Implementation of Schooling Based on Technologies for Communication and Information in the Subject Physics II

OLIVIA VIVAS VEJAR
Department of Mathematics and Physics
University of Táchira (UNET)
Avenida Universidad, Paramillo, San Cristóbal, Edo. Táchira
VENEZUELA

Abstract: - This research carried out with undergraduate students in engineering, sought to present a methodology as an alternative to access that subject, while producing a rise in the level of knowledge within the Bloom's Taxonomy. We studied student achievement, the perception of students and teachers to teaching performance, the use of media and the development of instruction. This study involves 68 students and 9 teachers. Students formed two sections, the Control Group (CG) with 64.71% of them and the Experimental Group (EG) with 35.59% of students. The first received instruction under the traditional methodology and the second by using technological means blended learning methodology. Initially the author applied two questionnaires, one aimed at both groups of students to teachers and other recorded demographics and academic perception with respect to development of the subject, the methodology and the teaching performance. Subsequently, the pre-test was applied to both groups on the topics developed during the investigation.

Finally, it was established that it is feasible within the university study, implement some methodological strategy incorporating technological tools, expanding coverage, for organizing this mentoring to enable two-way communication and multidirectional student-teacher, encouraging the use of technology in the process Learning Physics II, generating active learning environments, where the main protagonist is a student.

Key-Words: - Instruction, Option, Methodology, Technology, Level of Knowledge

1 Introduction
This study was located in a Latin American public university, technology and experimental. It was founded in 1973 as the Law of Universities (Ministry of Higher Education, 1970), its experimental nature lies in its dynamic structure adjusted to test new guidelines related to the comprehensive development of man, the search for levels of excellence the teaching-learning process; to innovation in educational administration, the creation, promotion and adapting technologies in line with the average regional and national levels, as well as to participation in studies leading to cultural development, technological, social and economic development of the region. This university was until the year 1983 with a system of distance learning system called Experimental Studies Led (ESL) applied in the first three semesters of each race and developed through mentoring group and individual that is a modality used to rely on semi-attendance printed and audiovisual material. Later this system became the traditional pattern and at present only classes clearly face. This university offers undergraduate-level studies in the areas of specialty in environmental engineering, agronomy, industrial engineering, computer science, electronics, animal production and architecture. At the level of postgraduate programs in engineering features as well as management, education and family medicine. Within its structure are academic departments and career support dependent Dean of Studies. Among the support is the Department of Mathematics and Physics (DMF) which is responsible for 15 subjects grouped into four clusters of knowledge: Algebra, Calculus, Statistics and Physics. The author of this study is attached to the core of Physics and administers the chair of Physics II. In such matters are taught knowledge of electromagnetism that is offered in five races and engineering is located according to the curriculum in the third semester. This material is offered in only five of engineering professions and according to their curricula is located in the third semester, identifying with the name of Physics II.
2 Problem Formulation
In each time the academic DMF offers eight sections of theory and 18 laboratory sections, each covering an average of 45 pupils and 20 respectively. Gradually in each semester has been observed that the offer is less than demand in terms of quotas on such subjects as shown in Table 1. The DMF to manage the subject Physics II has a staff of 10 teachers’ assets dictating each 12 hours of class attendance.

<table>
<thead>
<tr>
<th>Lapse</th>
<th>Offer</th>
<th>Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pupils</td>
<td>Sections</td>
</tr>
<tr>
<td>2001-I</td>
<td>360</td>
<td>8</td>
</tr>
<tr>
<td>2001-</td>
<td>360</td>
<td>18</td>
</tr>
<tr>
<td>III</td>
<td>360</td>
<td>8</td>
</tr>
<tr>
<td>2002-I</td>
<td>360</td>
<td>18</td>
</tr>
<tr>
<td>2002-</td>
<td>360</td>
<td>8</td>
</tr>
<tr>
<td>III</td>
<td>360</td>
<td>18</td>
</tr>
<tr>
<td>2003-</td>
<td>360</td>
<td>8</td>
</tr>
<tr>
<td>II</td>
<td>360</td>
<td>18</td>
</tr>
<tr>
<td>2004-I</td>
<td>360</td>
<td>8</td>
</tr>
<tr>
<td>2004-</td>
<td>360</td>
<td>18</td>
</tr>
<tr>
<td>III</td>
<td>360</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 1.
Three of the teachers are currently doing doctoral studies outside the university. This results in the number of teachers available assets to dictate the course is reduced to seven so that this number is insufficient to meet the demand for quota by students at the beginning of each semester. In parallel with this situation in the department will generate other problems among which include the following: (a) increase the maximum number of students who should meet each teacher, (b) excessive load time for teachers assets, (c) recruitment temporary teachers called interim, (d) conflict with the teachers' association in relation to compliance with the provisions of the Convention Act (UNET, 1998) and (e) budget deficit as a result of recruitment of teachers interim.

In summary the DMF it creates a problem of an administrative nature which results in heterogeneity of criteria and approaches to teaching, leading to a decline in the quality of teaching-learning process that is reflected in the low performance by students.

2.1 Purpose of project
The purpose of this research project was to assess the possible and various methodological strategies incorporating information technology and communication (ICT) as well as comparisons with the traditional methodology with the purpose of selecting the best portfolio respond to the need to extend coverage, maintaining uniformity of pedagogical discourse and raise awareness of students in the subject Physics II. Two of the most urgent problems of higher education at this time, are making the quantitative increase in enrolment does not weaken the quality of learning and simultaneously with the entry into the higher level does not become a step in the ephemeral higher education, but students remain within the subsystem and learning to achieve quality permitting efficiency and appropriateness in the chosen professions. To overcome these problems and turn them into real
challenges, it is necessary to implement actions vocational guidance before entering the subsystem and change educational practices within it.

Faced with the need to update and provide alternative learning opportunities to students of Physics II of that university, it became necessary to submit a proposal to contemplate methodological issues and the means by which they could respond to the learning process in science factual and conceptions epistemological guidelines on how to work and the scope of scientific knowledge in a comprehensive context. This proposal should also intended to allow alternative to achieve learning physics II, so that students who submit quota problems, collision of schedule, repetition, or other reason preventing them from entering in attendance, obtain access to all information necessary to attain knowledge. Likewise, under this mode of teaching students complained could pursue the subject without affecting the normal course of his career.

2.1.1 Consideration of the problem
There is a need to narrow that there are no "teaching recipes", requires that every educational experience from their practice and become the single print in living tradition of meaningful content of which the student's upper level can be acquired for their work and life, because they will realize that what makes them work better person. It is also important to mention that the university is currently launching a series of projects in the field of postgraduate, undergraduate and university extension, with the intention to implement educational programs that incorporate the new technologies of communication and information tools in the teaching process - learning. Referring to the urgency of incorporating new technologies, Hernández [2] found that just thinking about the diversity of businesses where the product will serve the university effort, because our professionals required as the average value, an updating of their knowledge of 6 to 7 years, and whose update has taken place at the time most convenient for their work, thus are decompensate to the demands of the working world who have to face. Addressing this group inevitably dispersed without the aid of telecommunications and computing does not seem possible. Although the commentary is contextualized to university graduates, these considerations are completely valid for other levels of education such as vocational training, adult and continuing education training for work at any level. In this regard it can be added that the Research Institute for Higher Education for Latin America and the Caribbean (IESALC) since 1996 at its regional conference (CRESALC), raised as a course of action the "Program for Management of new information technologies and communication ". This aspect is crucial for countries to achieve development based on a set of actions, among which indicates that this is achieved on the basis of a full understanding and use of NICTs, which should make the necessary efforts to that higher education has a computer and communications platform suitable for this purpose.

On the other hand Curci [3] to make a diagnosis of virtual higher education in the country, where they saw all institutions of higher education (167): public and private universities (42); institutes and colleges (123); and research institutes (2) where academic programs are offered at postgraduate level. Of the 9.6% universities developed a program of virtual education, institutes and colleges not developed virtual education programmes, and for research institutes them not to develop virtual graduate academic programs, so it concluded that "the process of virtualization in higher education institutions in Venezuela is taking place mainly in universities ", it being a new experience (since 1997) and is being evaluated recently, only 53% of the institutions that have academic programs virtual the assesses, evaluates some of them with instruments themselves (32%) and the rest of them (16%) is in the process of preparing its evaluation tools, for its part regarding the accreditation process of study programmes by international agencies None of them are running at the moment. It also emphasizes the fact that universities at the beginning focused its efforts on logistics, infrastructure and administration, however since 2001 in what they do and teaching methodology, namely that there is an evolution in which knowledge and make use of technology and its tendency toward substance, education.

Faced with this reality of slow growth and integration of ICTs to higher education, is in this country a study based on a survey conducted periodically by the Venezuelan Chamber of Electronic Commerce (CVEC) [4], where the results for 2003 showed that The number of Internet users dropped by 0.9% for the period 2002 - 2003, where he noted that Internet users have stopped using it belonged to the population under 24 years, with higher educational levels and social strata and C D, were 16.32%, on the other hand noted that a 50.36% of the population declared not having used the Internet and not be interested in doing so.

According to the CVCE, it is interesting to note the change that took place during the year 2003 the ways in which users access the Internet, stressing
that increased their cybercafé service of a 37.45% to 56.60%, however, think tanks, work, and home and informatics centres decreased demand for their service. Besides the main uses of the Internet in the country are represented in sending and receiving e-mail (55.5%), which declined in value by 6% over the period studied; seeking information for studies (young women, 53.3%), decreased by the period on a 10.4%; Chat (36.4%), increased in the year by 12.2%; seeking information for work (24.1%), increased by 6.4%; other indicators (search for information hobbies, read newspapers, make purchases, among others) all dropped their demand during 2003. The relevant to this study by the CVCE in regarding to this investigation, is that highlighted developments have taken the use and Internet penetration in the population. However makes no reference to the use of the Intranet or any other uses of ICTs in the educational process, but it could get an idea that reflects how people's behaviour off the Internet, leaving the question of whom are the most important reasons, which generally have been falling rates measured. This project is focused on providing the opportunity to contribute concretely to the change in the training of our professionals. Implementing new forms of work that had already been tested in other productive areas of countries such as economics or communications, which was justified in developing conscientiously, expeditiously, with the greatest interest to do and accomplish what better with our students, our colleagues and us. The proposal sought immediately able to adjust to the demands of quality education and to justify its implementation with the results and potentials that could provide as such.

3 Problem Solution
The rules in this type of educational projects included three fundamental aspects: a) the rules governing the college Physics course II b) regulations established by the head of the subject in remote mode, supported by ICTs and c) the current regulations on the use of the Internet or network in which they endured the design. The information was collected and links to access major software tools and simulations may be necessary or representing some value for the development of the subject Physics II. Given that participants had to socio-economic constraints when purchasing materials for their studies, it became necessary to provide information on programs for graphic design, image editing, and management of audio and video files, assessment programs, as appropriate. Since the object of study subjects, this was a subject in a formal curriculum of study for careers in engineering that were taught at the university and that they had a preset agenda, forced to comply with regulations, objectives, content and evaluation plan of instruction, which had to be revised according to the program and the possibility of implementing it in the distance mode. It also foresees the development of educational materials, supplementary materials, selection of external links, software, discussion forum, postage, etc. It also deals with the design and development of the website where he hosted the material, instructions, strategies, evaluation plan, control systems and other mechanisms of interactivity. Finally, we built the portfolio of the subject at a distance modality assisted by computer networking.

It was necessary for the evaluation of instructional design and development of the subject to gather teachers involved in the investigation that taught classes from the subject of Physics II, both for the control group to group therapy, to discuss and agree the frame of reference in which the project would be developed. Once drafted the final polls, proceeded to the organization and conduct of fieldwork. When implementing the surveys, there were questions exactly as they appear in the written questionnaire and in the same order, trying to answer the entire respondent. Finally, data from the surveys were purged in order to verify that they were properly answered and that the responses were consistent. Since the information was obtained from two different groups and that the researcher was a teacher of the subject, it applied personally surveys the groups. Moreover, the survey was validated in content and appearance, in addition to assess their reliability of internal consistency, through the Coefficient of Cronbach alpha. The validity is a concept which may be different types of evidence (appearance, content, criterion, predictive and construct) for investigation if it assessed the validity of appearance and content. According to Hernandez, Fernandez and Baptista [5] "refers to the degree to which an instrument reflects a domain specific content of what is measured." Reliability is the characteristic that concerns the extent to which their application or repeated administration at the same subject or object produces similar results. The data were processed using the statistical package for Social Sciences, used for social sciences and Stat graphics Plus. Allowing the first: to quantify, manage and process information for use in the interpretation and analysis of it, tabulating items that have to codify, as well as options for answers. Likewise, the second allowed for testing hypotheses.
that were necessary. Information from instruments once coded, tabulated, and generated databases to control groups, with treatment and teachers. A study by statistical tables often percentages, measures of central tendency and graphics, obtaining a clear picture of the behavior of the factors measured in the sample. Subsequently a study was conducted inferential, which analyzed responses significant and not significant. It proceeded to the scrutiny of the answers given by students in the group with treatment and those obtained by students in the control group. He then applied inferential evidence comparing average correlation between variables, and others that are deemed relevant at the moment to advance the analysis of information.

4 Conclusion
The results for the profile of students involved in research, both belonging to the control group as in the experimental group, show that both groups showed no significant differences in terms of marital status, sex, age and the amount of units approved credit. This led to conclude that the experimental and control groups were statistically equivalent, so that this equivalence initial groups coupled with the conditions under which ran the investigation and sought to ensure their validity internal and external, lead to the conclusion that the differences encountered during the development of research can be attributed to the manipulation of the independent variable of instructional design. Likewise, the results obtained in the profile of teachers involved in the investigation, show that corresponded to a group that did not show significant differences between them in terms of age, higher education diploma, the location ladder, condition and dedication. Therefore it was possible to conclude that the group of teachers involved in the investigation relates to a group of individuals equivalents, which joined with the conditions under which research was conducted ensured its internal and external validity.

The results to assess the first research question, integrating the objectives, as well as the working hypothesis, lead us to conclude first that the higher percentage of students (59.84%) accessing the website, belonged to the experimental group and not the control group (40.17%), so that there was a difference between admission to the page between the two groups of students, which implied that there was more interest from Students belonging to the experimental group, therefore could be more complete access to information that was shown on the page, as concepts, examples, solved problems and proposed, could further clarify their doubts personally or through the discussion forums or via e-mail. The proportion of students who were in accordance with the methodology using new technological tools in the development of the subject, was higher in the experimental group than in the control group with 95% confidence, since student perceptions towards performance and teaching towards the development of education as well demonstrated. With regard to how they should learn and transmit the contents of physical II using technological tools, based on the theory of learning significant Ausubel [6] indicate that in terms of their influence on the design of educational materials supported by the computer, which is seeking to establish effective means above all to propose situations discovery and simulations, supporting the reality of the laboratory, also, that the fundamental role of the teacher, as regards their capacity as a guide in instructional process and that no computer could ever be programmed to answer all the questions that students make. The methodology incorporating new technological tools have the same acceptance by teachers that the traditional methodology, since all teachers who were involved in the investigation was in agreement with this methodology. This was strengthened by the perception that was obtained from the attitude of teachers toward students during the process of instruction, motivated involving them through exercises, questions and problems obtained as material support provided by teachers either traditionally or via the Internet.

The results when assessing the second research question, lead us to conclude that teachers who taught the subject not observed differences between the definitions of material based on new technologies and delivered for them, so that 100% of teachers had agreed that there was uniformity in the pedagogical discourse used by all teachers involved in the investigation that rendered the subject of physics II in the careers of environmental engineering, electronics, computer science, industrial, mechanical and animal production that gives the university where research was conducted.

Likewise, the results obtained in assessing the third and final research question, lead us to conclude first, to assess the responses given by both the Students in the control group as a pilot group of students to the items presented at the trial of pre-test only difference was observed in the results of one of the ten questions that were raised, which does not permit to assure that both groups did not differ significant on the background of the subject, then regarded as equivalent groups and joined with the
conditions under which research was conducted ensured its internal and external validity.

4.1 Challenges
This research work, based on their results, brought four major implications, which are detailed below: Firstly, we can establish that it is feasible within the university study, implement some methodological strategy that incorporates new technological tools and allowing extend coverage, for organizing this, tutorials that allow two-way communication and multidirectional student-teacher promoting the use of information technology and communication in the learning process of Physics II and also, generating active learning environments, where the main protagonist in the teaching-learning process is the student, because this methodology has the same acceptance by students and teachers that the traditional methodology. This is reinforced when we consider that current technologies used in instructional design focusing on the student, helping boost in the individual learning constructivist. Faced with this, Polo [7], believe that technological development, such as the "World Wide Web," power formulating new learning environments, as they include processes which are aimed at meeting the interests, intentions and objectives of the student, and provide strategies and means to address and understand what is paramount for him. These environments by the authors called "open environments" they "emphasize the role of mediator apprentice to define in a way only the meaning, to establish the needs, determine the goals and commit to learning activities." In addition Araujo and Chadwick [8], show that each step enables the subject to the following address, implying that the instructional materials should be developed in small steps thus allowing many responses that must be properly reinforced. The sequence of the material will be linear and specific to the material itself in most cases.

As a second implication, is the realization that there was uniformity in the pedagogical discourse used by all teachers who taught the subject of Physics II in the careers of environmental engineering, electronics, computer, industrial, mechanical and animal production that provides college where the investigation took place, both in the case where it was worked by using technological tools as in the case in which he worked in traditional form, scope and brings that technology does not represent a disturbing factor in furnishing information, nor intends never replace the teacher, but on the contrary it provides support in its performance and therefore reinforces the above, that it is feasible to implement some methodological strategy that incorporates new technological tools and to maintain uniformity of pedagogical discourse, establishing the new role of the teacher as facilitator of teaching-learning process.

As a third implication, is the fact that students in the experimental group answered correctly 60% of items of post regarding 40% of students in the control group, allows us to indicate that the use of technology in development of the subject is presented as an alternative equivalent and therefore feasible within the context in which ran the investigation, because although that did not increase student performance in the experimental group by 100%, we cannot decide on plane that the decreased.

References: