Thermo-Fluids: Comparative Study of Academic Efficiency Between two Groups Using Different Methodologies of Instruction

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Abstract: - The present work was raised to know the influence the instruccional strategy in the academic efficiency of the students when incorporating the Internet like tool in the education of the subject Thermo-Fluids (TF) in the students of the fifth semester course of Industrial Engineering. The study leaned in the resource of the new Information and Communication Technology (ICT) using the Internet like learning environment. For it the platform was used Web or system of free conference by mean of the gratuitous platform Nicenet Internet Classroom Assistant (http://www.nicenet.org). The investigation was experimental and of longitudinal way in where the following instruments were used: a) list to determine the knowledge and previous abilities that have the students in the use of the computer, handling of the Internet and electronic mail, handling and use of the WWW like education learning tool, b) list to collect the perception of the student with respect to the learning atmosphere being used the ICT in the process education - learning of the subject TF and c) registry of the student efficiency according to the learning of unit two of the plan of evaluation of the course. In the analysis of the results one was favorable significant differences to the Experimental Group (EG), in the knowledge and abilities that the students in the use of the computer and handling of the tools of the Internet, as well as the student efficiency improved after to have applied the instruccional strategy.

Key-Words: - Educational Technology, Teaching Methods, Comparative Education, Internet, Perception

1 Introduction

This work focuses mainly in the investigation of factors related to the academic efficiency to make a more rational use of the instruction in the educative scope of today. The scope in where this investigation was carried out is an institution of Venezuelan superior education. This it is the labor surroundings in where the author evolves.

This university, according to Morles et al. [1] is an Experimental National University, created by the Venezuelan state with the purpose of trying new directions and academic and administrative structures. The institution can enjoy certain autonomy determined by the special conditions of its educative experimention. Her organization and operation are governed by regulations dictated by the National Executive (Article 10, Law of Universities, p. 19). In January of the 2002 the Ministry of Superior Education (MSE) was created, which, being the only regulating of the Venezuelan educative scope is in charge to handle to everything him referring to the plans and projects in the superior education. At the moment, the MSE, the National Council of Universities (NCU) and the Office Planning of Academic Sector (OPAS) [2] of the country where is the studied institution, it executes a project that is oriented towards the improvement of the quality and fairness of the superior education of the country and the search of the academic excellence.

Between the measures of this project the number of students in the all national universities is to increase. The Venezuelan superior education has evolved, surpassing the 1,5 million students located in more than 60 university universities and 28 schools and institutes, in addition to 104 deprived schools and institutes, in summary, is immense. The MES, NCU and OPAS, it indicated that the preoccupations of the universities with respect to the quality of the education that in them is distributed must be centered in the development of general and professional competitions.

Thus, this university, by exigencies of the MES has had to double its matriculation of entrance of students by semester in several of its courses. This fact has generated a serious problem of space, of
such form that the university authorities examined different academic alternatives to take care of more students with the same capacity of the physical plant. Also the MES, NCU and OPAS, indicated that it is necessary to incorporate in the universities, evaluations of the student efficiency in global terms, that include quality of the learning process, integration with the professional practice and the professional field, levels of satisfaction of the student and professorial population.

2 Problem Formulation
The statistics of the year 2004 of the coordination of control of studies and evaluation of the university at issue indicate that the academic index average of the students is of 5.54, in the scale from the 1 to the 9, and Thermo-Fluids (TF) is 5.41 in the mentioned scale. In addition, the statistics reflect that 55% of the students remain an additional time average of four semesters in the institution. Specifically, in the matter TF, the index of reprobated is of 45%.

By means of judgment of experts in evaluation, of the teaching staff in general, and the own authorities of the university at issue, these academic index are low and the repetition indices are considered alarming [3]. In May of 2004 a meeting with the participation of the head of the Unit of Evaluation and Control of Study of the university was carried out, the head of the Department of Industrial Engineering and the professors of the department, to analyze and to present proposals to solve the academic problems. Like result of that meeting, they proposed to design new strategies of education that allow to improve the academic efficiency, the effectiveness of the education-learning processes and to increase the motivation of the students for the learning of the different course.

With the purpose of obtaining an increase in the efficiency of the students, reaching the fairness finally and the optimization of human, financial resources and of physical space, the directives emanated by the National Center of Technologies of Information [4], establish that it is due to foment the investigation and the development of products and services in the ICT. Thus the main representative in the learning process is the student, who reaches an optimal efficiency and performance with the good use of the ICT, and the aid of the educational one. This, at any moment, he fulfills a roll of guide, tutor or facilitador of the process.

The study was developed with the attempt to support new strategies in the education-learning process that allow to improve the academic efficiency, the effectiveness and to increase the motivation of the students for the learning of the different subjects of the course. The work focused in unit two of subject TF of the course of Industrial Engineering, in the fifth semester course of the studies in where the students have low efficiencies. In the subject of TF it is counted on a total of four sections and each section has an average of 45 students registered during each semester lapse. The program of TF altogether it has conformed by five units of study. The subject has an academic load of four credits, which corresponds to distribute three hours of theory and two hours of practices. Whereas during the year two semesters regular of sixteen weeks are programmed and the summer course that is of six weeks.

The limitations of time and organizational competition, do not allow that the educative institutions have sufficient opportunities, to carry out formal investigations before initiating programs of remote education [5]. Therefore, some institutions initiate programs that work under the premise of the test and the error, which affects the quality of such. Morales el al. [1] they affirmed, the use of the new ICT in Venezuela has been developed in harmonies with the evolution of those technologies to world - wide level.

On the other hand, and conscientious of the necessity to take care of a greater number of students with an education of quality, and tie to the fortification of the program of remote education in the University of Táchira (UNET), Paz [6] showed that: Year 2002 served to construct the foundations of which it is going to be this important program for the educational work of the UNET. In particular, began with the first stage of the project of virtual classroom and generate the initial ideas of the curricular guidelines of remote education of the UNET.

With respect to improving the effectiveness of the education - learning processes, Alonso, Gallego and Honey [7] they indicate that the analysis of the learning styles offers indicators that help to guide the interactions of the person with the existing realities. On the other hand Martínez and Iriarte, [8]; Witkin and Goodenough, [9]; Messick, [10]; alleged that most of the authors who speak on the learning styles they agree in indicating that she is how the mind processes the information or how it is influenced by the perceptions of each individual. According to the previous thing, it was deduced that the learning styles provide to the educational one, the information on how the individual learning is made in the students, of form so, that this one can adapt its strategies of education to the different styles from the groups.
Succi and Spasojevic [11] obtained in their study that the electronic mass media, such as the electronic mail, are effective if they are used as complement to the actual traditional communication. Most of the postgraduate students (72%) they showed that the provided mass media helped the learning process, whereas only 38% of the pre-degree students were not in agreement with this affirmation. However, both groups of students showed that the electronic means helped to express themselves better.

On the other hand Romero [12], developed an investigation at the UNET, which had like one of its objectives to determine to what extent the joint between the virtual and no virtual education, actual and no actual it improves the quality of education and learning of the students. The results of this investigation demonstrated that the virtual and the no virtual thing joint of, significantly improved the quality of education and the learning, having itself observed that the efficiency of the students was increased when the professors used different types from technologies in their courses. The technologies used by the professor included understood pages Web, the electronic mail and presentations Power Point; where each professor worked with some of these technologies in individual.

2.1 Purpose of investigation
The present study had as intention to improve the academic efficiency and to optimize the perception of the students of Thermo-Fluids (TF) on an instruccional unit distributed at a distance with aid of the electronic mail. This was obtained, by means of the use of the ICT within an instruccional unit.

The effect was compared that has an instruccional unit using the format of the Internet versus the same unit using the classic actual format. With this purpose was determined a) if the academic efficiency average of the students of the subject TF obtained when applying the format of the Internet to instruction unit two, significantly deferred with respect to the academic efficiency average obtained when applying the classic actual format to the same unit of instruction; and b) if the students of the subject TF submitted a method of instruction with the use of the Internet, registered a perception average with respect to the atmosphere of learning using the ICT in the process education learning significantly better than the students under the classic and actual method.

2.1.1 Consideration of the problem
According to the data emitted by the unit of evaluation and control of study in six semesters, the total of students who repeated the subject surpassed in average 31%, as it is detailed in Table 1.

<table>
<thead>
<tr>
<th>Period</th>
<th>Enrol</th>
<th>Retired</th>
<th>Delay</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000/1</td>
<td>186</td>
<td>18</td>
<td>55</td>
<td>73</td>
<td>39.42</td>
</tr>
<tr>
<td>2000/3</td>
<td>186</td>
<td>5</td>
<td>60</td>
<td>65</td>
<td>34.94</td>
</tr>
<tr>
<td>2001/1</td>
<td>202</td>
<td>8</td>
<td>30</td>
<td>38</td>
<td>18.81</td>
</tr>
<tr>
<td>2001/3</td>
<td>179</td>
<td>5</td>
<td>60</td>
<td>65</td>
<td>36.31</td>
</tr>
<tr>
<td>2002/1</td>
<td>190</td>
<td>10</td>
<td>55</td>
<td>65</td>
<td>34.21</td>
</tr>
<tr>
<td>2002/3</td>
<td>182</td>
<td>12</td>
<td>45</td>
<td>57</td>
<td>31.31</td>
</tr>
</tbody>
</table>

The low performance in some subjects is one of the problems that affect in high percentage to students of the university, and subject TF, is one of them.

3 Problem Solution
Nevertheless for this investigation, the technological means Nicenet like resource, of in line easy will be used in line and safe to positioning of documents, exercises in line, and connections of interest. Because the university frame at the moment at which this study was developed, did not have a platform or technological system (Intranet) own. The functionalities of Nicenet are the same ones that offers the Internet, as they are to provide to the users a space where to store the information and to offer benefits of electronic mail, to char them, forums, transference of files and pages Web Progressively all the educational units can be connected or to become disconnected of the Internet according to agrees opening to new communication channels and manifold services to the members of its educative community. Nicenet emulates, practically an Intranet. In this platform it was where it was placed and it used the course of TF. In addition a guide gave itself so that the student carried out the registry and handling of the platform. This allowed controlling the access of the students. Next a workshop of induction to the students of the Experimental Group (EG) in the room of computer.
science of the university was dictated, to aim to make the inscription of the subject in the classroom of the Internet and to teach to these students the handling of the platform with the aid of the guide. The communication that had the EG with the professor via Internet went through of the Nicenet platform. This management system of learning makes public available a denominated system Internet Classroom Assistant to (ICA 2). To integrate ICT into my class I designed a Nicenet class called Thermo-Fluids to run parallel to the face-to-face tutorial. ICA 2 is a sophisticated tool of communication that provides great reach to the communication based on the World Wide Web, it has personal mail and it allows sharing documents and connections of resources to a variety of learning atmospheres. In addition Nicenet provides ICA 2 and without publicity gratuitously.

The ICA as a web site, it is very reliable. Teachers can provide their students with reading materials and information, annotated links to selected and categorized websites, information about scheduled events such as assignments. Students can also enter documents, submit homework, and add links to the web. Everyone enrolled can participate in discussion forums. They can be in the same room performing tasks in real time. The ICA runs on Nicenet's server and requires any web browser running on any platform and an Internet connection - there is no software to download and no server to configure. The ICA was intentionally designed as a low graphics environment to decrease the load time of each page. The queries used to fill the site with class-specific data take less than a second. A fully dynamic site, the ICA is customized at two different levels: 1) the user and 2) the class. Anyone can set up a class in minutes and allow others to join. Between the particularities that this platform has, is that the professor can create his own communication and allocate and without publicity gratuitously.

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For professors and teachers who are uncomfortable with allowing students the ability to add any link they want to the system or create a conferencing topic at their own discretion, Nicenet has included preferences that allow these abilities to be turned on and off at the professor's or teacher's discretion. Setting up a class on the ICA takes about 2 minutes. Professors speak of additional time and effort involved with online courses, but the work is no longer overwhelming and the effort is manageable. Students can go as deeply into an online class with links through ICA as they wish, often much farther than in a regular class environment. It is a time of opportunity for us all. ICA's e-mail link between teacher and student has the effect of changing the instructor-student relationship, putting it on a more personable and equal footing, an effect noted by many who teach over the Internet. One of the most important advantages that I have found for using ICA, however, is the ability of both instructor and students to post relevant links easily to the system. This ability is akin to giving every student in a class thousands of textbooks for a course. Whereas without this technology, an instructor is limited in the number of textbooks a student can reasonably have. The ICA is a low graphics environment and therefore loads pages quickly. Anyone can set up a class in minutes and allow others to join. Students create user accounts by selecting "join a class," then plugging in a unique class "key" given to them by their instructor. They then select their own usernames and passwords and complete their registration.

4 Conclusion

The results obtained in the subject Thermo-Fluids cannot be extensive for any other study, nevertheless can be generalized to populations similar to the defined ones in the methodology of this study. To measure the results that were found of the academic efficiency they fulfilled the following activities: a) individual participation, b) work in group and, c) written evaluation. The results that obtained when comparing variable the academic efficiency average (qualifications average) between the students of the Experimental Group (EG) and the Control Group (CG), visualize an increase in the student efficiency due to the application of the strategy applied when observing the averages of the qualifications final for EG and the CG as it is detailed in Table 2.

A difference of 1.01 points in the scale of 9 points in favor of EG was appraised. In the Table 2 it is observed that the best performance obtained the subjects of the GE with relation to GC. The average of the final note of the GE was of 6.05 points ($SD = .98$) in the scale of 9 points and the one of GC was of 5.04 points ($SD = .98$) in the same scale. This represented a difference of 1.01 points in relation to the final note, which constitutes an increase of 11.23% in the GE in relation to GC. This difference that turned out to be statistically significant ($p = .04$) favors to the GE, in addition, it observed differences
in the three partial activities of evaluation in favor of the GE with relation GC in its values averages. Table 2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>EG</th>
<th>CG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Part</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work in Group</td>
<td>3.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Written Test</td>
<td>3.4</td>
<td>7.3</td>
</tr>
<tr>
<td>Final Score</td>
<td>4.0</td>
<td>8.3</td>
</tr>
</tbody>
</table>

Note. \(X_{min}\) corresponds to the minimum points and \(X_{max}\) corresponds to the maximum points.

Meanwhile the average of the daily participation for GE turned out to be from 5.30 points (SD = 1.31) in the scale of 9 points and for GC of 2.53 points (SD = 1.10) in the scale of 9 points, which threw a difference of 2.77 points. This meant an increase of 30.78 %, the difference was statistically significant (\(p = .00\)) that favored to GE. In relation to variable the work in group, the qualification average was of 4.95 points (SD = 1.55) in the scale of 9 points in the GE with respect to 3.89 points (SD = .68) in the scale of 9 points obtained by GC, which threw a difference of 1.06 points. This represented an increase of 11.78 %, statistically significant difference (\(p = .00\)) that favored to GE. As far as the written test, the qualification was of 5.25 points (SD = .99) in the scale of 9 points for the GE and of 4.51 points (SD = .84) in the scale of 9 points for the GC, which threw a difference of .74 points. This represented an increase of 8.22 %, statistically no significant difference (\(p = .05\)) that favored to GE.

Based on the results of this presentation is to highlight the importance of this investigation. The results show that it is feasible and recommended the use of ICT and distance format to improve academic performance. This applies in the first instance, the performance of students of the subject Thermo-Fluids II of the university context and in second instance, the performance of students in this area that corresponds to Thermo-Fluids I and thermodynamics.

Because the students attending this subject presented in general, similar characteristics to those of students of GE, one could generalize, in third instance that the results apply to student achievement in the career of industrial engineering University framework. In the fourth instance, the results could be applied to the performance of students of different races from the university context, because the students of the university framework features equivalent to those of students of GE. This provides the possibility of repeating the effects of the experiment.

4.1 Challenges

Before embarking on the project a survey was conducted to establish student use of ICT. Figure 1 is a graphic representation of students’ use of ICT at the beginning of the course.

It is evident from Figure 1 that the majority of students had not used e-mail and Internet previously, and that they would require training. Unfamiliarity with the use of ICT and insufficient training remain two of the most commonly-stated reasons for the failure to implement ICT successfully in the classroom. This was difficult to implement because the institution does not have sufficient training laboratories that could be used for the purpose.

Fig.1

Computer literacy courses that are offered at the beginning of the year are usually over-subscribed, and many students cannot afford to attend them. Students had to be trained in small groups on a personal computer, which was not ideal. More proficient students also helped in training their peers.

To evaluate the results on the performance and perception of students Thermo-Fluids in the distance format, and establish consistency of the results found in this investigation, it is recommended to raise successive investigations similar to this work throughout the subject Thermo-Fluids. The focus of this work that embraces an entire semester would be the five units that make up this subject, evaluating the performance and perception of students on the procedure at the end of each unit. Finally, do a comparative study through analysis of repeated measurements, to realize the full impact of the method distance in the subject and
in turn, will collate the results reported in this investigation.

The recommendations as a result of development of this study should be taken into account for future research within the university framework. It will need further investigation, in order to identify all the variables that affect or may affect the motivation of the student. All this succeed in an asynchronous online course. The university framework should promote and divulge in greater strength, all references in the use of the Internet. Then there is bound to use and provide its services, preferably through this technological resource for the exchange of information and education. Based on the results achieved are invited to the university authorities to promote, support and recognize the contribution that generated those university teachers who incursions into the use of ICT for educational practice. To promote the dissemination of lessons to other teachers belonging to the kernel of knowledge Thermo-Fluids, in order to support this type of research that supports innovation and enhance the activity of university teaching. With regard to new applications in research activity, it is suggested, to extend this dissertation applied within the university framework. It proposes to use the same approach and same model of instructional method, to evaluate both the performance and perception, but from a different perspective. Whether, according to the analysis of the contents of the location of the subject per semester or the type of students who are pursuing careers as they are variables to take into account the use and approach to technology, as well as the attitude before it. Whereas the pilot is the same context in which widespread application of instructional format, which corresponds to the environment of the university where the author works, it is recommended to implement the new format as an instructional method of instruction at the university framework. Initially, those courses aimed at teaching-learning process of Thermo-Fluids and progressively in the course of the careers of Industrial, Mechanical and Environmental Engineering.

It was subsequently recommended to apply the methodology in other courses of different careers university framework, in order to replicate the results achieved in this investigation. The most important result is improved academic performance of their students. This means helping to improve: a) skills, b) academics index, c) the academic performance, and d) the rate of graduates. It could also reduce achieve: a) the number of condemned b) the number of desertions, c) the time spent in the institution. The best way to promote the use of ICTs is the institution that brings them within their teaching plan. Its use will enable students to meet the technological and intellectual challenges of the new millennium. The findings so far analyzed indicated that the use of information technology and communications significantly influence the methodology of the study. It showed that provide the student with the necessary tools to access the learning Thermo-Fluids at their own pace, were new elements of motivation for learning.

References: