

ON-LINE CONTINUING EDUCATION IN GEOMATICS AT THE SCHOOL OF ENGINEERING - URUGUAY

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Abstract

Since the 90's, the School of Engineering at the Universidad de la República (UdelaR), has been doing diverse continuing education activities for professionals, in particular on-site professional development courses with the objective of connecting them with the new technologies not learned during their undergraduate studies. The Geospatial Information Technologies Group (Grupo de Tecnología de la Información Geoespacial, GTIG), integrated by professors from the Computer Department, the Surveying Department, and with the support of a professor specialist in geographical data quality, from Spain, dictated the first on-line Professional Development course of the Surveying Department titled "La Herramienta SIG y la Calidad de la Información Geográfica" ("The GIS tool and the Geographical Data Quality").

This course was taken by professionals coming from diverse disciplines and from different parts of the country. This is a great success especially for a university that is mostly concentrated in the main city, Montevideo, the capital of the country. The syllabus contained the following topics: Introduction to GIS, Geographic Databases, and Geographical Data Quality. The course was developed in 7 weeks, from the end of August to mid-October 2010, and was dictated using an on-line education platform called "EVA" (Entorno Virtual de Aprendizaje developed with Moodle) that has been available in the School of Engineering since mid-2010.

The present document describes the pedagogical proposal used in the course, as well as lessons learned. For instance, it was evident that the context in which the course is developed is very important. Not only is necessary to have a good technical support team but also a good coordination from the registration of the participants to the end of the course.

Keywords: Online education, GIS, Geographical data quality.

1 INTRODUCTION

The Universidad de la República, in particular the School of Engineering, has been forming professionals in the Geomatic area for many years. Due to the quick advances of the information technologies, many of the graduated professionals did not have, in their curricula, specific instruction on the latest technologies. Since 1996, the School of Engineering has created professional development courses in order to bring to the society continuous education mechanisms.

Since then, the Surveyor Institute imparts professional development courses in many subjects such as GIS, Digital Photogrammetry, Remote Sensing, Digital Cartography, GPS, etc. In order to cover the national demand about the formation of professionals in cartography and geographic information in general, the Geospatial Information Technologies Group (Grupo de Tecnología de la Información Geoespacial, GTIG), designed an academic proposal which contemplates those necessities.

In addition, it was understood the importance of initiating the capacitation of those professionals in the area of data quality, which is an area not yet developed in the country. In that sense, it was important the valuable collaboration of Prof. Dr. Javier Ariza from Universidad de Jaén, Spain, who is an expert in the Data Quality area.

Due to the spatial dispersion of professionals and technicians whose jobs are related to these subjects, in addition to many request of giving a solution to this problem, it was decided to implement the first online professional development course in the Geomatic area. The main idea was to facilitate the access to education for people who does not live in the capital of the country where the School of

Engineer is located, and even to those professionals who do live in the capital but do not have the time flexibility to attend a course in person.

The first experience of this course started on August 30th and ended on October 10th of 2010. Its extension was about 6 weeks of knowledge interchange and one recovery week to be up to date with the proposed activities.

2 METODOLOGY

2.1 General elements

The pedagogical proposal takes as protagonists from the learning process the own participants of the course. Starting from their personal and institutional experiences, and through the professors' experiences related to the implementation of a GIS with a special emphasis in the data quality, the participants try to modify their realities about the geographical information. It was proposed to elaborate a final project where it was expected to consolidate the new ways of creating and/or developing the information. At the same time it was expected to find creative and specific solutions for each particular reality applying the knowledge acquired during the course.

In that sense, it was intended to stimulate the learning process through the cooperative work between professionals from diverse areas, creating a virtual community while the course was developed, and also the possibility to have a virtual net where technicians linked to these subjects can continue sharing their experiences in different projects around the country. The pedagogical proposal is based on an important methodological challenge, and requires from all the participants to be receptive, participatory and willing to be involved in the constant process of interaction-reflection-interaction.

The course structure is the following:

Module 1: The Use of the Virtual Platform – 1st week

Module 2: Introduction to the GIS – 2nd week

Module 3: Geographic Databases – 3rd week

Module 4: Introduction to the Geographical Data Quality – 4th week

Module 5: Application to each reality – 6th and 7th week

During the completion of the course, the participants do an intensive reading of the text, specially elaborated for the course, as well as complementary documents containing reflections and analysis of the central subjects debated.

In each course week, one professor is responsible for the discussion forum guidance related to a specific point in the agenda. The professor in charge manages the interchange of information through the forum, by stimulating the reflection with thought-provoking questions. This mechanism stimulates the deepening of the knowledge. In order to satisfy these objectives, it has been incorporated questionnaires (one per week) that reflect the information presented in the given materials. On the other hand, concrete assignments has been proposed to apply the knowledge learned for each thematic approached.

Through the interaction with their own realities, the participants elaborate a synthesis and conclusions about how to manage the geographical information. This was intended to foment a critical and creative attitude open to debate about the subjects treated in the course, and the obstacles needed to solve, in order to apply the learned knowledge to their past or present experiences.

2.2 Online modality

The Universidad de la República count with an online education platform called EVA (Virtual Learning Environment or "Entorno Virtual de Aprendizaje" for his Spanish acronym). EVA has the main objective to promote different alternatives to teach undergraduates courses, giving access to partial or complete virtual courses. EVA allows the integration of the TIC (Information and Communication Technologies or "Tecnologías de la Información y Comunicación") in the university education process through a software that supports learning [1]. Also, the School of Engineering has his own EVA system since mid 2010.

EVA was developed based on a course management system called Moodle [2], a free and open-source e-learning software platform, which helps educators to create online learning communities. Also this type of technological platforms is known as LMS (Learning Management System) [3].

The GIS Tools and the Geographical Data Quality course was developed using the EVA available in the School of Engineering, having a particular structure adapted to the needs of the case. To have access to the course, it is necessary that each participant can have an available computer connected to the internet. The Fig.1 shows the view of all participants and professors. Each person can be easily identified in the platform through a picture that they can upload in their personal information section.

IMAGEN DEL USUARIO	NOMBRE / APELLIDO	CUBANO	PAÍS	ÚLTIMO ACCESO *	SELECCIONAR
	Rosario Casanova	Hombres	Uruguay	36 segundos	<input type="checkbox"/>
	Valery Bello	Hombres	Uruguay	38 minutos 49 segundos	<input type="checkbox"/>
	Marcelo Zanetti	Hombres	Uruguay	3 horas 12 minutos	<input type="checkbox"/>
	Miguel Gonzalez	Hombres	Uruguay	2 días 3 horas	<input type="checkbox"/>
	Daniel Diaz	Hombres	Uruguay	2 días 4 horas	<input type="checkbox"/>
	Carla Natalia Soriano Perez	Hombres	Uruguay	2 días 16 horas	<input type="checkbox"/>
	Rosario Diaz	Hombres	Uruguay	2 días 22 horas	<input type="checkbox"/>
	Ulisses Benavides	Hombres	Uruguay	3 días	<input type="checkbox"/>
	Mark Esteban Gonzalez	Hombres	Uruguay	3 días 3 horas	<input type="checkbox"/>
	Indaleno Bernales	Hombres	Uruguay	3 días 3 horas	<input type="checkbox"/>
	Antonio Gutierrez	San José de Mayo	Uruguay	3 días 3 horas	<input type="checkbox"/>
	Marcelo Tarascio	Uruguay	Uruguay	3 días 7 horas	<input type="checkbox"/>
	Mark Jonathan Gonzalez	Hombres	Uruguay	3 días 22 horas	<input type="checkbox"/>
	Melina Pazo	Hombres	Uruguay	3 días 23 horas	<input type="checkbox"/>
	Ana Maria Leffredo Benavides	Hombres	Uruguay	4 días 1 hora	<input type="checkbox"/>
	Edgar Bello	MONTVIDEO	Uruguay	4 días 1 hora	<input type="checkbox"/>
	Quilón Zile	Hombres	Uruguay	4 días 1 hora	<input type="checkbox"/>
	Ana Fernandez	Hombres	Uruguay	4 días 1 hora	<input type="checkbox"/>
	Subercasa Bello	MONTVIDEO	Uruguay	4 días 2 horas	<input type="checkbox"/>
	Isabella Bello	MONTVIDEO	Uruguay	4 días 2 horas	<input type="checkbox"/>
	Natalia Casanova	Hombres	Uruguay	4 días 3 horas	<input type="checkbox"/>
	Ayara Mercedes Bello	Lisarrón	Uruguay	4 días 3 horas	<input type="checkbox"/>
	Yaela Bello	Hombres	Uruguay	4 días 3 horas	<input type="checkbox"/>
	Mark Bernales	Hombres	Uruguay	4 días 3 horas	<input type="checkbox"/>
	Leonardo Benavides	Hombres	Uruguay	13 días 3 horas	<input type="checkbox"/>
	Daniela Bello Aida	San	España	17 días 11 horas	<input type="checkbox"/>
	Marcos Pardo	Paraná	Uruguay	19 días 23 horas	<input type="checkbox"/>
	Carla Mercedes Gonzalez	Hombres	Uruguay	21 días 16 horas	<input type="checkbox"/>
	Jose Carlos Bello	Hombres	Uruguay	25 días 26 horas	<input type="checkbox"/>
	Carla Arocas			41 días 22 horas	<input type="checkbox"/>
	Miguel Ángel Bello	Dolores	Uruguay	47 días 19 horas	<input type="checkbox"/>
	Miguel Bello	Hombres	Uruguay	52 días 23 horas	<input type="checkbox"/>

Fig.1: View of participants and professors.

The time of dedication during the seven weeks of the course (6 of interchange plus one recovering week) was estimated to about 12 hours per week.

At the beginning of each week, on Mondays, the participants have available the lecture materials elaborated by the professor of the respective module. In addition, the activities they need to work on during the week are presented and clarified the first day of the week (such as questionnaires, assignments, forum discussions). Each week has a specific assignment related with the subject of the module, a forum where to express ideas or ask questions, and the questionnaire to evaluate the understanding of the text materials. The participation in the forums is mandatory, even though there is

not a direct qualification as in questionnaires or assignments. The deadline to present the assignment, participate in the forums and do the questionnaire of each module is the last day of the week, considered for course purposes the Sunday.

Fig.2 shows a view of a forum, where each intervention is identified by the name of the person and easily recognized through the person's picture. The title given by the author of the participation and also the number of chained responses appears in the view, as well as the name of the participant responsible for the last posted message in each group of messages.


Comentarios sobre los ejercicios		Francisco Javier Ariza	2	Francisco Javier Ariza Jun. 21 de sep. de 2018, 04:01
El RFS Aesino		Francisco Javier Ariza	2	Rosario Cisneros Jun. 23 de oct. de 2018, 09:41
Ánimo a participar		Francisco Javier Ariza	27	Francisco Javier Ariza Jun. 11 de oct. de 2018, 09:31
dudas sobre matriz de confusión		Daniel Vardi	15	Francisco Javier Ariza Jun. 4 de oct. de 2018, 04:31
Ejercicio 4.8.1		Cecilia Mariana Gonzalez Perez	5	Francisco Javier Ariza Jun. 4 de oct. de 2018, 04:31
Formato de esta entrega?		Cecilia Mariana Gonzalez Perez	1	Natalia Cisneros Jun. 3 de oct. de 2018, 12:41
Ejercicio 4.8.5		Alejandra Gutierrez	5	Francisco Javier Ariza Jun. 26 de sep. de 2018, 15:51
ej.4.8.4		María Eugenia Gonzalez	3	Francisco Javier Ariza mar. 28 de sep. de 2018, 09:31
EJERCICIO 4.8.3 HESDA		Gabriel Bodo	2	Francisco Javier Ariza mar. 28 de sep. de 2018, 02:01
Ejercicio 4.8.3 - t de Student		Cecilia Mariana Gonzalez Perez	3	Francisco Javier Ariza mar. 28 de sep. de 2018, 02:41
Ejercicio 4.8.5		Enrique Bensochea	3	Francisco Javier Ariza Jun. 27 de sep. de 2018, 11:31
Test sobre la variancia		Enrique Bensochea	3	Francisco Javier Ariza Jun. 27 de sep. de 2018, 11:51

Fig.2: View of a Forum.

The procedure chosen to measure the understanding of the texts provided was through questionnaires with specific ideas to answer. EVA has a variety of categories to create questions, but the most used for our course purpose were the Multiple Option and the True or False. Fig. 3 shows a partial view of one of our questionnaires.

6	¿Qué tipos de datos básicos hay en un SGBD?
Puntos: 1	<p>Seleccione una respuesta.</p> <p><input type="radio"/> a. Numéricos y textos.</p> <p><input type="radio"/> b. Numéricos y letras.</p> <p><input type="radio"/> c. Ninguna de las opciones es correcta.</p> <p><input type="radio"/> d. Booleanos, textos y fechas.</p> <p><input checked="" type="radio"/> e. Numéricos, textos, fechas y booleanos.</p>
7	¿Cuáles de las siguientes son operaciones de análisis que se definen sobre las geometrías?
Puntos: 1	<p>Seleccione una respuesta.</p> <p><input type="radio"/> a. intersection</p> <p><input type="radio"/> b. convex_hull, union</p> <p><input type="radio"/> c. distance, buffer</p> <p><input type="radio"/> d. Todas las opciones son correctas.</p> <p><input type="radio"/> e. difference</p>
8	¿Qué es un sistema gerenciador de bases de datos?

Fig.3: Partial view of a questionnaire.

In order to apply the knowledge learned in the different modules there was a weekly proposed assignment related to the topic. A final project was proposed at the end of the course with the main objective to consolidate all the new learning. Fig.4 shows the partial view of the final project proposal.

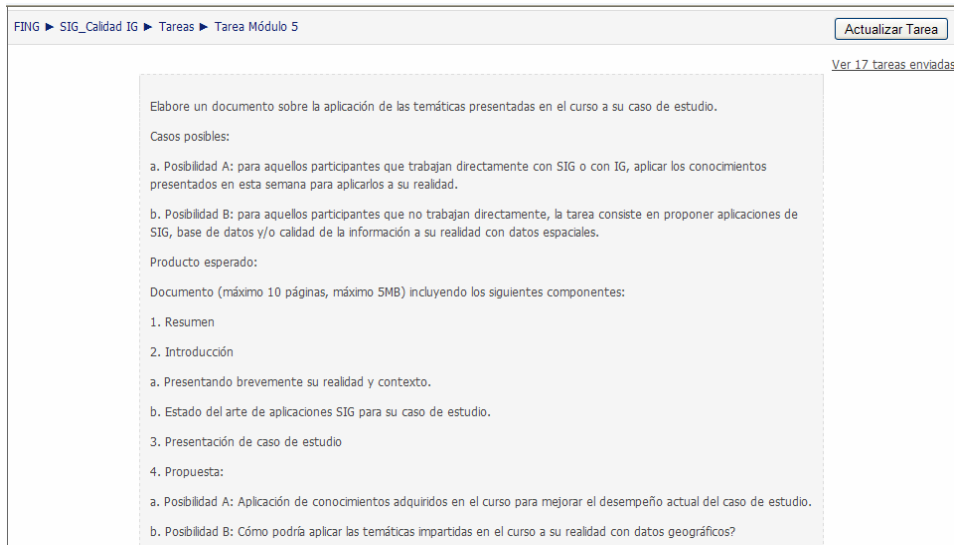


Fig.4: Partial view of the final assignment.

2.3 Course development and team organization

In order to manage the communication in forums and the correction of the assignments proposed in an efficient manner, a maximum of 25 participants was imposed. The total number of participants was of 24, even though there were more persons interested in taking the course. However, their registration was not completed before the deadline.

In online courses, not only is needed a professor to teach the course, but also it is necessary to have a coordinated team supporting the virtual environment. The structure of the team organization used in the course is the one shown in Fig.5. The School of Engineering counts with a technical team who brings support to the EVA (EVA Team for this paper purposes), and there is also a person who is in charge of the coordination between the different Institutes of the Engineering School and the EVA Team. The position of this person is referred as the General Articulator (GA) in this document. The EVA Team and the GA were the part of the course team in charge of bringing the technological support needed to teach the subjects in the course without any extra trouble than the own subjects' difficulties. This part of the team has the knowledge about the software learning technology and the rules of online education.

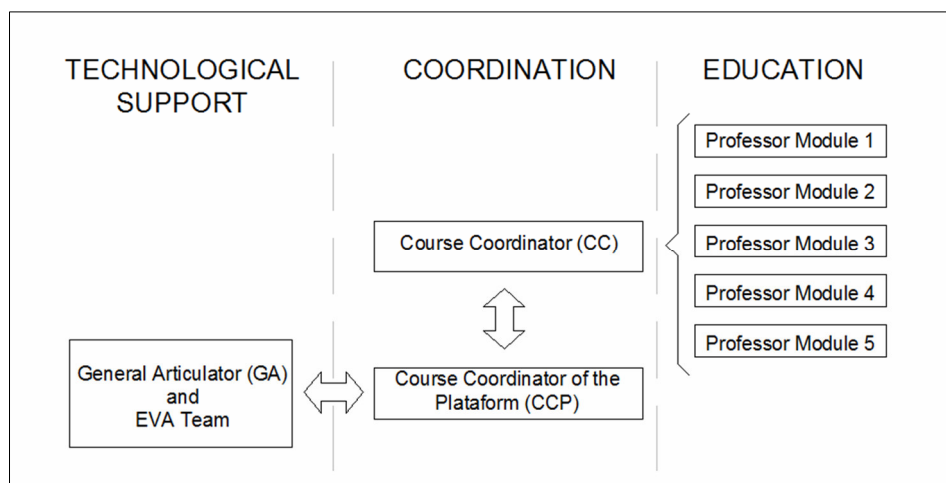


Fig.5: Structure of the team organization.

On the other hand, the professors who teach the modules are the ones with the main responsibility to maintain an attractive atmosphere within the course and learning environment. They are the ones who are continuously in contact with the participants, and they need to know deeply how to use the tools the platform provides to develop the communication. They do not need to know the details about how the platform works, even though it helps having a more general vision of the learning environment, but a basic knowledge about e-learning rules and the platform tools available are indispensable. Both, the technological and the educational sides, were connected in our case by coordination positions. There were two types of coordination, one more focused in the subjects of the course, and other more focused in the functioning of the course in the platform. The first person's duty was named the Course Coordinator (CC), responsible for the content of the course itself and the referent of the professors in the preparation of the subject materials and all the aspects related to the development of the course content. The second person's duty was called the Course Coordinator of the Platform (CCP), and was the person in charge to manage the course in his virtual modality, setting dates, updating the materials, making the questionnaires in the platform, and bringing the support to professors in the EVA environment. The CCP is the nexus between the participants, professors and the CC, with the GA and the EVA Team. If any technical problem occurs during the development of the course, the inquiries have to be redirected through the CCP.

Participants and professors needed to be registered in the platform, so that the GA had to ask the EVA Team to create the usernames and passwords. Once they were created, the CCP sent the instructions in a general email to enter to the platform and access the course, adding a help manual to know in advance some aspects of the platform and the course structure. A personal email was directly sent by the EVA Team to each participant, containing the username and the password.

2.4 Course approval

The learning methodology and the requirements to approve the course were added as part of the first module materials. It was established a maximum score for each activity of 100%. To obtain the course approval each participant had to do the totality of the assignments and questionnaires proposed, including participation in the forums, and to obtain an average score of 60%. With those requirements it was planned to give them an approval certificate, and with an average score less than the 60% a participation certificate. Otherwise there was no certification. The main idea was to stimulate them to do all the activities to assure they were involved in the subjects of each module.

3 RESULTS

At the end of the course the majority of the participants achieved the goal of doing all the activities proposed. It was observed a dropout rate of 16,5% as appears in Fig.6. This dropout rate was expected, as can be seen in Karen Frankola's document [4]. Also, there could be many reasons to explain the remaining or dropping out of the course, like are expressed in Diaz article [5].

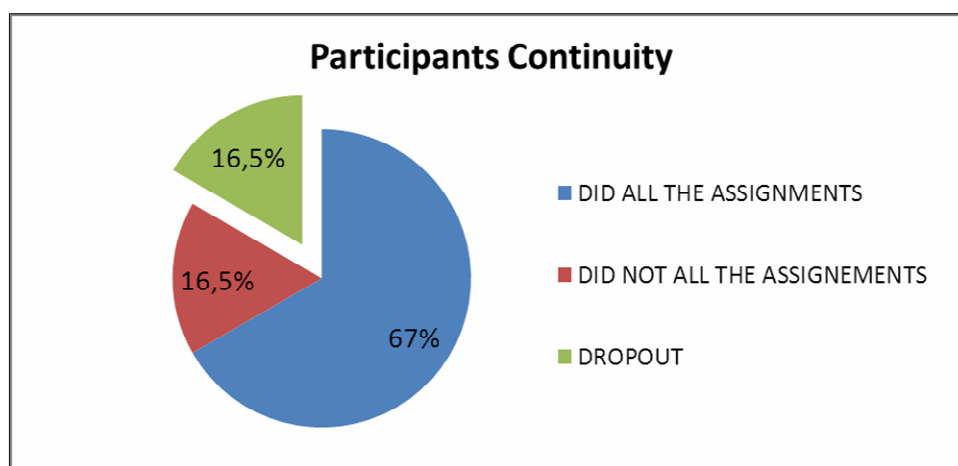


Fig.6: Participants continuity in the course.

Of about the 24 participants, 16 obtained the course approval corresponding to a 67% of the total amount of participants registered. Fig.7 shows the final approval results, with its percentages.

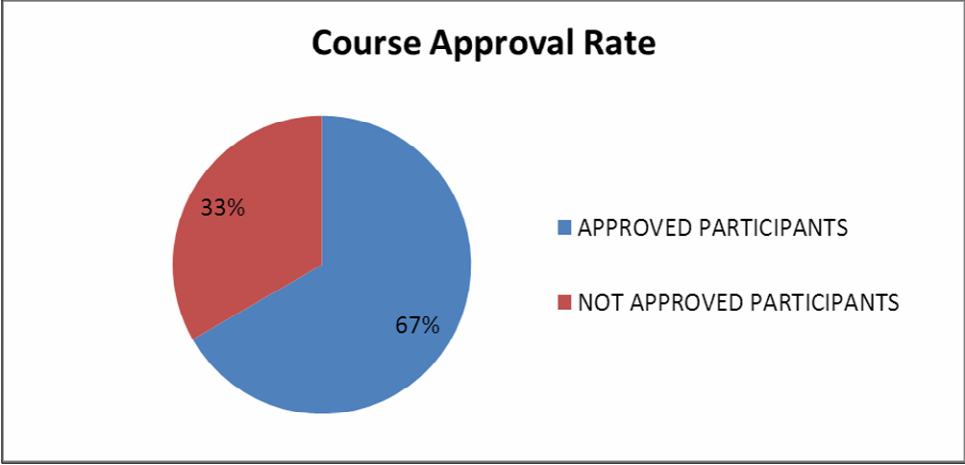


Fig.7: Final results

As mentioned before, one of the main objectives of the course was to spread the knowledge by making possible the attendance of people outside Montevideo. Fortunately, there was a 25% of participation coming from other cities than the capital. Six of the eighteen non-capital Departments were represented by technicians or professionals from the geographical information area. Fig.8 shows the political division of Uruguay in the 19 Departments, and Fig.9 shows the different locations where participants came from.



Fig.8.Political Division of Uruguay.

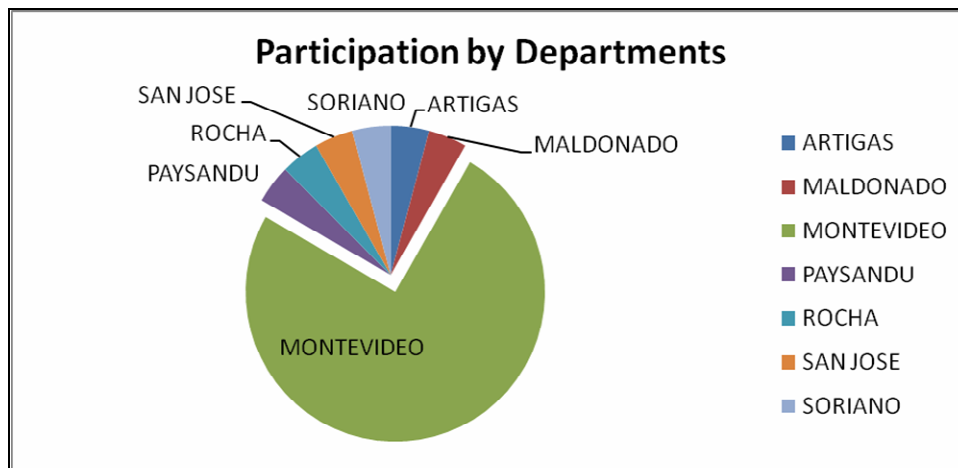


Fig.9: Participation by Location.

4 LESSONS LEARNED

Online education requires a high level of coordination between the different actors involved in the course. In addition, during the different stages of the development of the course, the amount of coordination and the participation of specific people may vary. For instance, before the course starts, there is a lot of work that normally is not easily seen and may influence the good development of the course directly.

In this case, the course has a cost which should be paid by the time it is asked the EVA team to make the user names and password with the purpose of access the platform. In the School of Engineering, the inscriptions and payments of a professional development course are done in two independent Sections. This situation may suggest a trivial problem, but if there was not sure that each person in the registered participant's list made the payment, usernames and password should not be communicated to those who didn't complete the registration. Once the list of registered participants is ready, the process in the School of Engineering to prepare them to access the platform is as follows. The EVA team receives a list with the data of each participant (complete name, email address and number of ID), and they prepare the usernames and passwords. They take around 3 working days to prepare it, and the petition can be done by email which sometimes adds dead times that make the communication a little bit slower. In all this process before the course starts, it was necessary to think in at least one week between the deadlines to complete the registration (inscription and payment), and the first day of the course. These lessons were learned from this experience. As there were some delays with the usernames, provoked in part due to delays in the confirmation of payments and inscriptions, and in part due to a misunderstanding between the persons involved in that duty. The problem was satisfactory solved but we had to start the course 2 days later than the official date. Fortunately this did not affect at all the development of the course because the first week is thought to learn how to use the platform, and has not very difficult assignments.

Other of the lessons learned were related with the participation in forums. It was a challenge to obtain an active participation from the students in the forums. It is necessary to find new ways of participation not only in order to solve specific issues of the course, but also to transform the forums into a comfortable space where the communication flows.

5 CONCLUSIONS AND FUTURE WORK

Being the first online course dictated in the Surveyor Institute, and also one of the first online Professional Development Courses organized in the School of Engineer with the EVA available a few months before the course started, it can be ensured that the positive experiences have been superior to the minor organization issues that happened.

The number of participants registered showed that there is a high interest in the subject and the online modality proposed, so it is expected to bring a new version of the course this year. Also the percentage of participants from other places than Montevideo showed the online modality is a good solution for those who are not able to attend in person due to location. Therefore, the Surveyor Institute has been working in other online courses in different areas, to bring more possibilities to those professionals who cannot assist in person or lack of time flexibility.

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