Computing technologies for oriented education: applications in biological sciences.

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ABSTRACT

The experience developing modern digital programs with highly qualified professors with several years of teaching postgraduate biological sciences matters is described. A small group of selected professors with a minimum knowledge or basic domain in computer software were invited to develop digital programs in the items of their interest, the purpose is to establish the bases for construction of an available digital library, The products to develop are a series of CD-ROM with program source in HTML format. The didactic strategy responds to a personal tutorship, step by step workshop, to build its own project (without programming languages). The workshop begins generating trust in very simple activities. It is designed to learn building and to advance evaluating the progress. It is fulfilled the necessity to put up-to-date the available material that regularly uses to impart their classes (video, slides, pictures, articles, examples, etc.). The information and computing technologies ICT are an indispensable tool to diffuse the knowledge to a coarser and more diverse public in the topics of their specialty. The obtained products are 8 CD ROM with didactic programs designed with scientific and technological bases.

Keywords: digital library, ICT, biological sciences, didactic programs.

1. INTRODUCTION.

The present paper relates the experience of high academic level Ph. D. professors specialized in the biological sciences, that require to be modernized in the use of the computing tools in order to diffuse their knowledge and to guide a wider and more diverse public, interested in the topics of their professional field, with the purpose of elaborate products and didactic programs with scientific and technological bases of the field that each one of them dominates. The objective is to establish the bases for construction of an available digital library, in series of CD-ROM and access to INTERNET. In order to achieve this, was needed to complete the capacities of the educational group with those of a group with dexterities in the use of computing tools.

2. METHOD

It was organized a course – work-shop, of 60 hours, in which participate twelve Ph. D. professors with outstanding national research level and with a minimum of ten year-old teaching in the biological sciences; they have material of utility in their educational practice. They were introduced gradually, in the use of each one of the tools of advanced computing technology, with the purpose of elaborating their own material. The design of the course –work-shop carried out by objectives and goals, was evaluated in each session with the intention of reinforcing the tasks included in the shop.

Characteristic of the program

The material in CD-ROM and also with access to INTERNET that they developed presents links and access to the different topics by means of a selection bar or main menu. Wide connectivity in *Windows platform* using text files, calculation sheets, slide show, video, sound, material with animation. The programs include thematic questionnaires of self-evaluation for users, besides guides and instructive of orientation to navigate among the chapters that each program contains. It is facilitated the selection and consultation of the basic bibliography through two modalities: a) to the direct one that is carried out linking the user with the file integrates from the book or reference to consult and b) with links to the address of INTERNET that corresponds.

3. RESULTS AND DISCUSSIONS

The selected group

The total of selected professors to begin the workshop was 8. Grouped by educational level, 6 of them have the Ph. D. degree while the other 2 have the Master in Science level. Four of them belongs to food science area, 1 to immunology and the other 3 to biophysical department. Related with the years of teaching, half of the professors have an educational experience of 15 to 20 years, while the other half their educational experience overcomes 25 years.

Table 1. General characteristics of the group

Reference	Degree and field	Years of teaching
1	Ph D. Food Sciences	15
2	Ph D. Food Sciences	30
3	Ph D. Biophysics	20
4	Ph D. immunology	30
5	Ph D. Food Sciences	20
6	M. Sc. Biophysics	15
7	Ph D. Biophysics	25
8	M. Sc. Food Sciences	25

Session one
With the objective of knowing the software levels of domain of the participants and some details of their ICT project.
The group have a regular level of domain in common software related with word processing, worksheet and powerpoint presentation, while only few persons of the group only shows some basic experience in image processing, programming, video and sound software, links and combining files and HTML software.

Table 2. Percentages of the ability levels of the group at the beginning of the workshop.

Software	Levels of domain (ability)			
	Few	Basic	Regular	High
Word	-	37.5	62.5	
Excel	-	50	50	
Power point	-	37.5	62.5	
Image	75	12.5	12.5	
Programming	75	12.5	12.5	
Video	87.5	12.5		
Sound	75	12.5		
Link & HTML software	87.5	12.5		

Step 1) Communicating the group the expectations of the workshop
- The participants exposed their expectations, restlessness and material with which they count to carry out the workshop.

Table 3. Relation of the projects at the workshop.

Num.	Title of the project
1	Food processing operations: drying
2	Statistical and experimental design
3	Physical Chemistry. Biochemical Engineering.
4	The immunology: an experimental biography
5	Nutrition. The man is what consumes
6	National School of Biological Sciences. History of research and graduate programs
7	Atomic and molecular spectroscopy.
8	Food Technology applied to older adult.

Session two
With the objective in the first class of "Inserting a title". The participant should be able to change the title of a sample for the new text that corresponds to their own project or topic.

Step 2) Knowing the structure of the program CIT.
- Getting familiar with the programming tools and defining a new title for each participant; as a result of the program included in the CIT material
- Editing the title from the headed text of "my program"

Session three
In these session the goals are: Inserting three to four images in the title screen. The participant should be able to adapt and to locate images in the left superior part of the screen corresponding to the principal head frame.

Step 3) Editing the head frame with images. Editing the credits page of the main window of my program texts and images
As a result: they practices the tools for the handling of images and become familiar with the tools for the incorporation of text in sheet of credits

Individual assessment
Visiting the professors in their offices and supporting the edition of their first page

Step 4) Carrying out the consultant in the laboratory and offering support to the peculiar necessities of each one of the participants.

Step 5) Example of the incorporation of files to the main menu. Tests of operation of the links

Session four
Obtaining useful information on "rights of author" and practicing the handling of images.

Step 6) Informing the rules in order to obtain the RIGHTS OF AUTHOR of the work that it is elaborated inside this workshop.

Step 7) Obtain images through INTERNET. links of the program. development of the programs (tasks that are hindered, problems in the programming)

Session five
Modifying the in agreement menu to the individual general index

Step 8) Identifying the codes source of the menu and to elaborating a general index in three levels

Step 9) Copying and editioning images of the programs. Copying selected files of the web.

Session six

Step 10) Working with calculation sheets (the links in Excel)

Step 11) Summarizing of the advances achieved in the elaboration of the materials (individual evaluation)

Session seven
Dominating the logic of the tools in the incorporation of texts and images. The participant should be able to adapt and locate four images in the left superior part of the screen corresponding to the headed frame.

Step 12) Practicing with the help of the adviser the tools for the handling and incorporation of texts and images.

Step 13) Editing sound

Session eight
Obtaining useful information on others CIT products and practicing links between the main menu and the central page.
Step 14) Informing on the advance of the CIT products that have been developed at the IPN.

Step 15) Providing the necessary elements to carry out links between the main menu and the central page. to verify the connections in the internet.

Session nine
The participant must identify and practice the links in each one of the three levels of the program

Step 16) Exercise links between the main menu and the central page. tools for the CD (you program executable)

Step 17) Identify the different steps for the incorporation of links and sound. to elaborate the cover and the mask

Session ten
Visiting the professors in their offices and to support the edition of their first page
Each session had its corresponding evaluation and the participants had the opportunity to express their experience through the following indicators.

Step 19) Carry out the consultant in the laboratory and to offer support to the necessities peculiar of each one of the participants. to present the elaborated material (first group)

Step 20) Present the elaborated material (second group)

Evaluation of each step:
The main question at the daily evaluation is: What it should be improved? In order to detect the level of advance obtained on each project and also for planning future activities it important to ask their opinion qualifying in a scale of (0-10): Easiness to adapt the step to your necessity; In agreement relevancy to the goal and; The Utility of this tool to apply it according to the objectives of the workshop.
Generally in most of the evaluations a higher qualification it was obtained above 9, except in the sessions related with the handling of video and sound software in which the average fell due to the limitations in the used equipment and because of the inconvenient presented in the particular configuration of each computer.

Final products

Total	(%) structured	(%) of full functioning	Total Copies	Ready to web
2	70	70		
1	85	85		
2	100	95		1
1	100	100		
2	100	100	250	

For the 8 CIT projects the final result, after the 60 hours of workshop, it is the following:

Two of the projects achieved an advance of 70%, the authors requires more time to conclude the elaboration of the material. As long as one of them that achieve an advance of 85% of the total material to incorporate in the program.
There is a project that it concluded with the structure and it showed an advance of 95% in the function ability tests.
Three projects concluded satisfactorily:

1. Statistical and experimental design. This is an excellent product practically ready to be located at the web Internet for students at high level.
2. Physical Chemistry for Biochemical Engineering. It is a well done work, very complete with routines of animation used to explain the gas general law.
3. National School of Biological Sciences. History of research and graduate programs. This project was finally carried out as a group directed by two professors, this excellent elaborated material was nowadays reproduced 250 times.

During the second semester of the 2003, under the outline and described methodology the group of selected professors developed, the following programs: 1) *Statistics applied to research in Biology*; 2) *The first law of thermodynamics*; 3) *Basic principles of the immunology*; 4) *Processes applied to the conservation of foods*; 5) *History of the 70 years of the graduated program in the National School of Biological Sciences of the National Polytechnic Institute (IPN)*; 6) *Foods of special regimens for elder persons* and; 7) *Advances in PH. D. Foods program, that will be imparted in the National Polytechnic Institute IPN*. During 2004 the course – work-shop will be repeated with the experience of twenty professors of medicine and psychology careers. This achieved advance corresponds to the first pieces of the construction of a virtual collection of the educational material that will be used in the National Polytechnic Institute (IPN).

4. CONCLUSION

The fulfilled objective in its entirety, is represented by the seven programs in CD-ROM and also in the material format HTML with access to INTERNET. The successful experience of a multidisciplinary course – work-shop in the modality of processes of self-learning directed by objectives sample got a great acceptance. The used methodology consisting on drifting, according to the participants' necessities, obtained a high qualification when evaluating it. The participants besides a successful academic trajectory of high productivity today, they developed their own material enlarging the diffusion in the case of sciences and technology applied to Biology.

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