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Implementation of the M@IVES Website in Postgraduate Education

Abstract

M@IVES research addresses the trajectory of Brazilian graduate students and their attitude to the development of educational technology through a pretest-posttest quasi-experimental process with experimental and control groups. It has included the design methodology of research since the establishment of the problem posed by the institutions of graduate work in guidance to course work. It analyzes data gathered in the field of research and in light of Brazilian reality. It enhances the development of a new teaching methodology, supported by educational technology – M@ IVES – for research specialization courses Education Area offered in the city of São Luís. It demonstrates, by building Site M@IVES and study developed, the limits and educational opportunities offered by the new methodology presented.

Keywords: *postgraduate studies, educational technology, teaching methodology, multimedia*

Introduction

Over the last few years Brazilian universities have been facing a sharp growth of mass education. This phenomenon has negatively influenced specialization courses and has caused a significant increase in the number of students per counselor. In order to find a response to the problem outside the political arena, a solution was suggested from the area of pedagogy, with the use of new teaching methodology and supported by virtual technologies.

The purpose of the investigation was analysis of the Methodology of Postgraduate Education supported by Educational Technology in order to solve problems that arise during the orientation stage of final course projects in Brazil. The investigation is centered around three main areas, where different plans of action are considered (Amador y Dorado, 2006) to address the objective: the area of scientific investigation methodology, the area of web design in the framework of educational technology and finally, the area of the educational process – learning through virtual models (Ballesteros et al., 2010). In this paper we present the most relevant conclusions of the research conducted on two groups (experimental and control) and a pretest-posttest, with the new methodology in postgraduate education utilized with one of the groups.

In terms of the area of methodology in scientific investigation, numerous studies can be found (Rusavin, 1990; Baptista, Fernández y Hernández, 2003) showing a tendency towards quantitative investigation – methodology, hypothesis, variables, tables, graphs and epistemological models of investigation. Recently, however, new models of a more qualitative nature have been observed, as in the case of the studies by Fazenda (2002).

An adaptation of the model proposed by *Area (2005)* was decided upon during the creation of *M@IVES* in reference to the construction and use of websites in university teaching. Building on line of multimedia work, a website has been worked upon, with important advances made, particularly related to the graphical layout in sequential forms of icons and the adaptation of the website to Brazilian reality (Nó, 2005).

For Area (2005), various means of information technology represent the combination of what is referred to as new technologies, which are characterized by developing, using and combining indistinctly any modality of symbolic codification of information. The most salient point of the study is the historical recovery of the project of Gros (1987), in reference to the evolution of computer programs, the procedures of learning and the design of software and its application in education (Area, 2005).

On the other hand, it is important to note that the large investment made in universities to train professors in the field of technology in educational practice has not managed to fill in large gaps in training among professors. In general, training continues to be deficient, and not just in the handling of technology or devices, but more fundamentally in their didactic or educational use (Ballesteros et al., 2010).

The main innovations in postgraduate education that the internet makes possible are related to the possibility of allowing students who for any reason can-

not attend classes in person to enroll in academic studies. The instruction gains dynamism since the knowledge is constructed from different sources, selected and mediated by students and teachers. A temporal discontinuity is allowed among the individuals involved in the process of teaching and learning through the internet; the physical limits of the university are extrapolated, favoring both internationalization and study promoted and mediated by the internet, giving students more autonomy (Area, 2005).

In regard to the teaching-learning process through virtual models, the most significant advances in this area come from the perspective of the teacher, in its application in courses of the investigative component of the curriculum in a postgraduate degree in education (Salinas, 2008). This allows courses such as Methodology of Scientific Investigation, Introduction to Pedagogical Investigation, Investigative Methods and Skills and Workshops I and II to focus on the development of the Final Course Project (*TCC).*

*A*s designed, the website will allow for the development of activities that assess student autonomy, establish resources banks, make it possible to resolve doubts in real time, or not in real time, break the traditional models of education that are constrained by the geographical space of the university, allow virtual interaction (chat, forums, email, etc.) bringing us closer to face-to-face models of virtual education (Casas y Stojanovic, 2013).

In reference to the construction of the M@IVES website, the proposal that was developed is similar to the extensive work of important authors in similar fields: Proença (1990), Area (2002), Cano (2001), Salinas (2005) y Ortiz (2011). Thus, the M@IVES is grouped with the programs of Computer-Assisted Education and, more precisely, the programs of demonstration (Cano, 2001), given its character of education personalized to the real needs of each pupil in the developmental phase of the TCC and, in some cases, those of simulation.

The theoretical basis that supports M@IVES is, in the perspective of the levels established by Area (2005), between level III of blended courses and level IV of Virtual Education. The nature of M@IVES is that of training with pedagogical simulations, didactic materials, review activities, teaching programs and other elements.

The activities of Project M@IVES address the concepts of Amador and Dorado (2006) in terms of the evaluation phases of the diagnosis of training needs, the concept of the technological model to develop the psycho-pedagogical guidelines that support the creation of the M@IVES website, the analysis of both the viability and social impact, the supervision of the design process and the production and evaluation of the technological model.

From the approaches described and analysis of problems experienced in departments of postgraduate studies in education in *Institutions of Higher Education (IES),* the following research problem was settled upon: Does educational technology improve the orientation phase of Final Course Projects (*TCC)* in the postgraduate courses in the field of education?

Based on the aspects that were analyzed, the general aim of our study consisted of designing and applying a new methodology of instruction supported by educational technology for the TCC stage of postgraduate courses. Along these lines, the specific aims are: (1) to analyze the theoretical basis of the postgraduate courses of study supported by virtual models in Brazil; (2) to design the M@IVES website on the methodology of higher education; (3) to implement the new methodology of education with the M@IVES website at the *Instituto de Enseñanza Superior Franciscano (IESF).* To reach the general aim, we suggest a hypothesis that postgraduate students exposed to the educational actions supported by the M@IVES website present better epistemological foundation in the production of Final Course Projects (TCC) than those within the traditional system.

Research Methodology

Procedure

The investigation can be characterized, on the one hand, as a document study and on the other hand as a semi-experimental pretest-posttest with experimental and control groups. The study consists of the comparison of two methods of postgraduate education: the traditional methodology and the new methodology supported by educational technology.

A multivariate study has been outlined, which establishes two independent variables (systemization of the set of operations of monographic orientation (x), technological – educational web applications (y)) and four dependent variables (command of creation of the theoretical foundations (a), command of the methods and skills of scientific investigation (b), command of the standards of the development of the TCC (c), speed in completing the TCC (d)). Once the variables were defined in their conceptual definition, working definition, markers and scale, the presentation of a codebook and its matrix was necessary in order to show the principal theoretical and/or practical elements of every variable, as a guide to the data collection tools used with the subjects of the investigation.

Sampling

The taxonomy of Gresller (2003) was chosen for the definition of the sampling, selecting a random-probability sampling type among professors, students and alumni of the Institutos de Educación Superior (IES), which offers postgraduate courses in Ciudad de San Luis (Brazil). The size of the sample was defined in accordance with the formula proposed by Labes (1998) for the phase of diagnosis, the invited Institutions were: FAMA, IESF, FSF, UNICEUMA, FACAM–MA, UFMA and UEMA, with the resulting sample consisting of 66 teachers, 196 students and 284 alumni, with a margin of reliability of 95%, out of a total study population of 79 teachers, 382 students and 973 alumni.

The sampling of the students in the semi-experimental study in the Instituto de Educación Superior Franciscano (IESF), in the phase of application of the methodology of education, answered to intentional and not probabilistic selection, due fundamentally to the accessibility of the group composed by 42 students, divided into two subgroups, the experimental and control group, the students signed up in a voluntary way, according to their knowledge of information technology, so two subgroups of 21 students were formed.

Instruments

A diagnosis questionnaire of the data collection tools was applied to the selected sample in order to analyze the principal difficulties of the teachers in the work of TCC's orientation. In the case of the students and alumni the purpose was to detect the control of methods and necessary skills to elaborate the TCC. The questionnaire is composed of 12 items in order to determine its reliability and validity by means of the coefficient of Cronbach's internal consistency (. 90) and reliability (. 93) across the test retest.

A Likert-type scale was developed to apply to the control and experimental groups of the IESF at different moments of the research: a) Pre-test, b) a test before the experiment c) a test during the experiment (even with the control group) and d) a post-experimental test) and to the specialized teachers of the Methodology of the Investigation groups. The scale is composed of 22 items with the validity obtained by Cronbach's coefficient (.89) and the reliability of the test-retest of 0.92. The fundamental aim of the scale was to check the independent variable (y) of the technological-educational website applied.

For document analysis, an information sheet of document observation composed of 22 items was developed, which was designed to identify existing

foundations as to gather information that had already been disseminated as the normalization of monographic work, the development of ongoing projects and investigations, the methodology of the scientific work, didactics of higher education and multimedia technology.

Research Results

Firstly, the testing of the variables and the hypothesis are presented, collecting the values of each variable yielded by the research tools and then each of the items that these tools contain. This allows for a contrast with the proposed hypothesis to be seen. Next, we present the results obtained in the development of the epistemological foundations related to the investigation, the construction of the M@IVES website, and finish with the new teaching methodology based on the M@IVES website and the results obtained in the pretest-posttest performed on the experimental and control groups at the *IESF*.

Table 1. Values for tabulation and calculation of reliability variable (a). (Prepared by authors)

Item	Correct answer		Incorrect answer
Concept FT	Value 1		Value 0
Function FT	Value 1		Value 0
Relevance FT	Value 1		Value 0
Item 4	< 2 Classics	From 2 to 4 Classics	> 4 Classics
Use of classics	20	10	20
Item 5	50% (Equal to or less than 5 years)		50% (more than 5 years)
Update of the theoretical Foundation	10		20
Item 6	Coherent + 70%		Coherent – 70%
Coherence of the FT	10		20
Item 7	Less than or equal to 1		More than 1
Use of non-specialized dictionaries	10		20
Item 8	Less than 2		More than or equal to 2
Inappropriate sources	20		10
Item 9	More than 8 references		Equal to or less than 8 references

Item	Correct answer		Incorrect answer
Excessive reference to theory	10		20
Item 10	More than 50% (text)	Between 50% and 20% (text)	Less than 20% (text)
Excessive use of citations	10	20	10

The following table gives detailed responses given by the students in the control group (1 to 3) and the analysis of finished *TCCs* (4-10) relative to variable "a." The analysis of the behavior of the variable as well as the relationship between the results of the experimental group and the control group are shown, with an observed improvement of over 80% in the experimental group, which shows that the variable is true.

Table 2. Model for variable testing, Theoretical and Practical dimension (a). (Prepared by authors)

Items	Group	Average percentage of correct answers	Result
1 to 10	Experimental group	91	True variable
1 to 10	Control group	68	False variable
Conditions = or > 80% True variable < 80% False variable			

Next, a transposition of the average value achieved by the experimental group and the control group was conducted. This can be observed in the following table, according to the predetermined condition that variable "b" be considered a correct answer on obtaining a value over 80%.

Table 3. Test of Theoretical and Practical dimension of variable (b). (Prepared by authors)

Items	Group	Average percentage of correct answers	Result
1 to 20	Experimental group	86.4	True variable
1 to 20	Control group	58.8	
Condition = or > 80% True variable < 80% False variable			

Additionally, a transposition of the average value achieved by the experimental group and by the control group was performed. In the following table, based on the predetermined condition, variable "c" was confirmed as true, as the median percentages obtained by the experimental group was averaged at over 80%.

Table 4. Test of the variable theoretical and practical dimension (c). (Own elaboration)

Items	Group	Average percentage of correct answers	Result
1 to 20	Experimental group	86	True variable
1 to 20	Control group	67	
Condition = or > 80% True variable < 80% False variable			

Subsequently, we contrasted variable "d," as shown in the following table, observing changes in the variable in relation to the experimental and control groups. These changes allow for the statement that the Final Course Projects of the experimental group, which were completed in less time, were superior to those of the control group. Therefore the variable is true.

Table 5. Contrast of the variable (d). (Prepared by authors)

Group	Average time	Average mark of TCC	Result
Experimental	262	9.0	Superior
	295	8.4	Inferior

Table 6. Synthesis of the results of the tests of variables. (Prepared by authors)

Variables	Experimental G.	Control G.	Result
x	94.5	69.2	Exp. G > Control G. (+) result
y	810	No difference	Internal contrast teachers and students (+) result (Scale from 0 to 1000)
a	91	68	Exp. G > Control G. (+) result
b	86.4	58.8	Exp. G > Control G. (+) result
c	86	67	Exp. G > Control G. (+) result
d	262	295	Exp. G< Control G. (+) result

Following the application of M@IVES, the median of the answers from the experimental group was 89.4, with a standard deviation of 11.82, and from the control group 65.8, with a standard deviation of 14.21. Comparing both groups by means of an ANOVA analysis, there were statistically significant differences ($p<0.0001$).

In the study, we wanted to find out if statistically significant differences between the object of the study groups really exist at the moments of the pretest and the posttest. In the first place, Leve's Test was realized to analyze the possible existence of differences in the variance of the experimental and control groups. In the pretest of the experimental group, $p = 0.057$ and in the control group, $p = 0.595$, in both cases $p > 0.01$. In the posttest of the experimental group, $p = 0.268$ and of the control group, $p = 0.105$, also $p> 0.01$, for which there are no significant differences in the homogeneity of the variance. In this way, both the control group and the experimental group can be considered homogeneous.

The test for the independent variable X, of a practical and theoretical character, was designed in order to obtain the perceptions of the students about the teaching methodology applied in the experimental and control groups in relation to the instruction and workshops on the Final Course Project in the didactics of higher education course at the IESF.

Regarding variable Y, the test was not given to the control group, as the students were not exposed to instruction through the M@IVES website. In terms of the students of the experimental group, the test can be considered satisfactory.

Additionally, the tests performed with dependent variables a, b, c and d were positive, confirming the suggested hypothesis in this study.

It should also be emphasized that the description of the methods of study, the presentation of the reliability of the sample based on a defined population, as well as the test related to the reliability and validity of the data collection methods, with rigorous control of the common sources of mistakes in the experimentation, all contribute in a significant way to the results of this study.

As for the study of the methodology of education applied, we kept to the methodology that would be applied in the experiment in terms of instruction and workshops related to the investigation of the postgraduate course in didactics of higher education at the IESF, with the main objective of improving the quality of orientation in the *TCC*. The following courses of action stand out: a) development of new plans and programs for fields of study, b) adaptation of the curriculum from a multidisciplinary point of view, c) specification of the methods and skills to be applied, with special value placed on practical research, d) presentation of the final design of the teaching methodology, from diagnosis,

in reference to the aims, content, skills, capabilities, references, timelines and other elements.

All the variables obtained results of over 80%, much higher than the results obtained by the control group and quite significant in relation to the information collected in the diagnostic study. The improvements shown in the study of the variables and the experiences of the students exposed to epistemological educational activities based on the website demonstrate a better epistemological foundation in the development of the *TCC*.

Conclusions

In conclusion, we can affirm that the students exposed to the epistemological and educational actions, in the form of *Systemization of the set of operations of monographic orientation* – (variable x), supported by the technological-educational *M@IVES* website – *(variable Y),* demonstrate a better epistemological foundation in the development of the *TCC*, with this premise being demonstrated by control of the construction of the theoretical foundations *(variable a);* control of the methods and skills of scientific investigation *(variable b);* control of the procedure for the development of the *TCC (variable c);* and the speed in completing the *TCC (variable d).*

In sum, the study presents the following significant advances: from the theoretical point of view its principal contribution resides in presenting a plan of action for postgraduate education aimed at the orientation and development of a *TCC* in the specialized courses. From the methodological point of view, the study represents an advancement in the conception of an innovative methodology of teaching and learning by means of educational technology.

In reference to the tools of the M@IVES website, the forum and the chat, they suppose a differential for the methodology of education, considering its potentials of exchange of experiences, orientations and training for every work of conclusions of developed course.

The study tries to open the way for another more general study that involves other Brazilian Institutions and that confirms the findings exposed with a methodology and a web support relied on the educational Technology similar to the exposed ones. It is considered necessary to continue research, going into detail about each of the components of the M@IVES website, adapting it to the new legislation both at the European level and international level.

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