

Formation of Communities of Practice to Promote Openness in Education

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This article presents the educational experiences of an inter-institutional project that consisted in forming a Community of Practice (CoP) among Mexican educational institutions, in 2009. The main goal of this project was to enrich a catalogue of OER for basic and elementary education (K-12) for Spanish speaking countries in Latin America, and the rest of the world, within the field of innovative education and technology, through the work and community of practice of K-12 teachers and university faculty participants. Six Mexican higher education institutions participated in this project, and this article will talk about their faculty experiences with a community of practice that used innovative applications and new technologies. Also, this article describes how OER were used in the K-12 educational level through the portal website of TEMOA, the academic search engine developed by Tecnológico de Monterrey to help teachers with the design and instruction of their courses.

1. Academic's knowledge mobilization

Recognizing the transition we are facing to a new knowledge based society (KBS), we could visualize the reality that data and information is fully accessible through different media formats via the Internet on a massive and exponentially way through Web tools and search engines, including personal Web sites and those devoted to libraries, information centers and civil society organizations (communities, associations, affiliations). The problem is recognized in several studies that in many instances information reach people without any filters or professional revisions like peer review, raising questions about its authenticity, validity, and reliability (ACRL, 2010). The American Library Association (ALA) recognizes and defines the critical need for education in the subject of information literacy, this is said for an educated person should be able to scrutinize and recognize when information is reliable and necessary, and develop the ability to find, evaluate and effectively use the information needed in specific circumstances (Plotnick, 2000).

Without distinction, in every one of the areas of society there is a strong dependence on the study of knowledge to effectively participate in a modern technological and digital world, which affects all productive sectors in industry of any value chain (production and services), from agricultural practice to complex and sophisticated market processes, banking, government, healthcare, transportation, entertainment and financial transactions. In fact, it is predicted that people who do not develop the ability to find the essential knowledge and to evaluate and discern its proper application in the context of specific situations, are intended to live precariously and societies will be deprived of their possible contributions. In agreement with Haddad and Draxler (2002; p. 4), without the ability to find the essential knowledge and develop equally adaptive skills in order to overcome the social, political and technological change, people will quickly find themselves in disadvantage compared to others that effectively overcome the challenge of a digital and information literacy.

The worldwide movement of Open Educational Resources (OER) is one of the most revolutionary and important trends that are helping education through information and communication technologies (ICT), and it's a term that is being adopted every day in many educational institutions, from Higher Education to basic education (D'Antoni, 2007); especially those which have embraced distance education (e-learning) and blended learning as one of their major institutional and teaching efforts, such as the "Tecnológico de Monterrey" in Mexico. *Tecnológico de Monterrey* is a private, non-profit academic institution with 65 years of experience. It is composed of 33 campuses across Mexico that offer high-school programs, undergraduate and graduate degrees, continuing education, as well as social programs. Through technology-based distance programs, *Tecnológico de Monterrey* is a pioneer in distance education with more of 20 years of experience through its Virtual University, reaching 29 countries; at present time, the Virtual University offers totally online undergraduate, postgraduate, continuing education, and social programs.

Tecnológico de Monterrey has worked in the past three years in several projects on the reuse of royalty free course materials from Carnegie Mellon University, Yale University, and the Massachusetts Institute of Technology, with the objective of identifying key critical factors to develop a model to effectively knowledge transfer of OER. Capitalizing these experiences, *Tecnológico de Monterrey* proposed the creation of an important educational initiative, named "**Knowledge Hub**" (Burgos, 2008) at the World Economic Forum (WEF) in Davos, Switzerland, in January 2008 during a Global Universities Leaders Forum session (Galán, 2008).

The initiative titled "*Knowledge Hub*" was named later as TEMOA (Burgos and Ramirez, 2010), and it is defined as a public catalog that provides a multilingual search engine that allows the user to discover selected Open Educational Resources (OER) using metadata enriched by experts and enhanced by librarians, using Web 2.0 such faceted searching and social networking tools. The portal website of TEMOA is for free use available on the Internet for teachers, professors and self-learners of all educational levels, from higher education to elementary and basic education. It was created to assist teachers in the task of introducing innovations in the classroom which will improve the teaching-learning process, and by consequence, student retention, motivation and attention.

The purpose of TEMOA is to have a unique index catalog of open educational resources (including full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials or techniques used to support access to knowledge) available on the Internet to help students and teachers. TEMOA objective is to assist professors and students in the discovery process of the educational resource that best suits their needs. To achieve this objective, TEMOA applies enriched metadata defined by experts, as well as specialized searching and social networking tools for sharing comments and rankings on the OER (Burgos, 2008). This initiative puts together the effort of both faculty and administrative staff of all its undergraduate and graduate programs to create a website and academic search engine on the Internet and the World Wide Web, to offer indexed open educational resources (Morera and Escamilla, 2009).

At the core of the digital revolution of Open Educational Resources, lies the basic idea that the world's knowledge is a public good and that information and communication technologies spurs a huge opportunity for everyone to share, use, reuse, rework, remix and redistribute that knowledge. OER are the essential elements that integrate the basic modules of courses, subjects and tools to stimulate teaching, learning, and research in a different way of view the education process (Smith and Casserly, 2006; p. 8).

2. Formation of a Community of Practice for a K-12 inter-institutional project

The project titled "Knowledge Hub for K12 Education Project" received funds by the Corporación de Universidades para el Desarrollo de Internet (CUDI) and by the Consejo Nacional de Ciencia y Tecnología (CONACYT) of Mexico and was hosted by the *Tecnológico de Monterrey*, in Mexico in 2009. Six higher education institutions were involved: *Tecnológico de Monterrey* (with 5 professors and 5 researchers), Universidad Regiomontana (with 2 professors), Comité Regional Norte de la Comisión Mexicana de Cooperación con la UNESCO, AC (with 3 researchers), Universidad de Morelos (with 4 professors), Instituto de Investigación, Innovación y Estudios de Posgrado para Educación, IIIPE (with 3 researchers) and Escuela Normal Miguel F. Martínez (with 5 teachers).

The group of 11 professors, five teachers and eight researchers agreed to work virtually and locally with traditional face-to-face meetings using several communication mechanisms:

From the field

A webpage (Blog) to centralize efforts of communication and documentation process (<http://khubk12.blogspot.com>)

- Web discussion forums to debate, argue and agree about several topics
- Electronic mail (email)
- Videoconference (Internet 2)
- Chat and web-conference
- Face-to-face local meetings

Also, the group agreed to have several training sessions through videoconference and recorded sessions through DVDs and power point slides. The training's sessions have had the objective to develop new skills and abilities about the use of web technology and information literacy. Also, the training sessions addressed the awareness about Open Educational Resources (OECD, 2007) and the clarification about the use of resources and materials for teaching and learning purposes in the classroom.

Knowing that to foster effective project learning in the group, it should be needed encourage collaboration and exchange of meanings and experiences. The group of researchers decided to integrate several working groups to reach the best potential of valuable source of knowledge generation and learning through the creation of a Community of Practice (CoP) that is defined as a "group of people who share a common interest, a set problems or simply have a passion to share a particular subject and want to deepen their knowledge and experience through various processes of interaction" (Wenger, McDermott and Snyder, 2002).

At the beginning, a critical issue in the group was to be aware of the primary mechanism to facilitate project learning, that is, the implementation of effective knowledge transfer. Knowledge creation is a basic process that transcends boundaries of one entity to another through the acquisition of new knowledge, for example, from the individual to the group, from one group to one organization, and from one organization to other organizations, generating virtuous cycles of knowledge creation (Nonaka and Toyama, 2003). Johannessen, Olaisen, and Olsen (2002) share a vision which fosters the dynamics of four unique processes, the first process describes that is through the social systems that knowledge is created, the second is about the coding process, systematization and structuring of data, the third process describes the process of recognizing the information and its application as knowledge, finally, explains the operationalization of knowledge.

Figure (A) shows an adaptation that is based on the model proposed by Nonaka et al. (2003) and quoted by Lin & Lin (2001) which features a spiral mechanism that integrates four key processes of conversion and transfer knowledge. The *socialization process* allows the exchange of tacit knowledge that is implicit in the individual through the processes of nonverbal communication. The *externalization process* refers to the codification of that tacit knowledge into understandable language and understood by others. The *combination process* generates knowledge codified (explicit) from previously externalized knowledge through social processes of communication, dissemination and systematization. The *process of internalization* refers to interpret the explicit and tacit knowledge to make it significant into practice through experience.

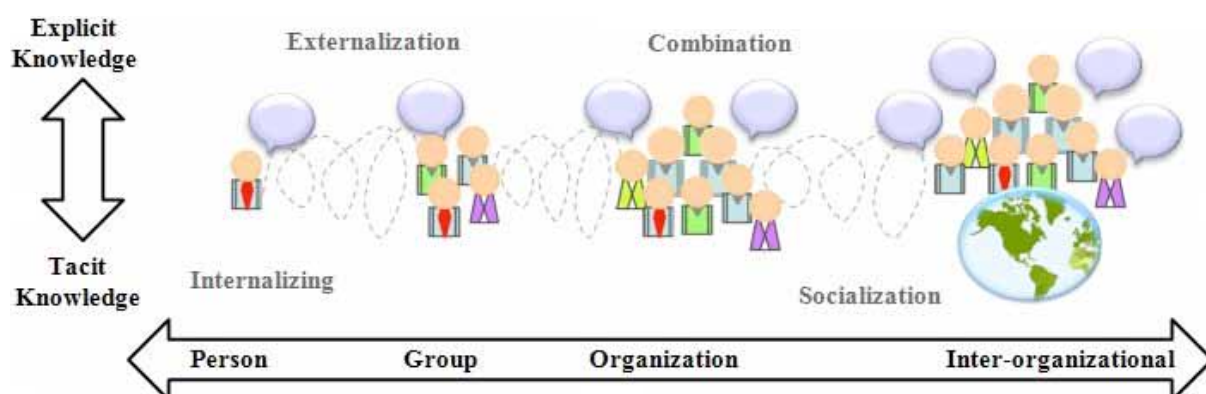


Figure A: Knowledge Transfer Model

According to Nonaka, et al (2003), the way to generate new explicit knowledge is through knowledge transfer itself and its combination. The *combination process* facilitates the generation of new knowledge from previously externalized knowledge through social processes of communication, dissemination and systematization. In addition to this process, it is required of the learning achieved through internalization process, which refers to interpret (and infer) the explicit knowledge into new tacit knowledge through the practical experience.

Considering that a *Community of Practice* helps to vanish the several hierarchical levels in a pre-established institutional structure (Saint-Onge and Wallace, 2002; Saint-Onge, 2004), the group of researchers took advantage of this fact (see Figure B), which helped in the reduction of time in the inquiring process of information and experience in solving special issues. The dynamics also allowed sharing of ideas and the valuation of different perspectives with colleagues or peers, helping them to take better decisions. In fact, there was a greater participation and less fear of mistakes knowing they had the confidence to have a support group from several institutions.

As lessons learned, the group identified access barriers for the use of Open Educational Resources (OER) in Mexico by teachers in K-12 schools, such as technological infrastructure (lack of internet access, projectors and computers), legal issues (access of the resources in terms of licensing), relevance about the content of the materials available on the Internet (resources mainly from other countries), lack of resources in Spanish (language

issues), computer literacy gap in K-12 schools and lack of awareness in the institutional level (lack of information in managerial levels).

The group of researchers coordinated 150 teachers in 20 schools using OER in basic education programs for learning and teaching in the classroom. The experiences were documented in the webpage (Blog) and critical topics were resolved in the discussion forums.

The *Community of Practice* in general consisted of six institutions of higher education where each institution was integrated as a special working group research. Each institution (working group) served as coordinator of a small group institutions of basic education (K-12), which allowed the overall coordination of 20 institutions of basic education in Mexico.

3. K-12 schools participants and context

The main goal of project for K-12 project was the inclusion of open educational resources available at the Internet, resources that can help to reduce educational gap in Latin America, especially at basic and elementary educational level.

Within the project several professors and researchers from six institutions of higher education of the State of Nuevo Leon participated. Each of these institutions worked with three or four K-12 schools (*basic education, named in Mexico: educación básica [preescolar, primaria, secundaria]*). Each institution supervised their own elementary schools, training and teaching

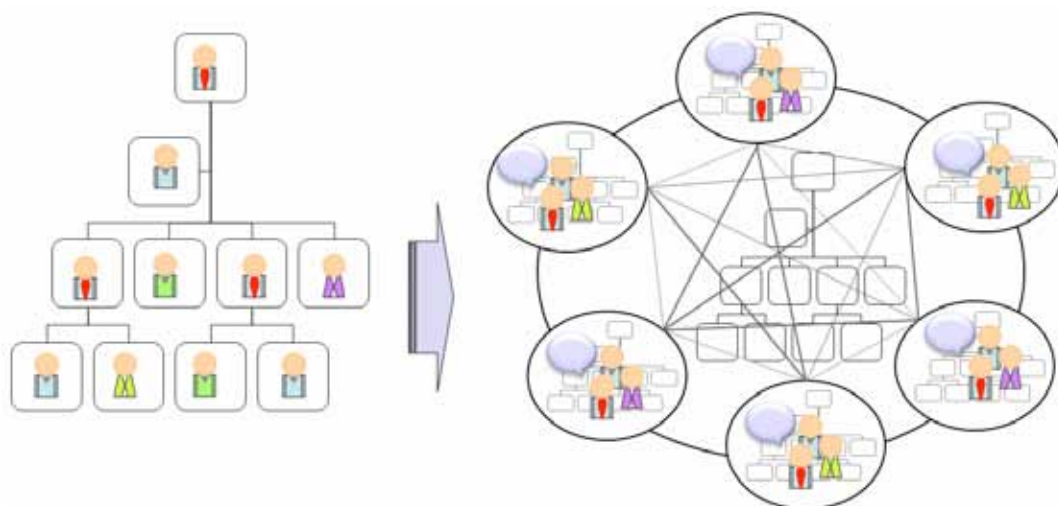


Figure B: Promoting Equality of Ideas and Knowledge

their teachers on how to find the OERs and how to catalog the OER using especial metadata, and how to post the information within the catalog of TEMOA. The elementary schools teachers participants from the basic or elementary schools were mainly full time teachers, with many years of teaching experience at K-12 level, teaching face-to-face and traditional education; but with few knowledge or lack of knowledge on the use the Internet and no experience at all on how to use technological resources and incorporate them to class. During the project, also they were trained to use the Internet (computer literacy) and how to use some technological resources within their class sessions. All of them had a big interest to learn how to integrate educational technology within their learning environments (blended learning).

Among the elementary schools which had participated in the project we can recall: the Nicolás Bravo elementary school, the kinder garden Jaime Torres Bodet, the elementary school Colegio Bosques del Lago, the kinder garden Prof. Timoteo L. Hernández, the elementary school Vicente Guerrero, in Monterrey city, Nuevo Leon, Mexico; the junior high Prof. Felipe de Jesús Jasso and the Instituto Soledad Acevedo de los Reyes, in Montemorelos city, Nuevo Leon, México.

During the Project several strategies were followed to accomplish the proposed goals, such as:

- Six higher education institutions worked each one with a small group of elementary schools in Mexico (in the State of Nuevo Leon).
- Faculty of higher education was working together with elementary education teachers.
- Six subprojects were developed within the main project; each one for each participant institution, the main goal was disseminate the knowledge on Open Educational Resources, for collaboration purposes and for the implementation of technology at basic education level (K-12).
- Every three weeks were scheduled a project group meeting using videoconferencing as a media for communication purposes.
- For the delivery of the training workshop for K-12 teachers was used Internet 2 tools.
- A website was developed for documenting and sharing of ideas among researchers participants: <http://khub12.umenlinea.com/>

- One Blog for K-12 teachers was developed: <http://khubk12.blogspot.com>

Each institution developed several subprojects within the main Project to generate information to understand the process of documenting and cataloging OERs for K-12 education.

- Different research methods were used base on their area or field of interest, such as: quantitative research methodology, or qualitative research methodology, or mixed methods.
- The sources of Information were: the K-12 teachers and students, administrators, meaningful documents and the faculty researchers of the Project.
- Gather data instruments were: surveys (using statistical analysis) and interviews to K-12 teachers and students. Beside, the analysis of documents using non-intrusive methods (OERs, website, training workshop syllabus, blogs, forums, institutional paper work, researchers' reflexive diaries), participant observation and quantitative observation records.

Results:

Between January and April 2009, the main project results were:

- Design of the training workshop on how to identify and catalog Open Educational Resources (all six participant institutions collaborated on the design and teaching delivery).
- Creation and production of workshop and course materials, such as: digital resources, formats, handbooks, handouts, and video tape recording.
- Selection of the 178 K-12 participant teachers.
- Identification of the website sources for OERs
- Design of the website search engine for K-12 OERs (Knowledge Hub).
- Develop of six projects within the main project, using different methodological approaches.
- Develop of three Masters' thesis about the project.

Between May and November 2009, the main project results were:

- Design of four workshops to train K-12 teachers on how to select, document, use and adopt OER within class sessions.
- Production of course materials, such as: digital resources, formats, handbooks, handouts, and video tape recording.

- On October 2009 there were 176 K-12 teachers participating within the project.
- Total of OERs documented at the end of the project = 291.
- Total of OERs used and adopted by K-12 teachers = 101.
- End of the six projects within the main project, using different methodological approaches.
- Four articles published in Journals
- Finish of three Masters' thesis about the project.

4. Educational experiences from the research field

Tecnológico de Monterrey had an interesting and meaningful experience within the project. Its faculty researchers: *Dr. Marisol Ramírez, Dr. Fernando Mortera, & M. Sc. Vladimir Burgos*, and the K-12 teacher participants collaborated and worked together to accomplish the goals of the project: identifying, documenting and cataloging Open Educational Resources (OER) for K-12 education for Spanish speaking countries.

During the months of September and October of 2008 *Tecnológico de Monterrey* faculty researchers, who belong to the seminar group named "*Cátedra de Investigación de Innovación en Tecnología y Educación*", of the Graduate School of Education, Virtual University, applied for the 2009 CUDI-CONACYT grant. During those two months this faculty group worked on the project proposal and submitted it. Meanwhile three others higher education institutions were invited to participate with us in the project. In November, 2008, we were informed that the project was accepted and we started to work on the organization and planning of the different stage of this OER project for K-12 education.

We had our first group project reunion in December of 2008, and we started to work on the month of January of 2009 with the first stage of the project. We had every three weeks project reunions with all the participant institutions, through videoconferencing, and moving to different places for the reunion purposes. In the months of March and April of 2009, two more higher education institutions requested to be part of the project, and we accepted them, their names were: Normal F. Martínez and IIIPE.

In April of 2009 we had the impact of influenza virus in Mexico, which made all the schools to be closed, and we had to interrupt the research process, while the sanitarian contingency was over. During one month the project was in "standby", finally we

restarted it in the month of May. After this particular situation we needed to recuperate time and the work intensified, training and teaching the K-12 teachers to identify and select OERs for elementary education, especially in Spanish language. Because we needed to finish in the month of November 2009, we need to hurry the process of cataloging OERs and to implement some of them within the students and class sessions. Each participant institutions had the responsibility and duty to write down their technical and final reports, and also to publish their project results in an academic journal.

Tecnológico de Monterrey faculty participants and K-12 teachers participated actively within the project. In particular, we had a lot of support from the technical staff of the *Centro para la Innovación en Tecnología y Educación (Innov@TE) (Center for Innovation in Technology and Education)*, center which belongs to the *Tecnológico de Monterrey*. These technical staff was important in the technical part of the TEMOA website, without them this educational project would not be possible, and their collaboration was a key component for the project itself; we could work with them and develop the project, and to made decisions that were important to keep going with the project.

On the other side, we developed an entire work process to contact K-12 school participants, and to develop the workshop to train them to accomplish the project goals. The participant schools were, the following ones: a) kinder garden *Jaime Torres Bodet*, and b) elementary school *Nicolás Bravo*, in Monterrey city, State of Nuevo Leon, Mexico. These two schools participated (teachers, administrators and principals) with enthusiasm and commitment (regardless that they confronted several technical difficulties and constrains to be connected to the Internet and to have access to the WWW; in spite of it the finally could be connected and work to accomplish the project goals).

We need to acknowledge the collaboration and assistance given by two other *Tecnológico de Monterrey* personnel, people who helped us to accomplish the project objectives and without their help it would be not possible to finish some of the project tasks, these persons were: a) Fernando Lozano (a tutor at the Graduate School of Education), and b) a masters' degree student Gladis Menare (they helped us with the training process, research and some secretarial and administrative processes).

The experience among researchers was diverse and meaningful. Dr. Marisol Ramírez had an important role to coordinate all the main project efforts, with an outstanding capacity to organize multiple aspects of the project, it was an admiring thing (such

as: administrative, technical, organizational process, budget, and so on). Dr. Fernando Mortera, as *Tecnológico de Monterrey* project responsible faculty researcher, worked hard and meaningful along the project, especially in the field work and training process, also with the writing of technical and research reports, journal articles, and other kind of reports. M. Sc. Vladimir Burgos, with his active work and coordination of all the technical aspects related to the former Knowledge Hub website, currently named TEMOA, was important and central, without his participation it would not be possible to get the outcomes that we accomplished.

Conclusions

Open Educational Resources (OER) are important material that enriches educational processes. OER are a medium which help teachers to develop diverse competencies and help in the appropriation of knowledge. It is necessary to work on the development of a culture of collaboration for joint construction, for future educational purposes. The fact that six higher education institutions in Mexico worked together, putting all their forces to accomplish a common goal, and helped to develop the Knowledge Hub K-12 educational project, it was by itself a real success.

Put together institutional forces to work on a multidisciplinary project is a big challenge. The different activities and tasks developed in this project received the assistance of diverse area specialist (such as: pedagogy, psychology, administration, engineering, and technology experts); these specialist and experts helped to see this educational issue from different points of view.

Diverse challenges come out while you are fostering Communities of Practice. Like any research and applied project where intervene a group of persons, they face and experiment obstacles for accomplishing project objectives, these challenges need to be handle through a joint work with the effort of all the community members. The project described in this paper had many and diverse challenges and constraints in different ways (technically, procedural, and motivational), however any of these obstacle defeated the main goal of this educational project, to create a body a list of cataloged OER for K-12 education in Spanish which follow copy right and licenses issues and quality standards.

Mexican governmental entities were crucial to develop this project, such as: *Corporación de Universidades para el Desarrollo*

del Internet (CUDI), public entity which belongs to *Consejo Nacional de Ciencia y Tecnología* (CONACYT) (National Council of Science and Technology) in Mexico. Both public entities have decided together to look for the assistance and to help educational initiatives on the construction of knowledge and scientific research in Mexico. Such efforts help and ease the development of educational projects and educational innovations.

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