appropriate use of computers and the web, beginning with notions of how to overcome “computerphobia,” and extending to questions of how to capacitate students to be discriminating and critical users of information on the web. In addition, the researchers of the School of the Future were charged with the development of thematic sites as part of an “interactive portal” on the web, to serve as the “meeting point” for collaborative projects involving all participating schools. The challenges involved in creating this virtual learning community began with a new approach to teaching and learning, one making use of a transdisciplinary conception of the curriculum, the combination of appropriate uses of information and communication technologies, and special attention to the need to overcome the sense of isolation felt by the participants before the project began. Special effort was dedicated to giving value to regional diversity and richness, to the development of civic pride, and to the involvement of members of the general community. In addition to creating activities related to the curriculum of the schools involved, projects designed to bring closer together members of the local general community and students and teachers were initiated along the following broad guidelines:

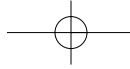
**Cultural Identity** – study of the trajectory of man and society in relation to nature; the symbolic, ritualistic, and mythic dimensions;

**Citizenship** – ethics and the development of values;

**Environment and Sustainable Development** – eco-formative education and eco-professionalization;

**Integration of the Family and the School** – pro-active health; dialogue between school and parents; an auto-formative education program for the families of students.

Now in its fifth year, the Telemar Virtual Learning Community has reached many citizens, both young and old, and promises to develop further in the coming years. 436 schools are currently involved in the project; 74,628 students, 2,866 teachers and community project leaders were mobilized and absorbed into the virtual community; and 520 different local community projects have already been completed or are currently in progress.



## 5.6 TôLigado (I'm Connected) – Your Interactive School Newspaper

[www.toligado.futuro.usp.br](http://www.toligado.futuro.usp.br)

Coordinator: Dr. Brasilina Passarelli

Conceived as a virtual learning environment, "Tô-Ligado" brings together the research, knowledge production and communication activities of students in grades 7 through 11 in the public schools of the State of São Paulo equipped with computers and Internet access (about 2,000 schools out of a total of 6,000) for the students. The metaphor of an interactive newspaper creates a multimedia learning environment for the knowledge "socialization" and, consequently, is especially appropriate for a "community." Research activities are suggested to students within thematic topics such as: "Your Community Alive," "How Does it Work?," "A Patents Central," "Bio-Trails," "You Are The Reporter," and "Interactive Comics," in which students are challenged to learn about the proposed issues, write their reports, compose a song or soundtrack as well as develop digital illustrations or flash animations, all of which are published in the "TôLigado" (I'm Connected) virtual environment. The project has been in operation since 2000, sponsored by the State Secretariat for Education of São Paulo and includes the participation of over 2,000 public schools and almost two million students. More than 10,000 "activities" have already been published in the project portal by students and their teachers. Workshops like "Teach the Teachers" are provided twice a year to enhance teachers' digital literacy. More than 3,000 teachers have already been part of such workshops. This project constitutes, as far as we know, what appears to be the largest virtual learning community in Brazil.

## 5.7 Acessa São Paulo – State Network of Telecenters

[www.acessa.sp.gov.br](http://www.acessa.sp.gov.br)

Coordinator: Adriana Guzzi, Mest.

Acessa São Paulo is the main project of "digital inclusion" sponsored by the Government of the State of São Paulo, and through which the Government brings computer resources and the Internet to the low-income population by means of local "InfoCenters," thereby reducing digital exclusion, and at the same time stimulating the human and social development of such communities. There are currently over 400 InfoCenters in the State of São Paulo (100 in the downtown and low-income suburban areas of the capital, São Paulo, and 300 in other cities throughout the State, in collaboration with local municipal governments); 100 more will be opened by the end of 2006; and there are presently 1,000,000 registered users of the system. Every InfoCenter is equipped with 10 computers, Internet connection, printers, webcams and scanners, all provided by the São Paulo State Government. They are open from Monday to Saturday, 11 hours a day, and the usage of the computers is free of charge, but restricted to persons at least 11 years old. Since its creation in 2000, Acessa São Paulo has handled more than 16 million "service requests." The main uses of the system are for Internet access, school research, electronic-government services, e-mails, curriculum preparation and job searches. Each InfoCenter has two monitors who are there to orientate the users. The School of the Future of USP is responsible for the selection, training and evaluation (technical and pedagogical) of the monitors. The preparation of the



monitors takes into consideration the specific needs of the population, such as job searching, access to government services and the preparation of schoolwork. An example of telecenter-based continuing education, this systematic, continuing training of the monitors is structured according to a method of "social construction," featuring some face-to-face modules, accompanied by distance-learning components, and other modules which are totally distance-based, organized into three distinct clusters of basic competencies – administrative, technical-pedagogic, and those related to behavior.

To enhance the digital inclusion program, the School of the Future develops free-access educational content such as Mini-Courses ([www.minicursos.futuro.usp.br](http://www.minicursos.futuro.usp.br)) and Electronic Notebooks ([www.cadernos.futuro.usp.br](http://www.cadernos.futuro.usp.br)). The Mini-Courses consist of self-directed, on-line courses aimed at individual learners, each course consisting of an average of four lessons, and each lesson providing a homework suggestion and an Internet site indication to complement its content. Currently there are six courses being offered, namely: "How to Make a Curriculum Vitae," "How to Tie a Tie," "Dengue," "Personal Security," "Sugarless Sweets," and "Internet Etiquette." Upon completion of each step of a course, the user is evaluated through a multiple-choice test, which motivates the user to study the material given. In 2006, additional five courses are under development, among which the ones concerning "An Electronic Government of the People," "Consumer Rights," and "Public Health Concerns: AIDS." The Electronic Notebook program develops several computer skills and Internet knowledge. Currently there are 10 Notebooks being offered, such as: "How to Create and Manage E-mails" and "Website Creation and Publication."

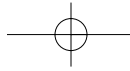
The School of the Future conducts several types of research focused on the InfoCenter users, their opinions and their customary practices. The results of the Annual Online Survey in 2005, with 5,873 respondents, showed interesting figures, such as:

- 76% of the users consider the computer an advance that is improving peoples' lives;
- 16% think that the Internet is a faster and more efficient channel of communication;
- 80% of the users access Internet just to send and receive e-mails.

The data collection is done online, facilitated, when necessary, by the InfoCenter monitors, who are also prepared, through distance learning offered by the School of the Future, in the process of encouraging participation in online research.

Within the Acesa São Paulo project, the School of the Future has carried out a weekly Internet survey for the last three years. This sub-project is entitled "Fala São Paulo" (Speak São Paulo) ([www.falasp.futuro.usp.br](http://www.falasp.futuro.usp.br)). The surveys cover a wide variety of subjects, such as Culture and Leisure, Health, and Jobs. All the data obtained is tabulated by sex, age, and location, and an average of 3,000 users participate each week.

The School of the Future is also concerned with more formal, deeper investigation, its main scientific mission. In both 2004 and 2005 the Acesa São Paulo project gave three graduate-study scholarships, two at the doctoral level, one at the masters level, to develop research under the name "Scientific Connections Program" ([www.conexoes.futuro.usp.br](http://www.conexoes.futuro.usp.br)). The research was carried out within the InfoCenter system, on the following subjects: "How Women Relate to Technology," "InfoCenters and the Working World,"



“Digital Inclusion, Strategies and InfoCenter Daily Operations.” In 2006, this program will focus on the question of “Indicators of the Digital Divide.” Also underway is a plan to publish in book form the results of the investigations carried out so far within the ACESSA São Paulo project.

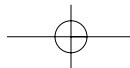
The latest project developed by the School of the Future within the ACESSA São Paulo effort is called PIM – Passport of the Internet and Multimedia ([www.pim.futuro.usp.br](http://www.pim.futuro.usp.br)). This project is currently under test, and probably will be launched during the second half of 2006. PIM, an analogy to a passport, is designed to be a support for computer users and net “surfers”. After being approved in tests on basic e-mail skills, Internet navigation and text editing, participants receive a hardcopy, multipage passport, similar to a conventional one, in which they can “track” their learning with passport stamps. A pleasant surprise was to learn that passport holders had begun showing their stamped passports to prospective employers as a “certification” of their competencies. Another objective of PIM is to develop an on-line community that will promote greater interaction among users through forums and messaging.

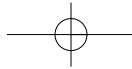
ACCESSA São Paulo is also concerned with involving the general community living in the regions where the InfoCenters are installed. This is done by stimulating the development of projects and activities that use technological resources in a creative and educational way. Designated the “Network of Projects,” this effort concentrated support on community development through the utilization of technology and the methodology of project management making use of the collaborative platform “Wiki.” All of the InfoCenters were mobilized, producing thirty-five local-action projects – the ones with the greatest impact were “My Place: São Paulo,” involving the memories of the local population in the suburban sector of the mega-city, and “Digital Accessibility,” a diagnosis and evaluation of website access. In 2006, ACESSA São Paulo is promoting the development of courses in an open, collaborative format, and the increased use of educational media, thereby extending to its users contact with the various forms of expression in digital culture – textual, audio and video. Also in 2006, the original “vision” of this project, of making access to information more “democratic,” will be furthered by creating a new form of access to the entire collection of documents and iconography produced by ACESSA São Paulo from 2002 to 2006 – approximately 15,000 files, available for use under a Creative Commons license. The School of the Future is also responsible for the development and support of the administrative and management software systems of the InfoCenters.

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