

## UN MATERIAL AUDIOVISUAL DIDÁCTICO PARA LA ENSEÑANZA DE LA ESTADÍSTICA

### AN AUDIOVISUAL MATERIAL FOR THE TEACHING OF THE STATISTICS

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*El diseño y desarrollo de un material audiovisual didáctico permite en los docentes cumplir entre muchas funciones la de convertirse en productor de medios y materiales de enseñanza adaptados al contexto en el cual labora de manera tal que establece nuevos ambientes de aprendizajes. El objetivo de este estudio fue el diseño, desarrollo y evaluación de un material didáctico para la enseñanza y aprendizaje de la unidad didáctica: naturaleza de la estadística. Una investigación del tipo mixta (cualitativa y cuantitativa). En la opinión de los tres sectores involucrados a nivel visual y auditivo facilita rápidamente la comprensión del tema.*

*Palabras claves: nuevas tecnologías, medios audiovisuales, enseñanza-aprendizaje*

*The design and development of an educational audiovisual material allows teachers carry out many functions like to become a producer of media and teaching materials adapted to the context in which works in such manner that establishes new environments of learning. The objective of this study is the design, development and evaluation of a teaching material for teaching and learning structural unit: and nature of statistics. An investigation of the mixed type: qualitative and quantitative. According to the opinion of the three sectors involved visually and auditory for giving quickly facilitates to the subject understanding.*

*Keywords: new technologies, means audiovisuals, teaching -learning*

## 1. Introduction.

The present work is the results of a study of case made in the faculty of Economic and Social Sciences of the University of Carabobo, Aragua Nucleus in Venezuela. The experience began from the following question about the opinion have the statistics teachers, the students of statistical program and the specialists in technology, in relation to the design and production of a didactic audio-visual material for the unit of education-learning unit *Nature of the statistic* ?.

We must indicate that education in the mathematical area of and the statistical, is characterized in some institutions of superior education in Venezuela by the ability of the professor, the text book, the pencil, the paper and the slate, where the professor is the only transmitter of information. For this cause, our study is important for several reasons, in which we emphasized the necessity to use a design and use of audio-visual means of didactic ways, stimulation and agreed to the real context, so that may contributes to facilitate the significant understanding of the contents study objects. Other reason is the interest of the descriptive character that the University of Carabobo (Venezuela), has to implement new audio-visual material useful to support teaching, which the university also is interested. Besides it, to open a perspective in which the necessity is contemplated in exploring how these materials affect the processes of education-learning in general and individual, in the teaching of the Statistic.

In order to initiate and to give answer to the previous question, came itself to a documentary revision in relation to the use of didactic means in teaching (Marqués, 2001; Calvo, 2003; Bravo, 2004; Cabero, 2004, 2007;

Bartolomé, 2008; Espinosa & Abatte, 2008; Marín, 2008) where in all of them its importance like didactic resource of support to teaching is shown. We lived in a society in constant transformation, where the socioeconomic changes cause new educative challenges in relation to the didactic strategies to use. At the present time, we can emphasize among the facts and events most important developed in our society, in several aspects: the mass media diversity and information, the implantation of liberal democratic regimes, the progressive egalitarian advances that are developed in an attempt to be surpassing old and traditional divisions, the rupture of physical, economic, psychological and cultural spaces denominated globalization and the development and involution of the technologies (Cabero, 2001). Times where authors as Guarro (2005) denominates society of the information, society of the knowledge, society of the learning, society of network or networks, economy of the information to talk about the same phenomenon. Among the characteristics of this period and its exigencies for the educative institutions we found the use of the technologies of the information and the communication (TIC) in contexts of learning characterized by the concept to learn to learn (Cabero, 2007; Marín, 2008). Between the characteristics of this period and its exigencies for the educative institutions are the use of the technologies of the information and the communication (TIC). In that same order of ideas, authors as the Fernández Batanero and Roman Graván (2010) emphasize the opportunities that offer the present world in relation to the supports and digital resources (tapes betamax or VHS, D-ROM, DVD, electronic agendas, Internet digital video) to create spaces where educational students and can interchange ideas.

Unfortunately, still many professors exist who use the same methodology for the transmission of the contents that for 50 years. Additionally at the present time, in the education process learning it is important to obtain a change of conduct or competitions in the student, reason why the educator in its functions of facilitator, orientation and investigating it will have to create motivating and significant environments of learning (Espinoza García & Fernández Batanero, 2011).

## 2. Design and Methodology.

The general objective of this study has been to design, to construct and to evaluate a didactic audio-visual material for the education-learning of the didactic unit "Nature of the statistic", in the program of statistical in order to obtain this general mission hearing the opinion of teaching expert content, specialists in technology was considered and students in the program of statistical one.

### 2.1 Design and development of the educative resource.

In the design of the didactic audio-visual material, authors like (Galán, 2006; Salinas, 2007; Fernández Batanero et al., 2010; Espinoza García et al., 2011), agreed the importance of the organization of all the contents of the material, structuring based on one subject, where the final quality of the product will come determined by the decisions made in this phase.

Regarding to this audio-visual material, two stages were considered: one first stage of planning and second of accomplishment. In the planning the following strategies were used: elaboration of a didactic plan and

elaboration of a production plan. The didactic plan talks about the selection of means to use and elaboration of the three scripts (of content, didactic and technical). Among the reasons considered to develop a design of the audio-visual material are the following ones:

- The necessity to incorporate in the process of education-learning the new technologies in these the audio-visual means. In this aspect, the educational ones assigned to the department of statistic of mathematical, and technical quantitative of the Faculty of Economic and Social Sciences of the University of Carabobo Aragua Nucleus collaborated and gave their opinion to the present study.

- Among audio-visual means (cinema, video, television and multimedia) at this moment a characteristic is the diminution of the cost of equipment and material to use.

- The audio-visual means, like didactic resource, wake up social interest without concerning their format (tapes betamax or VHS, D-ROM, DVD) being able to be used in any level (Romero, 2002).

- The verbal images, music and explanations, as well as the rate of the sequences, meticulously is selected in agreement with the characteristics of the students to whom it has been des. Also in this society of the information, the digitalization has introduced a radical change in all means having allowed very high video and standards audio and a quality of sound and very high image. (Marques, 2001; Fernández Batanero and Roman Gramán, 2010).

In reference to the three types of elaborated scripts to say that in the content script the programmatic content appears of the most schematic form possible to communicate to the receiver. The developed didactic unit was

“Nature of the statistic” and the developed content “Handling of statistical basic terms”, being the involved sub subjects the following ones:

- Importance of the statistic in the area of the administration and public accountant’s office

- Basic terms: Phenomenon, experiment, event, data, attribute, variable, universe, population, show, parameters, statistical

- Scales of measurement.

The didactic script: it shows the developed content totally, constituting the phase first of the instructive design (Saline, 2007). In him the following aspects are described: identification of the content on which it treats the material, boundary of the hearing (conducts of entrances and characteristics of the students), identification of the skill to use and equipment available, general missions and specific and the feedback. Other authors like Fernandez Batanero et al. (2010) they distinguish the stage of screenwriting, denominated like of concretion of the product, being this one key a phase in the process of production of a didactic resource. In this sense, the didactic script corresponds, in the authors before mentioned, to the script of contents which includes the totality of the information to transmit. Next a part of the didactic script of the elaborated material is specified:

Didactic audio-visual material referred the nature of the statistic.

Subject: Nature of the statistic.

Objective general:

When culminating the following didactic unit, the students will acquire abilities and skills as far as the handling of statistical basic terms.

Objectives specifics:

- To describe to the importance of the statistic in the area of the administration and

public accountant’s office.

- Conceptualize: Phenomenon, experiment, event, data, attribute, variable, universe, population, show, parameters, Statistical.

- To distinguish the Scales of measurement.

- To create and to solve problems with data used in the daily life

Place: Hall classes assigned by study control of the Faculty of Economic and Social Sciences Aragua Nucleus.

Materials: equipment of video projection, laptop, screen. Television set of twenty one inches

Hearing to who is sent: students who attend the fourth semester of the Chair of Statistic I, School of Business Administration and Public Accountant’s in the Faculty of Economic and Social Sciences, Aragua nucleus.

Respect to the Didactics in the statistic area we must say that there are no specific theories on the learning and for that reason, it is necessary to approach the next area and to analyze the recent tendencies on the education in mathematical subject (Batanero, 2001). In the area of mathematics there are antagonistic positions of the authors as far as how to teach this subject and similarly it happens in the statistical matter. The area of mathematic there are diverse positions of the authors as far as how to teach this subject and of a similar way happens in the statistical matter. In this sense, Gómez (1999) describes three fundamental lines: epistemological (what class of mathematics we want the children learn), the psychological one (how we think that it is learned) and the methodological one (how one is due to teach or how to take ahead education). The position of the authors of this investigation tends towards an education based on situations of the daily life, a university student faced in the statistical subject real data, specific examples which can

be created in the himself context of in the class the atmosphere includes articles of the daily press, in order to give real examples of real life. It is not only the projection of means, but also the interchange of ideas to share in the classroom. In the student it works as a initial conduct to be evaluated, the didactic resource is used and its final performance is verified.

The technical script in addition to the previous aspects includes/understands considerations relative to the accomplishment of the material. Of a simple way the technical script was presented/displayed in two columns, one where the image appears and in the other column the content of audio. Fernández Batanero et al. (2010) they denominate to the technical script like literary script enriched with all class of necessary indications for the running and the scene: types of planes, movements of camera, angularities etc. According to the production plan, it was developed attending to authors like Cabero (2007) and Salinas (2007) who indicate the necessity to stick to a plan and to temporize the development process. To carry out a plan of the design process, development, application and evaluation allows to the designer to take knowledge from the necessary resources, the precise time for the accomplishment of the process and the budget, very specially the economic one. For the elaboration of our didactic material, from its design to its evaluation, a period of time of eight months was used. The accomplishment or the development of the didactic audio-visual material: it is the part of construction of the material in itself, since it constitutes the development of the product, where determines the content, extension, aspect and methodology of the material, as well as the possible results. In that same order of ideas, in the edition of a didactic audio-visual material

it is possible to be used from domestic materials and the new edition systems nonlinear, through computer science software I specify at nonprofessional level like: Adobe, Premier, Alead Media and Studio Pinnacle (Cabero, 2007). The designed didactic resource in this investigation used an edition to a nonlinear computer science software Studio Pinnacle version ninth. The followed process was the following one:

- Capture: in the first place the video in the hard disk of the PC is due to record

- To publish: later it is placed the scenes of the video in the wished order and the scene is eliminated that is not wished. It is possible to be made visual effects with transitions, titles, graphs as well as effects of sound and background music.

- Accomplishment of the video, in which three months were used.

## **2.2 Questionnaire elaboration for the evaluation of the didactic audio-visual material.**

The decision which was more compromised, because it determined all the early process, was the election of the methodology that logically was justified based on the context which we wanted to investigate. Due to the particularities of ourselves, we considered the option of a qualitative and quantitative methodology pertinent. In this study the technique used for the information collection was questionnaire, being used one applied in other referred investigations to audio-visual means mainly in the didactic video. The instrument selected for such aim was the elaborated one by Marques (2001), for the evaluation of videos. This instrument was selected by ten university professors considering the context in which it was going

away to use and the validity of content. The instrument consisted on the following dimensions:

- Functional aspects and utility
- Technical, aesthetic and expressive aspects
- Pedagogic aspects
- Opened questions
- Dimensions and categories.
- Global assessment

The instrument consists of open questions and closed questions. As far as the opened questions, its intention was to deepen the opinion of the students, educational and specialist in technology as far as the use, in the educative surroundings, of the educative resource of way to generate the greater possible information on the contributions and limitations of the didactic audio-visual material.

### **2.3 Didactic audio-visual evaluation of material.**

The function of evaluation of didactic means is diverse, from improvements of technical and aesthetic aspects, adjustment of the material to the characteristics of the receivers, design and redesign of produced means, all this with the purpose of making better decisions in future situations (Prendes, 2007; Fernandez Batanero et al. 2010). In this investigation the audio-visual material in a preliminary version and a definitive version was evaluated. In the first version it was considered:

- The evaluation of the production equipment
- Evaluation of experts in content
- The expert in technology
- Student

The production equipment was conformed by a lawyer in education mathematical mention

to masters in education and a lawyer in administration specialized in graphical design.

The instrument of Marques (2001) was applied to the experts in technology, experts in content and students of the University of Carabobo, Faculty of Economic and Social Sciences of the University of Carabobo of the Aragua Nucleus.

In the selection of experts, the specialists in technology like the educational ones in content, he was intentional. In an intentional sampling their point intention is to select relevant information for a study in depth and in the sample the variables sex, age, socioeconomic level are represented of the best way (Martinez, 2006; Rojas, 2007).

Also, the criteria of the selected experts the following ones were considered: expert in the selected area, availability in the suitable time to make the evaluation and disposition to participate in the study. For the first version and second version of the didactic material five experts participated in content. For the first version and second version of the didactic material five experts participated in content. These experts are assigned to the chair of statistic, mathematical, statistical the department of and technical quantitative of the Faculty of Economic and Social Sciences of the University of Carabobo of the Aragua Nucleus integrated by engineers, professors and some with postgraduate and doctorate. In relation to the experts in technology they were three experts with specialty in technology of the education and postgraduate in education of the University of Carabobo. With regard to the pupils, the selection of the sample was intentional and it worked with the sections assigned by the chair. Between the characteristic presents in the participant subjects it is possible to be mentioned: in the first place to be student of statistical subject I

and a second aspect its disposition for the evaluation of the didactic audio-visual material once looked. The participant students were 55 in the first and second version of the didactic audio-visual material. Once made the application of the instrument and read the opinions of the participants, in the first version of didactic means, the producing equipment came to make the adjustments and corrections of the didactic audio-visual material. The second version contained the verbal modifications as far as the size of the letter, colour, sound, expressions and sequence of the images.

### 3. Results.

Next one appears some of the results in the functional aspects and of utility:

As far as the educational experts in content:

In Table 1, a 60% of the experts surveyed in content tend towards the high alternative, 20% to the excellent option and correct one, the didactic audio-visual material for the experts in educational content interviewed acts like a facilitator of the profit of the objectives. Thus in the second question, an 80 % of the surveyed ones tend towards the high alternative, and a 20% towards the correct alternative, are observed a representative average, therefore in the didactic resource the objectives clearly are defined. With respect to the experts in technology:

In Table 2, the 100% of the experts in technology expressed that the video acts like facilitator of the profit of the objectives and in

Items	Excellent		Tall		Correct		Small		X	S	CV
	f	%	f	%	f	%	f	%			
1. Audio-visual material acts like a facilitator of the profit of the objectives	1	20	3	60	1	20	0	0	3	0,7	23,33
2. In the audio-visual material the objectives clearly are described	0	0	4	80	1	20	0	0	2,8	0,4	15,7

Table 1. Utility and frequencies, percentage, averages, deviation and coefficient of variation of the answers of the educational experts in content in the functional aspects

Items	Excellent		Tall		Correct		Small		X	S	CV
	f	%	f	%	f	%	f	%			
1. Audio-visual material acts like a facilitator of the profit of the objectives	3	100	0	0	0	0	0	0	4	0	0
2. In the audio-visual material the objectives clearly are described	3	100	0	0	0	0	0	0	4	0	0

Table 2. Frequency allocation, percentage and averages of the answers of the experts in technology in the functional aspects and of utility

Items	Excellent		Tall		Correct		Small		$\bar{X}$	S	Cv
	f	%	f	%	f	%	f	%			
1. Audio-visual material acts its as, facilitates the profit of the objectives	20	35	28	51	7	13	0	0	3,23	0,66	20,43
2. In the audio-visual material the objectives clearly are described	28	51	22	40	5	9	0	0	3,42	0,65	19,23

Table 3. Utility and frequency allocation and percentage of the answers of the students in the functional aspects

the video the objectives clearly are defined. According to the students:

We observed the Table 3 of the averages and the items of the instrument in the functional aspects and of applied utility the students, 51% of the students tend to the high alternative, a 35% to the excellent option and 13% to the correct alternative, the average of item 1 are of 3.23 and its coefficient of variation of 20.43%, this indicates the favourable tendency of the participants and in where the didactic audio-visual material facilitates the profit of the objectives. In item 2; 51% of the students tend to the excellent alternative, 40% to high option and 9% to the correct alternative, the average is of 3.42 points and the coefficient of variation is of 19.23%, therefore there is a tendency of the students to the high alternative, therefore, in the didactic audio-visual material the objectives clearly are described.

In relation to the open questions we will express the results of those more relevant aspects. Thus, in relation to the *efficiency and advantages with other means* the educational experts in content, thought that this audio-

visual means are didactic, the content is quite dynamic with this instructional, useful resource like average line of vision and with good quality of audio, at the same time he facilitates a greater fast in the understanding of the subject on the part of the students. The experts in technology emphasized of positive form the didactic aspect of audio-visual means, the dynamics of the content, and the importance like aid to the students with problems of understanding in the programmatic content. The students emphasized didactic, attractive, stimulator, the stimulator thing of the interest, and their great efficiency like didactic resource. Is visualized, is learned and the subject is included/ understood better, improves the learning and reaffirms the knowledge.

In the category *problems and disadvantages*, professors ones showed the preoccupation of the lack of audio-visual equipment in the department, considered to include a greater number of contents laminate, necessity of additional material to reinforce the treated subject and that the environmental conditions must be optimal for the good use



of means. As far as the experts in technology, they recommended not to be repetitive in certain expressions, to include a greater number of content laminate, the sound distorts some presentations and the laminate of formulas suggest more colourful. The students thought that is better to improve the audio, the high illumination of the audio one, to correct the description of the content. Also, they showed that the audio-visual material at a certain moment goes very fast and in very slow other.

In the section to *emphasize* to say that a effort worthy to recognize, to improve the education process, was one of the expressions of the educational ones, the content is enough complete in relation to the time of development, good booster of education and dynamic, visual and auditory means audio-visual. The experts in technology mentioned that the material has excellent sound and narration, the content is enough complete in relation to the time of development, the presentation has good frequency and this good elaborated for the pupils, dynamic, didactic, good elaborated for the pupils, dynamic, didactic, good initiative. With respect to the students, they emphasized that the material is stimulator, original, sure didactic and comprehensible. It reinforces the knowledge, high quality and excellent clear presentation and needs.

Second (final) version of educational audiovisual material:

As regards the category *efficiency and benefits with other media*, teachers identifies it as an educational audiovisual means which allows you to display no obvious aspects with other instructional resources, supplemented by the teaching of statistics and allows students access to the information of a precise and fast way. The Technology experts

distinguish the use of audio and visual media at the same time in the teaching of statistics, also how allows students access to the information in a fast way and the content is presented in a very organized and hierarchical manner. The students pointed out that this audiovisual media is educational, dynamic, illustrative different, unusual and modern. It gives plenty of information in a short time. Learning is a good resource of education to introduce the history and evolution of the statistics, easy perception and understanding, quick understanding of the topic. In the category “problems and disadvantages” are as follows: external factors, such as electrical fault would not allow the use of the computer, also is given to know how this material difficult the dialogue while its presentation lasts, the environmental conditions must be optimal for good use of the medium, are appreciations of some teachers. The Technology experts suggested not leaving images of accidents long time. It should not be prolonged screenshots of clash of cars were observations of students, in the same way, the classroom is not designed for the use of this resource that distorts the voice sometimes and incorporate more prints texts are opinions of the students.

The Technology experts noted that this audiovisual media has excellent sound and narration, the presentation has good frequency and well prepared for the students, is also important to complement this audiovisual medium with an annex material to reinforce the theme and is an inspiring contribution to the teaching-learning process. A good resource for teaching drew students, thus also audio-visual materials and the discussion is good, a good idea to translate knowledge and aid to creativity.

Global evaluation: In the first and second

version students and teachers demonstrated a tendency towards the very well alternative; the experts in technology were that the didactic audiovisual materials are excellent.

#### 4. Discussion.

The obtained results is demonstrated the advantages and limitations of audiovisual material, expressed in the general form by Cabero (2001, 2007), Marín (2008), Fernández Batanero et al. (2010) like stimulator, booster of learning, the program can be observed an indefinite number of times, can be used in a diversity of functions and individual in the use of didactic means for the education of the didactic unit *Nature of the statistics*, in where the developed content is quite theoretical in this first unit of the statistical subject I of the studies of Public Accountant's office and Commercial Administration of the Faculty of Economics and social of the University of Carabobo Aragua Nucleus. According to the opinions of the educational experts in content, it allows to visualize non evident theoretical aspects in the technique of skilful lesson. It complements the education of statistics in a didactic way and allows in the students the access to the information of a fast form and needs as far as the handling of statistical basic terms, which is the objective of this first unit. The students as far as education and learning emphasize that the use of the didactic audiovisual material for the didactic unit before mentioned allowed the fast understanding them of the subject for being didactic, dynamic, informative different and nondaily modern. And he gives good amount of information in just a short time and the experts technology interviewed showed that it is an additional material to reinforce the subject and is a stimulator contribution to the process of

teaching and learning of the didactic unit before mentioned In the limitations, the surveyed sample agrees with the authors before mentioned because the production of a didactic requires of a minimum instrumental dowry, (the institution will have to be equipped with the minimum audiovisual resources) it is needed a specific formation as far as the language and design for the production of audiovisual material.

#### 5. Implies.

At teaching level it implies a change of strategy of education in the descriptive statistical subject, in the studies of Public Accountant's office and Commercial administration of the University of Carabobo Aragua Nucleus, due to that normally the programmatic content of the subject was developed of a skilful way. The design, development of an educational audiovisual materials creates an atmosphere of more dynamic learning, because the teacher it can be used at the beginning of the academic activities to motivate the academic act or at the end of the academic activity to reinforce the learning. The important thing is that the teacher can design a learning atmosphere where can stop certain the audio-visual material in a specific moment to interchange ideas with pupils and in additionally to promote a motivating significant learning for the daily examples provided by pupils. This experience allows working with a large number of students. At level of students it implied to impulse in their education- learning of the programmatic content of the statistical descriptive subject in a dynamic, didactic manner, it specifies, creative, stimulate and very original.

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