

Implementation of Didactic Guide “The Chemistry of Life” Applying Hypermedia Resources for the Learning of Biochemistry

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Abstract

Aim: The second level students from the Nursing School at the State University of Bolivar have been only using printed teaching material since 2013, so that they presented difficulties in the comprehension and learning of the biochemistry; the majority pupils did not manage contextualized and interrelate with clarity the thematic of the 14 didactic units of the subject and they limit themselves to memorizing the concepts.

Objective and Method Used: The present research reveals the results obtained with the design and implementation of the guide “The Chemistry of Life” with the support of hypermedia tools to learn Biochemistry. For the development of the hypermedia application, it was used the program of visual author Multimedia Builder version 4.9.8., in system Windows Office and others software’s for the audiovisual production. To that end, two groups of students were selected, a group control with whom in the teaching learning process of the biochemistry was used the traditional methodology and the experimental group, the guide, during 2014 academic period.

Result and Discussion: The design applied was quasi experimental, to contrast the results themselves, that were submitted to a statistical, descriptive, and inferential analysis to showed, that with the use of the digital guide and the supported in the hypermedia application improved consistently the learning biochemistry and consistently in the student’s performance that belongs to experimental group in contrast to those of the control group. Therefore, the utilization of the guide is recommended and its complement, its structure comes added with information and communication technological, in hypertext format and multimedia, becoming it an educational technological innovative resource, which is characterized for being not linear and interactive, useful for the new generation and new forms of biochemistry learning and optimize the work in the classroom.

Key words: Biochemistry, hypermedia resources, hypertext, information and communication technologies, multimedia

INTRODUCTION

A continuous professional development, the establishment of methods and the use of interactive educational resources allow educators to systematize the formative training process; starting from the identification of individual and organizational learning necessities to the evaluation of results in the formative activities performed by the students.

With the advent of computers, the evolution of information and communication technologies along with the development of the internet,

interactive, and didactic resources have been developed (multimedia and hypertext tools), which allow us to interact with a computer using a variety of codes to visualize the

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information required; instruments related to the educational process to acquire scientific knowledge in a rapid and meaningful way to facilitate students to obtain practical solutions to be applied in their daily lives.^[1]

On the other hand, the use of “hypermedia” has intrigued the educational and pedagogical field due to the advantage and disadvantage that its application may probably cause in the formative process.^[2] Therefore, the existing educational challenges in this new millennium imply that teachers should contribute to the continuous improvement of self-study methods by providing students appropriate educational resources to optimize their learning, so that they may be able to solve problems.

The description of teaching and hypermedia resources, as mediators in the development and enrichment of the teaching and learning process that qualify and quantify its dynamics from different dimensions by expressing communicative interactions between students and teachers along with the quality and efficiency of pedagogical actions.^[3] Likewise, the development of an interactive guide as an instrument that serves to organize, plan, and socialize the syllabus of the subject as well as the description of the teaching and learning process.

One of the main principles in higher education was based upon the quality of the teaching process that demands the integration of a variety of didactic materials that pursues a more receptive, participative, practical, entertaining, and interactive class.

These resources must be integrated in an adequate manner and must be compatible and articulated with the educational context to become effective. That is to say, they should successfully impact the students and contribute to maximize their motivation in such a way that the teaching and learning process of science would be enriched.^[1]

The general objective in the present study was to demonstrate that the application of a hypermedia didactic guide entitled “The Chemistry of Life” through a software and a dynamic and cooperative methodology that fostered the development of socio cognitive-affective skills and contributed to the learning of biochemistry in students enrolled at the second cycle from the Nursing School at the State University of Bolivar, 2014 period.

On the other hand, the teacher’s compromise is to offer students new learning environments to acquire more effective experiences through the application of methods, techniques, and other didactic and interactive that allow them to explore and interact with the environment, this supplies the foundations for more complex knowledge that develops skills, values that in addition to communication increase cooperative relationships among students according to the regulations in higher education (Art. 350) along with the aims stated in the organic policies of higher education (LOES).

In the same way, this study provides details about the methodology applied (dynamic and participative) methods (expository, collaborative and autonomous learning) techniques (group discussion plus extracurricular activities), the interactive and didactic hypermedia software entitled “The Chemistry of Life,” topics and contents covered in the classroom through pedagogic workshops in the teaching and learning process of biochemistry.

METHODOLOGY

Study zone

The study was conducted at the State University of Bolívar situated in the “Ernesto Che Guevara” s/n and Gabriel Secaira Avenue in Guaranda, Ecuador.

Experimental unit

A male or female student enrolled in the second term at the Nursing School at State University of Bolivar.

Study population

An 18-second period, students in class “A” as the controlling group and 20 students in class “B” as the experimental group, during the academic period 2014.

On the one hand, the controlling group used a linear material due to it is characteristic in the traditional teaching and learning process and the expository method used by the student inside the classroom to establish the analysis and discussion of the topics stated in the syllabus as well as the extracurricular and autonomous personalized activities.

On the other hand, the experimental group utilized a hypermedia guide plus the application of a dynamic and cooperative methodology with techniques such as teamwork, group discussions, cooperative work, workshops, and extracurricular and autonomous activities.

Sample size

The overall population from the second-term students enrolled at the Nursing School ($N = 38$), sampling methods were not applied as the courses were previously established.

Techniques and instruments for data collection

A survey was the technique applied to the experimental group to evaluate the design, development, implementation, and application of the didactic guide; also, the scores obtained by the controlling and the experimental group. As for the instruments applied, we have a questionnaire and the

score report. With the information obtained a database was elaborated and then the corresponding statistical analysis was conducted.

Variables of study

The independent variable refers to the application of the hypermedia didactic-guide entitled “The Chemistry of Life” and the dependent variable that refers to the learning of Biochemistry.

Design, types, and research methods

A quasi-experimental design was applied; among the types of the investigation: The bibliographic, descriptive, the field research, application, correlational; the scientific, analytic, hypothetic, and deductive method.

Analysis and interpretation of information

The information was analyzed by “Statistix 9.0.” The frequency and percentages were presented in graphics and tables. The relationship between the variables was established through the T student with an average of 95% of confidence and a level of significance of $\alpha = 0.05$.

RESULTS AND DISCUSSION

All of the contents from the didactic units of biochemistry were tested to students from both the controlling and the experimental group. To obtain the results, only three didactic units were taken into account such as: Generalities in Biochemistry, the treatment of biomolecules and the elemental of urine and biometrics, as examples. The evaluation of the second-term students about the generalities of Biochemistry can be observed in Table 1.

The numbers show that in the majority of students enrolled in class “A,” the concept of biochemistry was not clear enough to understand in contrast to the students in class “B” who acquired and incorporate hypermedia technological tools in the educational context to comprehend the topics, something that was quoted by Pires and Rosales (2014),^[4,5] that posit that once the diverse characteristics of hypermedia are considered, they create a suitable learning environment to implement constructivist principles as these benefit the construction of meaningful learning through the use of mental connections in a motivating, versatile, and autonomous teaching and learning environment. The statistics from the treatment of biomolecules are shown in Table 2.

From these results, it can be inferred that there exists a statistic difference in all the categories that were evaluated,

Table 1: Evaluation of the generalities in biochemistry, class A and B

| Scale | Category | Control group (A) | Experimental group (B) |
|-------|-----------|--------------------------------|--|
| | | Using a module of biochemistry | Using a hypermedia guide and a technique of collaborative work |
| | | Frequency (%) | Frequency (%) |
| 6 | Poor | 6 (33) | 3 (15) |
| 7 | Good | 4 (22) | 6 (30) |
| 8 | Very good | 2 (11) | 4 (20) |
| 9 | Very good | 2 (11) | 5 (25) |
| 10 | Excellent | 4 (22) | 2 (10) |
| Total | | 18 (100) | 20 (100) |

Table 2: Evaluation of the treatment of biomolecules class A and B

| Scale | Category | Control group (A) | Experimental group (B) |
|-------|-----------|--------------------------------|--|
| | | Using a module of biochemistry | Using a hypermedia guide and a technique of collaborative work |
| | | Frequency (%) | Frequency (%) |
| 6 | Poor | 12 (67) | 2 (10) |
| 7 | Good | 5 (28) | 8 (40) |
| 8 | Very good | 0 (0) | 4 (20) |
| 9 | Very good | 1 (6) | 3 (15) |
| 10 | Excellent | 0 (0) | 3 (15) |
| Total | | 18 (100) | 20 (100) |

results that have allowed us to verify that hypertext resources inserted in the hypermedia interactive guide called “The Chemistry of Life” and the group discussion applied in psych pedagogic workshops have a high impact from one group to another. The evaluation of the elementary study of urine and biometrics are shown in Table 3.

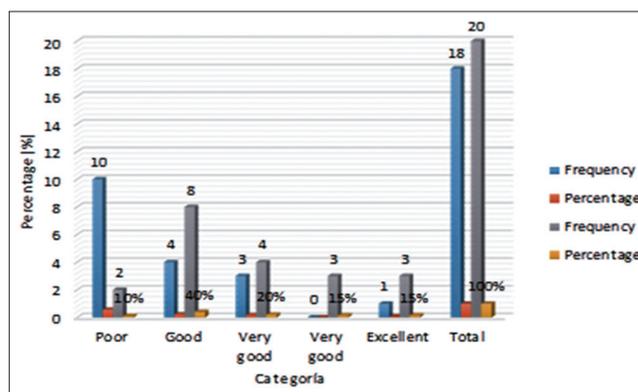
This table verifies that there is a considerable percentage difference between the “A” and “B” groups in all the categories evaluated, since in group “B” multimedia resources and the technique of group discussion were also applied to benefit the teaching and learning process of Biochemistry, in accordance to Sheperd (2010), who argues that these working environments use tools that facilitate cooperative work and permit students a direct relationship with topics that are always under the teacher’s supervision. The Table 4 and Graph 1 show the overall score obtained after the evaluation of the students.

The scores obtained by the students in the controlling group showed that most of them did not comprehend the content of the subject versus the students in the experimental group who reached better scores in the evaluation of contents.

These results revealed that the application of a traditional and repetitive methodology which is linear (the use of a module to teach biochemistry) resulted in memorization of contents that in the long-term would not be neither recalled nor fixated

by the student minds, affecting their understanding, learning and performance, in contrast to the experimental group that positively acquired knowledge in an active and meaningful way.

The evaluation of the hypermedia didactic guide called “The Chemistry of Life” (applicative software) to foster the learning of biochemistry obtained positive comments from the students who mentioned that it is an innovative tool since it contains an interactive Interfax, resources such as hypertext, multimedia, and web as practical tools to handle a computer and present and combine information. These results corroborate what was said by García, 2011, who



Graph 1: Evaluation overall score, class A and B

Table 3: Evaluation of the treatment of urine and biometry class A and B

| Scale | Category | Control group (A) | | Experimental group (B) | |
|-------|-----------|--------------------------------|----------|--|--|
| | | Using a module of biochemistry | | Using a hypermedia guide and a technique of collaborative work | |
| | | Frequency (%) | | Frequency (%) | |
| 6 | Poor | 15 (83) | 7 (35) | | |
| 7 | Good | 2 (11) | 5 (25) | | |
| 8 | Very good | 0 (0) | 4 (20) | | |
| 9 | Very good | 1 (6) | 2 (10) | | |
| 10 | Excellent | 0 (0) | 2 (10) | | |
| | Total | 18 (100) | 20 (100) | | |

Table 4: Evaluation overall score, class A and B

| Scale | Category | Control group (A) | | Experimental group (B) | |
|-------|-----------|--------------------------------|----------|--|--|
| | | Using a module of biochemistry | | Using a hypermedia guide and a technique of collaborative work | |
| | | Frequency (%) | | Frequency (%) | |
| 6 | Poor | 10 (56) | 2 (10) | | |
| 7 | Good | 4 (22) | 8 (40) | | |
| 8 | Very good | 3 (17) | 4 (20) | | |
| 9 | Very good | 0 (0) | 3 (15) | | |
| 10 | Excellent | 1 (6) | 3 (15) | | |
| | Total | 18 (100) | 20 (100) | | |

posits that informatics, communicative, telematics, and multimedia resources constitute a space to reflect on the relationship that exists between the technological potential and the pedagogical assumptions that need to be considered in the teaching and learning setting to promote constructivist experiences in the students.^[5]

CONCLUSIONS

The design, the implementation, and the application of the guide called “The Chemistry of Life” demonstrated that the use of a hypermedia resource along with a dynamic and participative methodology permitted to develop the students’ socio-affective and cognitive skills through group work activities and discussions in the learning of Biochemistry of the students, class “B” in the Nursing School at the State University of Bolivar, in 2014. Moreover, the application of the guide that contains hypertext and multimedia tools assisted the comprehension and learning of biochemistry and improved the students’ academic performance that helped to be competent to learn how to learn.

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