The Transversality of the English Language in Engineer´S Training using ICT

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ABSTRACT

This paper emphasizes the importance of implementing a second language and using technological resources in teaching. With the constant growth of technology, communication has had the need to advance to the point of creating environments that facilitate and sharpen this communication. Regarding to the implementation of a second language didactic sequences are taken into account. With these sequences what is intended is that students solve problems faced without the direct help of the teacher, so they can develop a critical thinking and learnt to work together. As result, evaluations will be done, and students who excel at these activities will be rewarded. The purpose of this essay is to create a different form of working, which not only benefits teachers, but students as well.

General Terms

The implementation of didactic sequences in a second language supported in new technologies of ICT.

Keywords

Didactics sequences, didactic, second language, ICT, blog, English.

1. INTRODUCTION

Because of the new challenges of modern life, the Benemérita Universidad Autónoma de Puebla (BUAP for its acronyms in Spanish) has had the need to update and modify its curriculums to fulfill, according to the "Fundamentals of Minerva University Model" (MUM for its acronym in Spanish) [1], the following: "the transformation requirements that the new economic, political, social and cultural conditions demand in a national and international level" [1]. Within the educational and academic principles governing the implementation of the new model (MUM), referring specifically about the profile of the university student, the BUAP indicates that students besides knowing their language and using it properly must master a second language in order to enhance their professional skills, so they can join to intra, inter and trans disciplinary teams of work, researching and development. This is the reason why the implementation of activities and classes in a second language are necessary and mandatory for every faculty of the university that wishes to meet the guidelines for which was created. Furthermore, the faculties have to make use of the new technologies as a way to link students with the multimedia resources and the Internet. Thus the combination of learning a second language along with the use of new technologies (information and communications technology) results in a very enriching experience to students and teachers.

This enriching experience such as: The feedback (by means of dialog with messages or comments), the identification of the students with their institution (by interacting with their teachers on a relaxed learning environment), the integration of work groups (by promoting the collaborative work in pairs), the creation of learning communities (by having access to international forums)

In addition, the MUM (2009) was designed with a flexible and transversal curriculum, which has five areas: human and social education, development of critical and higher thinking skills, development of skills in the use of technology, information and communication, languages and, finally, researching education. Taking into account the third and fourth areas as those that are part of this essay, the development of skills in the use of technology and languages, the aim of all transversal education is that its elements do not appear directly related to certain areas of knowledge but in a broad manner, i.e. there must be a relation between all of them. Transversal education should have social relevance of the issues that forms it and should have great moral content as being full of values [2].

For this reason the coordination of Mechanical and Electrical Engineering College (CIME for its acronym in Spanish) of BUAP concerned about encouraging the learning of a second language on their students and complementing the use of new technologies, but especially the importance of a permanent learning –not only inside the classroom but also outside-, has the task of starting the implementation project of didactic sequences in English language within their subjects of basic and formative level, basing on and making use of various multimedia resources and the Internet in first place. To this end, students of the Modern Language Faculty doing their social service were required, so the didactic sequences in a second language could be carried out with their advice, in terms of language structure (syntax), subsequent process that happened once they were trained in the development of didactic strategies.

In order to understand how they work, their purpose, materials used and the function that teacher and students perform when implementing a didactic sequence, it is necessary to explain each of these mentioned aspects. In this phase of experimentation to implement elements in a second language within the coordination of IME, it was decided to create didactic sequences in the most relevant language in terms of vanguard written and online publications: the English language. However, this is not a

limitation. Once such "novice" didactic sequences are applied in the classroom, and as an ideal aim, will be improved, it will be done the same with other languages, a fact that promotes the permanent and supportive learning within the educational community.

To initiate a permanent learning formation allows the student to identify improvement priorities, which will have implicit the need of dominating a second language to communicate emotions, interest and about proposals, which can have an international impact. Above all it permits the access of scientific information for the student in which exist restriction for the language, to be included as a high receptor in the diffusion of knowledge that the scientific internationals communities realizes.

2. BODY

2.1 Didactic Sequences

For the purpose of constructing and developing the knowledge of students, it should be created a set of activities, situations and materials that the teacher does use. This requires didactic sequences, which can be defined as:

"[…] the organization of the schedule of teaching activities, student and teacher activities, contents worked to achieve objectives that comprising in an interrelated manner the teaching sequence (techniques and activities done by the teacher), and learning sequences (learning activities)."[3]

The content of the didactic sequences has to achieve the objectives proposed in the curriculum and, therefore, such content and activities have to be didactic, i.e., they should follow practical-normative-decisional theories which help students to link knowledge with social activities or vice versa. The implementation of a didactic sequence implies learning in a "spiral" manner (Fig. 1 shows an example), in which gradually and progressively students acquire knowledge and skills until the objectives proposed by a transversal curriculum are achieved.

Where specifically the section of foreign language, promotes a greater access to the internationalization of the educational programs, which it's provided with the use of the ICT, in this particular case, with a blog that contains in an electronically way the didactic sequences for the transversal English teaching in the formatives assignments of the Mechanical Electrical Engineer.

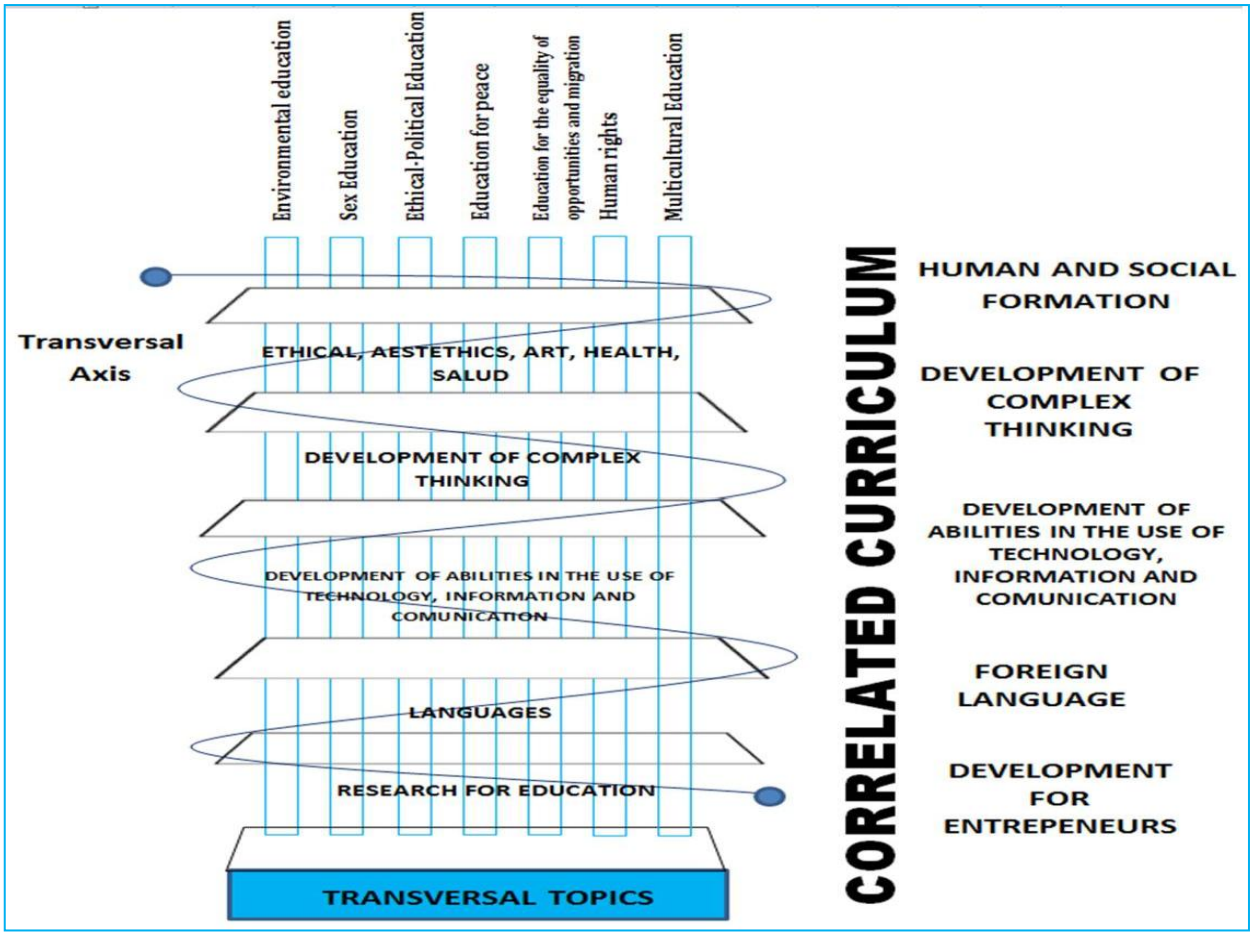

Fig 1: Learning in spiral manner according to MUM.

Three competences should be aimed by the didactic sequences:

First, opening competence, it is necessary that teachers encourage the entry of knowledge to students, for which teachers should make a diagnosis of their students by

introducing them the topic and/or problem, so the previous knowledge will be activated to then relate them with the new topic and method of working in the didactic sequence.

Second, development competence, this competence has as function to activate student abilities so the knowledge will be generated. It should meet a specific objective, with activities that help to the understanding of the principles and concepts through didactic activities that help student to develop intelligences and abilities.

Third, closing competence, the closure has to have an activity of integration that permits to evaluate how students incorporated their previous knowledge with the new ones in a significant manner.

Thus, a didactic sequence can be seen as a cycle in which students are in constant feedback phase. Unlike traditional educational system, didactic sequences not only focus on theory, but instead, generate a "practical-theoretical-practical" process which guides students to a constant evolution of their knowledge and which meets the new need of the learning centered in student according to the guidelines of the education for the 21st century -where is expressed, the need of strengthen the cognitive process of the students-, as this process demands the constant using, actualization and innovation of teaching-learning strategies (TL), alternatives to the traditional methods, because is important that the student gets the need of counting on didactical support to enforce the significant learning, above all ,when it's promoted the learning based in projects (LBP), which establish that the student must be autodidact and shows a positive attitude founded in the amaze and analyze of the parts that form a TL system.

The guides of the education for the XXI century, suggest that the development of the individual in any field of life demands the utilization of the skills, abilities, talents that the students acquires during their formation as a person, and mentions that the learning during life is a inherent process in the human formation which has the impact in the following levels:

- Personal and cultural development, that gives sense to the existence of each individual;
- Social development, that refers to a place in the community, citizen, politic participation and sociability;
- Professional development, that keeps relation with the not precarious and quality employment, bond with the production, personal satisfaction and material well-being. [4]

For the previous, the Mechanical Electrical Engineer College (MEEC) seeks to create an autodidact personality in the student and to facilitate the students the orientation that guides them to the initiation and keeping of an integration process of their capacities, aptitudes, attitudes, interest and expectations as a person. It is important to mention that in order to support the integral formation of the students in their linguistic abilities; it's required to involve a foreign language (English in this case) in the formative teaching of the curriculum, with the gold of facilitate and improve the learning of other international knowledge (above all those with scientific character), as well as widening the cultural and social frame in their educational formation.

Vygotsky considers that the social condition is determinant to the understanding of the new knowledge. This way he proposes what is called The Next Development Zone (NDZ) [1]. Since for Vygotsky "the learning is a way of appropriation to the culture inheritance available, is not just a individual process of assimilation; it is the origin and the motor of learning (BUAP, 2009)".The previous quote allows to asseverate that the learning depends on the existence of complex structures before the knowledge, un which will be integrated the new elements of learning, just that this structures are more social that individual.

To recreate a NZD, is necessary to count on the according teaching methods, for that the teachers must realize didactical sequences in a second language which make use of ICT. In equal form, the college students need ways to retain obtained information in and out the class rooms; one of this by means of the realization of cooperative structural activities, which are of easy realization, since with the use of the ICT (Information and Communication Technology), both the docent and the student, can handle documents, archives and multimedia on a faster and efficient way, speeding the process of TL in the classrooms and putting in contact the students with the new technologies, such as the ideology of Learning Based in Projects expresses(LBP).

That way the assimilation (acquisition of new knowledge and it's relation with the existing) interrelate in an exercise of memory and execution, that causes the understanding of the new knowledge that the student handles in the classroom.

By means of the realization of the didactical sequences proposed, it's pursued that the student keeps active, which avoids drowsiness in the classroom, also will have a backup that will help to understand new topics in revision.

2.2 How the didactic sequences work

To facilitate the use of didactic sequences, it is required a familiar format to the teacher or one with which he can became familiar with, so his/her function as facilitator can be sharpened. In the Table 1 and 2, the formats to create didactic sequences in a second language are shown, IME teacher are familiar with that format so the implementation of the activities in English language can be less heavy and gives students more freedom to develop themselves within the classroom (that format is general and can be applied in any area of knowledge).

Note: As an especial consideration to the generation of didactical sequences it's establish that the topic must be of high relevance both in the Spanish and English language, for example, it's suggested to use axioms, equations, principles, in general elements that do not change the meaning or application in respect of the culture that uses them.

Table 1. General information of the course

Course Description	
Name of the course or material	
Major in which is teach	
Educational Objective	
Practical, theoretical and total hours	
General objective	

Table 2. Didactic sequence by thematic unit

Development	
Subject	
Number and name of the unit	
Unit objective	
Content	
Subject description in which learning it is considered as pre-requirement (in case of exist)	
Didactic sequence or teaching methodology	
Opening activities	
Development activities	
Closing activities	
Chronogram	

By completing these forms, the teacher makes an analysis of the curriculum, the time that has, students (through a diagnosis), the topics that are feasible for the implementation of certain activities and also has a base that guide the teacher during a class session in order not to forget the objectives to be achieved.

Emphasis is placed in that the docent must design the didactical sequence in an extensive way for the student to find the more description of the activities and can proceed to develop the actions on a fluid way, but following a structure (beginning, middle and end) predefined.

Fact that will allow the student to obtain a clear idea of the functions that must be develop (for each role proposed in the sequence) and this way understand the importance of following procedures. For a better understanding of the table 3, is showed the development of the didactical sequence for the static course.

Table 3. Working format of the didactical sequences to enforce the learning of a second language.

a) General information of the course

Course Description	
Name of the course or material	*Static*
Major in which is teach	*Mechanical and Electrical Engineering Degree*
Educational Objective	*The students will develop the skills that will allow them understand, handle and apply the fundaments of the static, from a point of view of the scalar and vector analysis in two and three dimensions and visualization in the space. They will develop its analysis toward practical issues and questioning about if they can be or not present to the reality, they will verify the obtained results and its logic and apply their creativity for the solution propose of real problems applicable to their particular discipline. .*
Practical, theoretical and total hours	*48 theory hours, 32 of practice, 80 total hours.*
General objective	*Understand and apply concepts of static as a fundamental tool for resolving previous problems to the design of structural elements of mechanism and machines as well as their application in other fields of the engineering.*

b) Didactic sequence by thematic unit

Development	
Subject	*Static*
Number and name of the unit	*Unit I. Introduction*
Unit objective	*The student will make difference of the concepts: strength, mass, weight, as well as their respective units. The student will know a methodology for the transformation of the used units in engineering. The student will use vectors to represent strength and apply theorems, laws and the pertinent properties for the addition of vectors.* *Will understand what the static studies and the problems that the engineering solves.*
Content	*1.1 The static as branch of the mechanics, scope and division. Relation between statics and otter assignments of the S.P and between the units that form this assignment.* *1.2 Concepts of: strength, mass, weight, particle, rigid body. The three first Newton Laws.* *1.3 Units Systems, transformation of units and dimensional homogeneity.* *1.4 Vector representation of strength and its application in the Cartesian plane. (Collinear, parallel, coplanar and concurrent).* *1.5 Geometric methods: triangulation, parallelogram and polygon for finding the strength resultant.* *1.6 Application of the conversion of signs in the vector decomposition as well as: the Pythagoras Theorem, the sine law and cosine law, the trigonometric functions and properties of the triangles and the angles, in the solution of vectors additions.* *1.7 The two problems of the static and its axioms.*

	1.8 Knowing the application of the three Newton laws in static.
Subject description in which learning it is considered as pre-requirement (in case of exist)	*Pre-calculus and lineal algebra.*
Didactic sequence or teaching methodology	
Opening activities	*For realizing this didactical sequence the students must have reviewed previously the correspondent concepts to the unit I (mass, weight, strength and Newton Laws).* *The teacher will explain that the day's activities will relate to issues already discussed, but now highlighting the importance of learning a second language (as text publications and scientific and technological edge are written.* The teacher Shall give instructions for the activity "concept map" 1.- Students should form teams of 5 to 7 members (depending on the total number of students in the class).Must choose between the following topics, one per team. • Mass • Weight • Force • Newton's First Law • Newton's Second Law • Newton's Third Law
Development activities	2.- The teacher will give each team cards (the number depends on the topic) that contain the keywords of their topic. 3.- The teacher will place in the board a radian conceptualization (see anex1) the origin of the static and derived concepts, which are represented only by branches. 4.- Students should form with the given cards a branch that completes the conceptual map.
Closing activities	*5.- One integrant of each team will pass to the front and explain the existing relation between his elaborated branch and the statics (Note: The student must use the list of enlace phrases – see annex 2- to form sentences for explaining his assigned topic concept).* *6.- Another integrant must write in English the explanation of his partner in a letter paper.* *7.- The teacher will select an integrant of each team to be "evaluator", his function consist in translating the redacted text for each one of the teams, for that he will count on a dictionary and a laptop with internet Access.* *8.- Once redacted the text in Word; this will be reviewed with the grammatical and orthographic tool.* *9.- The evaluation will be scale in the following range:* *From 1 to 2 mistakes-10* *From 3 to 4 mistakes -9* *From 5 to 6 mistakes-8* *More than 7 mistakes-5* *This evaluation will have a final value of 0.5 points in the total addition grade.*
Chronogram	*Initial activity:* 1. *Presentation and instructions (15 minutes).* 2. *Form team from 5 to 7 integrants and distribute the topics for the group (10 minutes).* *Development activities :* 3. *Delivery of the material of the activity and the elaboration of the map in the board (5 minutes).* 4. *Construction of the branches of the conceptual map in the board in teams (15 minutes)* 5. *Explanation of each of the branches of the conceptual map (20 minutes).* 6. *Redaction in English of the explanation of each of the branches (one integrant per team). (20 minutes).* 7. *Select an evaluator and realize the translation. (15 minutes).* 8. *Revision with the grammatical and orthographic tool. (5 minutes)* *Final opinion. (5 minutes).*

2.3 Type of material used

New technologies are part of the material that teacher and students will use. The description of the didactic sequences is done in Microsoft Word. The didactic material is presented in Power Point, and in some cases in Word; the material should be printed both for teachers and student, and laptops with access to Internet, markers, blackboards are used. Since the activities have an evaluator, the answers are included in the didactic material. On the other hand, teachers have the freedom of printing their cards, tables, etc. in the material they wish, so their creative and didactic development are not limited or oppressed by the implementation of new materials.

2.4 Electronic Resources

Besides the materials mentioned above, a blog is used in order to facilitate the didactic sequences to teachers and students. Sáez Vacas states "a blog is like an interactive conversation during a journey through knowledge" [5] so both teachers and students can find in the blog (Figure.1 shows an example) the Mechanical and Electrical Engineer profile, a brief description of each didactic sequence and a link to download them, for further reference you can consult http://imebuapingles.blogspot.com/.

Fig 2: The image shows the blog developed for the MEEC, for the application of the didactical sequences in English, to the previous college and in which takes advantage of the free resources of the ICT.

Since all the didactic sequences are available on the network, both teachers and students can access anytime and anywhere, giving them more freedom and creating spaces more accessible to the elaboration of tasks outside the classroom. In addition, since the blog has a function of "interactive conversation", teachers and student can leave comment about the sequences they worked with, which is vital to the creation of new sequences and for updating them.

To create a familiar environment with the language, all the information contained in the blog is in English. Within the blog can be found link to the different CIME Web pages, social networks as Facebook and twitter, so students will be felt closer to their teacher, combining something they use frequently as a form of leisure or recreation, in a productive manner, creating transversal links between their education/formation and their hobbies.

2.5 Teachers and students roles

Teachers are responsible for teaching in the classroom; however, with the didactic sequences, students are aimed to create an autonomous personality, therefore, the function of teachers is, as mentioned before, as facilitators since they will be who provide the information about the implementation of activities. Teachers will let students work without their help, this will cause that students reflect, look for new learning strategies and news tools to solve the problems that are presented to them.

"In many cases teacher are limited and limit students in their learning-teaching process by not giving them time for reflecting what they have learnt. So it is very important to give them time to make such reflection" [6]. With the didactic sequences teachers change their role from an active to a passive role in order to give students the opportunity of reflecting on what surrounds them.

Student's role in the activities is of self-evaluators, since they by themselves have to prove their knowledge about the topics previously discussed. Moreover, teamwork is essential in the implementation of activities and, at the same time, this leads to the integration and collaborative work between students because they will have to support each other to explain, answer and even evaluate the problems faced, interacting either consciously and unconsciously in a second language.

Apparently the role played by teacher is not important; however, this role will be the start of a change of attitude and perception of students that will help them not only in the school but in their daily lives, since students will be prepared to take decisions in any moment that they face a problem.

2.6 Purpose of the implementation of didactic sequences in a second language

Nowadays, mastering a second language is important because the communication between cultures is growing constantly. So society is forced to study a second language, either English, German, Japanese, French, etc.

English language has a significant importance since it is the third most spoken language in the world. And more than 350 millions of people speak it as a second language. Currently, it is the language preferred in science and more than 80% of the information found in the Internet is in English [7].

Not only information from the Internet, but books which are not translated yet. Sometimes, students find information that can be helpful for them but the fact of not understanding what is written is a great loss of information, without forgetting the new trends on engineering simulation (specialized software) which are used more frequently in the teaching of science and technologies, and these have English as their native language.

3. CONCLUSIONS

The intention of this document is to give the docent and the student an alternative, that familiarize you with different resources for the teaching and learning, and this media elements serve to provide more feedback to docents and students, to determine the pertinence of the curricular contain. Based on the electronic resources, the docents must pay attention and be open to their use, as there are still docents that do not consider them, losing an important resource that is of great support in the formation of the actual professionals, since is more common to see the students immerse in a cultural dynamic of the use of the computer and of the multimedia contain.

The docent also will be capable of improving the way of working the teaching toward the students, since as facilitator will propose a structure that makes easy the visualization and reading of the contains of each course.

Finally, implementing, in the different colleges, didactic sequences in a second language supported in new technologies is important because the function of the three competences: opening, development and closing, is focus in both on theory and practice. In this way, students have the freedom to reflect, evaluate, look for options and become people who take decisions without the help of docents. Also, teachers, despite not participating actively, would be who evaluate the attitude that each students takes to do the proposed activities.

In the MUM is important to evaluate the attitude of the students, since this determines the level of participation that can have in the society and allows a reception of the innovation level that can provide to sustainable development of the community which forms part and annex to the skills that can be find in the domain of a second language, will have the capacity of making a greater impact in the population.

It is exactly the purpose of implementing didactic sequences in English; to students generate an attitude of aperture to a second language since they will start new attitudes and skills in student and teachers, and this will motivate students to continue learning a second language. As mentioned before, students will find books, articles, essays, etc. not written in their native language but which will be help them in their academic formation, so if they have notions of the language, they will be able to understand those texts, especially because the lexicon in science and technology will be strengthened. Likewise, the incorporation of new technologies in their ways of working will give them advantage when graduating from the major and facing a world that is full of electronic and multimedia resources.

Since the electronic resources allows more dynamic changes in the scholar curriculums, it is necessary to know the new formative needs of the new MEE, for this the feedback by means of electronic ways as blogs, are consider of a great relevance to determine the pertinence of the contains that integrate the curriculum of the educational engineering program.

4. EVALUATION AND FEEDBACK OF INDICATORS

The evaluation of activities done during a didactic sequence is necessary. The evaluation is done in teams during the closing phase of the sequence. All the didactic sequences should be finished with an oral presentation of evaluation in which it is taken into account the clarity and teamwork of students –action that promotes the value of honesty, ethics and moral in an implicit manner-. To encourage the diligent work of students in future activities, 0.5 points will be given in the final grade to the winner of the activities and to those whose work during the session had been outstanding.

To know which sequences has been used the most, the statistics that each blog handles are used. In that way the most visited links and pages can be known in order to have an idea of the success of these sequences. Also with the comments that students left after implementing a sequence, modification could be done to improve the works and activities in class. As a quantitative alternative of evaluation, it is proposed that each student generates his/her blog of notes through the access to this, it could be quantified a grade of support to approve the course in progress.

For educative example, to measure the impact of the propose in general and in each of the didactical sequences that is showed in the figure 3 the analyze of the blog where are the statistics of the users visit statistics.

5. INMEDIATE BENEFITS OF THE PROJECT

The benefits of this project are, first, to be familiar with the terms and structures (spelling and grammar) in a second language. In second place, students will develop skill to work in teams. As mentioned before, students will adopt an autonomous attitude to do activities inside and outside of the classroom. Didactic sequences will not only have impact in students but teachers also will have contact with new material and new was of working. This strategy allows a supportive participation and especially to work together in a local community, that gradually permeates to a national and international community in order to take part in the worldly identity proposed by Morin, this intention can be observed in the figure 4 that shows the traffic of the countries where it's being consulted of the blog. So the motivation is high since allows the possibility of getting feedback, not just local, but international and national, above all establish the relevance of the use the ICT, since without them it will be not possible to have an international impact.

Fig 3: Shows an overview of the consultations undertaken by the different users of the internet and frequently of time of the same.

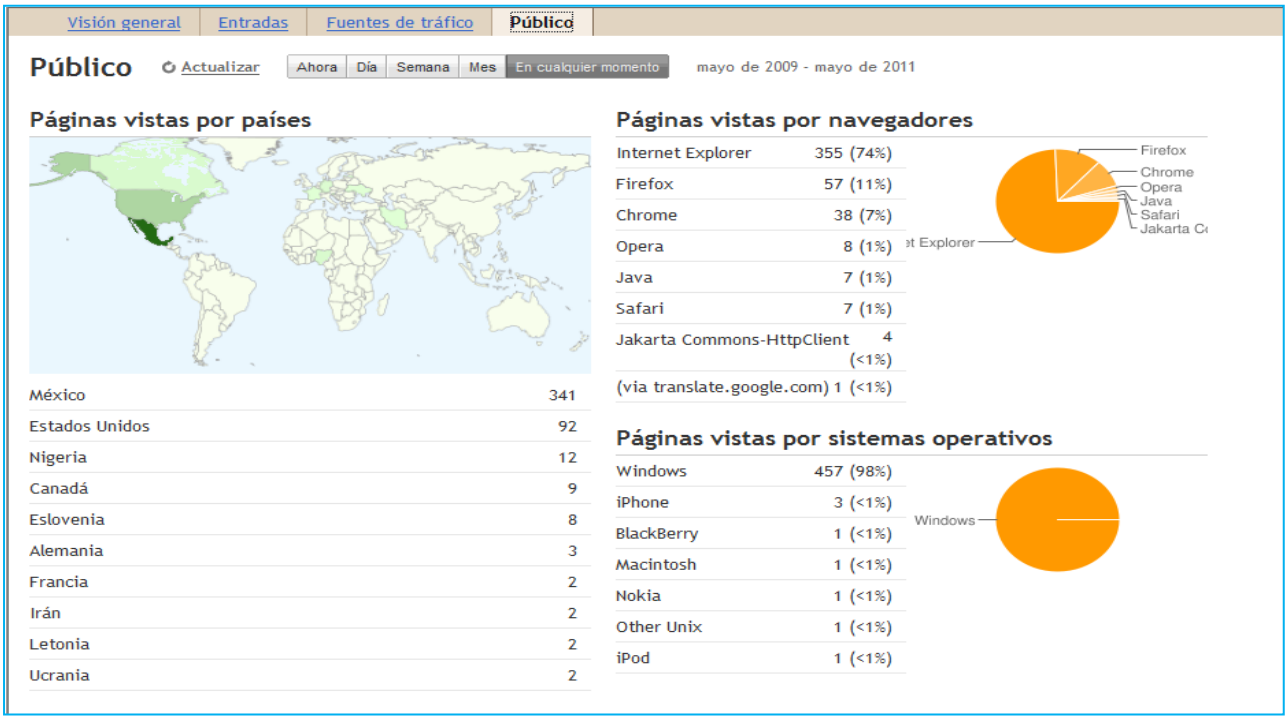

Fig 4: Provides an overview of the importance of proposing actions that allow the international interest, since can be observed that the blog has been consulted in different countries, where the native language is not Spanish.

This project seeks students that are directed to a self-learning and that teachers encourage their students to this end, action to strengthen independence and self-study before attending the classes, so the benefit will be reflected an improvement in the teaching-learning process and that impact on the results of the evaluation of the course. Also students will be able to solve their concerns through collaborative work, and provided to them (through teaching strategies) the way you should take roles to perform and present their work while ensuring a single procedure. The long-term benefits are that students will adopt a joint working structure, keeping this way of working even after finishing the degree in which they are studying.

As well, the academy of MEEC accomplish with their academic task to generate didactic material that facilitate the work to the students, for the access to the quality information.

Also the creation of a blog by the teachers provides a best communication and interchange of information with their students, both in and out in the classroom. This makes that teachers and students share experiences (distance mode) in the working moment or to change ideas for improving a project, when the generational gap and the increment in the use of ICT interrelation, to generate a best solidarity coexistence reducing the lack of put attention of the student's need as the format of the curricular contain of the student.

6. ACKNOWLEDGMENTS

Our thanks to Irene Andrade Parra and Josefina Samitiz Rios students of the Faculty Modern Languages, BUAP. Who have contributed towards with theory development and translation of the template.

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