

***La página web como recurso educativo digital en la
asignatura de Biología 4 décimo grado
The web page as a digital educational resource in the
subject of Biology 4 for tenth grade***

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Resumen

El problema de investigación que motivó este trabajo se enmarca en la desmotivación en la elaboración y empleo de recursos digitales en el proceso de enseñanza-aprendizaje de la Biología en la enseñanza preuniversitaria por parte de los docentes, lo que implica una desmotivación por el aprendizaje de esta asignatura por los estudiantes. De ahí que el objetivo del presente artículo es la elaboración de una página web como recurso educativo digital que contribuya al proceso de enseñanza-aprendizaje de la Biología 4 décimo grado. El enfoque de esta investigación fue cualitativo y de revisión documental. Los principales resultados estuvieron determinados por una mayor motivación, una participación activa y un mayor rendimiento académico de los estudiantes. Se llegó a la conclusión de que el empleo de recursos educativos digitales constituye una alternativa para lograr mejorar el proceso de enseñanza-aprendizaje y la motivación de los estudiantes en la asignatura Biología 4 décimo grado.

Palabras clave: Página web; Proceso de enseñanza-aprendizaje; Recurso didáctico; Estudiantes.

Abstract

The research problem that motivated this work is part of the lack of motivation in the development and use of digital resources in the teaching-learning process of Biology in pre-university education by

teachers, which implies a lack of motivation for learning this subject by students. Hence, the objective of this article is the development of a web page as a digital educational resource that contributes to the teaching-learning process of Biology 4 tenth grade. The focus of this research was qualitative and documentary review. The main results were determined by greater motivation, active participation and higher academic performance of the students. It was concluded that the use of digital educational resources constitutes an alternative to improve the teaching-learning process and the motivation of students in the tenth grade Biology 4 subject.

Keywords: Web page; Teaching-learning process; didactic resource; Students.

Introduction

Education is a fundamental human right, which should generate possibilities for lifelong learning, bringing together different agents and social groups, elements contained in the 2030 Agenda for Sustainable Development. Goal 4 mentions that this goal seeks to increase and diversify learning opportunities through a variety of modalities so that young people and adults acquire problem-solving skills, critical thinking, creativity, teamwork and communication skills, as well as competencies to perform optimally in a job and education for life.

In this endeavor, information and communication technologies (ICTs) play a significant role. It should be added that technological advances and their impact on society have led to an environment that requires people to use these technologies and the wealth of knowledge acquired through them to solve the pressing problems facing humanity, so education has the responsibility to prepare them.

The different Cuban educational levels have assumed the challenge of incorporating, gradually, ICTs to the teaching-learning process of the subjects, provoking a necessary reflection about the cognitive phenomena and the didactic situations associated with their integration in the contents. In the specific case of pre-university education, it faces the problem of the large amount of content that students must master, motivated by the accelerated production of knowledge and its rapid expiration.

Therefore, incorporating ICTs in the teaching process is a challenge and an opportunity at this level of education and keeps students active, generating greater interest in learning.

Teachers are continuously integrated into the continuous updates in the use of ICTs to effectively develop the contents of the class they are going to teach. The teacher in his role as facilitator must be a motivator and the one who provides the student with tools, techniques, strategies and resources to generate interest in students, applying the use of materials to achieve meaningful learning, this will

manifest itself in the student's motivation to understand and comprehend the teaching content in a dynamic way.

Likewise, ICTs provide new opportunities for teaching, providing solutions such as virtual teaching-learning environments, virtual teaching materials, educational software and digital educational resources, among others, aimed at facilitating the acquisition of knowledge.

These statements are made taking into account that for UNESCO: ICTs are a factor of vital importance in the rapid changes that are taking place in society. In the last decade, new information and communication technology tools have brought about a profound change in the field of business, and have brought about significant changes in many fields. They also have the potential to transform the nature of education in terms of where and how the learning process takes place, as well as to introduce changes in the roles of teachers and students.

It is therefore necessary for teachers to update themselves in all those aspects that can broaden the spectrum of pedagogical didactics in order to strengthen their work and promote more effective learning. One of these aspects is training in the use of Information and Communication Technologies (ICTs) applied to education.

With the scientific-technical development, the use of ICTs has gained greater importance in education systems, because they have demonstrated their effectiveness in helping the learner to achieve more cognitive independence. In Cuba, educational policies focus on the use of ICTs to achieve better results in the teaching-educational process.

Since the end of the 20th century, for the teaching-learning process of the Biology discipline in pre-university education, the preparation of teaching support materials was already oriented, taking into account the peculiarities of the career in which it was to be taught. Since support materials are all those resources that facilitate the realization of teaching activities, ICTs are included in them. In this sense, the methodological guidelines of the subject Biology 4 tenth grade emphasize the need to allow the widest use of ICTs, applying them with responsibility and critical sense.

a) Teaching scientific knowledge supported by technology is undoubtedly an essential didactic resource in these times, because it means integrating, revaluing and re-signifying the daily culture of students. Teaching resources would be all those materials, whether printed or digital, that facilitates the learning process. Hence, they include digital educational resources.

b) Digital educational resources have been defined as "those digital materials designed with an educational purpose to inform, transmit, reinforce learning, develop competencies and evaluate knowledge" (Cepero and Pérez, 2022, p. 13)

c) Within the digital educational resources, the use of the web page allows the development of inquiry skills and information contrast and other fundamental research skills for the development of the student, it also allows to raise motivation towards teaching activities, strengthens vocational orientation, allowing knowledge to recover its essential character, recoverable and transferable to other learning situations.

d) The studies that have been carried out on the use of the web page as a digital educational resource in education are diverse. We can mention the works of (Área, 2003, 2005; de la Cruz, 2010; Chibás, 2020; Pérez-Ortega, 2017; Osorio, 2018; Garcia and Granda et al. 2019;), among others, who refer to the importance of digital educational resources to promote meaningful learning and motivation for learning to learn.

Thus, their use in education implies the creation, search and selection of tools that allow the fulfillment of the objectives proposed by teachers according to the desired level of cognitive development to be achieved.

The incorporation of the web page as a digital educational resource to the teaching-learning process of the subject Biology 4 tenth grade has multiple advantages that should be taken advantage of to achieve greater motivation in students. Based on this, and on the need for resources for the subject Biology 4 tenth grade, the objective of this article is to socialize the result of the application of the proposal of a web page as a digital educational resource for the subject Biology 4 tenth grade.

Development

An approach to the website as a digital educational resource

Biological knowledge taught in Cuban middle school has remained stable and without significant changes in the different improvements of the National Education System, with the predominance of the leading roles of the teacher who directs it, basically under an instructive posture of supposedly finished and imperishable knowledge and where the student is simply a receiver of information, in which the use of traditional means of teaching-learning has predominated, which shows an insufficient use of updated information from online sites and web pages, which causes that for some students it has little significance.

Some of the most important advantages of ICTs in general (including the web page) is that they offer models in which student participation is very important to build knowledge and develop cognitive and social competencies in an integrated manner, thus ensuring higher quality reflected in the ability to meet diversity, more efficiency by optimizing the use of resources and greater equity by ensuring the same opportunities for all students. When these requirements are met, education acquires an inclusive sense in favor of development and improvement of competitiveness.

Among the characteristics of the web page, as a didactic resource are:

- a) Its didactic value, which depends on the use made of it by the teacher. This is not the case with more complex technical media such as cinema, TV, among others, which carry a coherent and integral message.
- b) They can be operated by teachers and students. With the use of the web page, the student does not adopt a passive and receptive position, but can and should be on it, can participate in its learning in an active way.
- c) It allows a high degree of objectivity in teaching.
- d) They make possible the student's independent work. This resource can be used individually to solve exercises, tasks, problems, update on a specific scientific topic that is related to some school content so that the biological content that is taught acquires for the student a social significance, a social sense.
- e) Its didactic use is not limited to only the duration of a school year, but can be updated and used in several school years.

The above characteristics support the criterion that the web page, due to its characteristics, undoubtedly becomes a didactic means to be used in the classroom. Thus, its use in class allows to train students in the understanding of what happens in the space in which they live; they become aware of this reality as citizens, value freedom as expression, encourage self-expression and creativity, among other benefits. Likewise, it is agreed that the use of the web page, as a didactic resource, favors the integration of the assimilation of the content (instructive), the formation of faculties (developmental), and the achievement of traits of other forms of personality (educational).

- The instructive is the process and result of the assimilation of knowledge, the mastery of the skill for the development of work, for the sake of its preparation for life.
- The developmental refers to the faculties that man has, and that are the psychophysiological support for the execution of the activity. The faculty and other physical and spiritual qualities of man (functional potentialities), are the result of the mastery of

multiple skills whose learning does not respond to a single algorithm, but which are included by the psychophysiological peculiarities of the student in the context of his ontogenesis, and in which his aptitudes, as well as genetic characteristics, play a transcendent role.

- The educational aspect is related to the formation of values and convictions, in the course of the teaching-learning process of Biology and at the philosophical, ethical, political, aesthetic and physical levels.

In order to select the web page as a didactic resource, it is necessary to consider the level of development of the students, this is very important, because as mentioned above, their capacity to interpret the biological content transmitted by the press depends on their intellectual development and previous experience.

Its use should be conceived in such a way that it also helps the development of their interpretation and reading skills and at the same time enriches their intellect. In this case, the press acts as a medium for the integration of the concrete and the abstract and facilitates the continuity of thought processes.

Another aspect to consider with the use of the web page is the methodological objective of its use. We consider that it constitutes the basis of independent study and is the basic source of knowledge. Its correct use contributes to the development of scientific work habits in the student and allows linking theory with practice.

In summary, we can specify that the didactic resource in the teaching of Biology, in this case the web page, with updated information, should stimulate the productive activity of the student, should be inserted in a system of means and should consider the level of development of the students, the methodological objective of its use and the ideal moment of its use depending on the level of assimilation and depth of the content.

Considering the objective of this research, the web page is identified as an electronic document, which contains digital information, which can be given by visual and/or sound data, or a mixture of both, through texts, images, graphics, audio or videos and other dynamic or static materials, generally built in HTML language (Hyper Text Markup Language or Hypertext Markup Language) or in XHTML (Extensible Hypertext Markup Language or Extensible Hypertext Markup Language).

The elaborated web page constitutes one more variant to achieve efficiency in the teaching-learning process, with the particularity that it is contextualized for the learning of the topic: cellular metabolic processes of the program of the subject Biology 4 tenth grade in pre-university education. It is a tool that will allow students to increase their knowledge about cellular metabolic processes and teachers to

structure and design the activities of each class in a more effective way in combination with other means selected by them.

Procedure for the development of the web page

First moment: To determine, through the methodological analysis of unit 3. The cell as a basic unit of structure and function of living beings, the educational potential of the same for the use of information and communication technologies (ICTs), which allowed the analysis of the objectives and contents covered in the unit of reference, as well as its organization, taking into consideration the logic of the subject and those skills less achieved by students during the learning of the same, so as to allow the selection of the content to be included in the design of the technological product.

With a similar intention, a review of the existing DNA software at the pre-university level was carried out, with the aim of analyzing its content aspects and avoiding unnecessary repetitions.

Second moment: Search, selection and organization of the different texts, images, videos, simulations and their organization in such a way that we could obtain a good design with appropriate colors, photos, icons and other infographic resources so that, mixed with good taste, they turn the experience of visiting the web page into a pleasant practice and thus stimulate the curiosity and the need of the students to navigate in it.

In addition to this, the media obtained and used in the elaboration of the web page are edited and the programming, that is to say, the coding of the previously defined sections, is carried out.

The web page is subjected to several tests that consist in the systematic verification to look for possible errors and that allow the whole structure of the same to keep working, from the periodic review of certain aspects, both hardware and software of the PC, these influence the reliable performance of the system, the integrity of the stored data and a correct exchange of information at the maximum possible speed within the optimal configuration of the system, as the project was conceived, updating the content according to the dosage of the unit in question and the technological elements.

Third moment: Structuring how each of the aspects contained in the web page should be used by the students.

The web page is constituted by a main page where the generality of the metabolic processes is described so that the students understand all the contents of the web page, and five sections are shown that correspond to the contents identified in the methodological analysis.

The menu is made up of the first section where the tables of contents are integrated. The second is dedicated to the exercises or activities; the third section is made up of images and conceptual maps of

cellular metabolic processes. The fourth is dedicated to the videos of each of the metabolic processes and the fifth is a help support where the computer instruction manual is found.

On the page, each of them can be accessed with a click of the mouse and the student can navigate through the ones he/she considers necessary at that moment.

The use of the different sections will be oriented from each of the classes, for example, in the exercises section, the student can solve the exercises that are presented there as the classes progress, since in the textbook there is only one exercise to systematize the classes.

In total, the page has a video of each one of the cellular metabolic processes that favor the motivation of the students for learning the content of the cellular metabolic processes and 4 videos where the metabolic pathways are explained, which allows them to deepen and understand this content.

Materials and methods

An investigation was carried out at the IPU "Ramón Infante García" in the 2022 course, using as population the 54 tenth grade students, who receive this subject. The sample was selected through a non-probabilistic sampling by criteria, choosing 38 who make up one of the teaching groups and excluding students who did not give their consent to participate voluntarily.

The practical method of documentary review was used to review the current state of the subject, its importance and to corroborate the correct use of the web page as a digital educational resource in the different teaching organizational forms. For this purpose, a search for updated bibliography on the subject was carried out and the lesson plans of the subject and the class controls carried out by the department head were consulted. In this sense, it was also necessary to use the historical-logical, analytical-synthetic and inductive-deductive theoretical methods.

A questionnaire was applied as one of the empirical methods of scientific knowledge. This was carried out individually to the selected sample of the total population, with the objective of knowing their evaluations about the use of the web page as a digital educational resource during the development of the classes of the subject Biology 4 tenth grade.

This questionnaire allows qualifying the answers of the students with the objective of facilitating the obtaining of results. The questionnaire was applied after the end of the course.

Another questionnaire was implemented to the teachers who teach the subject, following the same objective of the questionnaire applied to the students.

The class observation method was also used to explore the potentialities and weaknesses that were presented in the use of digital educational resources in the teaching activities developed to enhance learning in the subject.

Results

Based on the methodological guidelines of the Biology 4 tenth grade syllabus regarding the use of ICTs and their benefits, the proposal of a web page as a digital educational resource was used in course 2022. During the class visits, the use of traditional didactic resources such as the blackboard or printed bibliography was observed; this could also be verified from the class plans of the subject and in the class controls carried out.

In the questionnaire applied to the selected sample, 85.71% of the students thought that the teachers sometimes used digital educational resources to teach the contents of the subject, constituting a majority in relation to the 14.29% who expressed that they were always used. 90.48% thought that the digital educational resources used were always or almost always adequate to teach the classes and 9.52% thought that the resources were adequate only sometimes.

These data coincide in part with the results of the questionnaire applied to teachers; they expressed that they sometimes used digital resources to teach their subject and think that they were almost always adequate, since this depends on many variables such as the characteristics of the students. The methods used in all the teaching organizational forms were between joint elaboration and independent work, which facilitated the work with digital educational resources.

Among the digital educational resources most used in class, 100% of the students listed videos. Meanwhile, 91.67% added power point presentations and 33.33% included books. The digital educational resources mentioned by the students agree with those referred to by the teachers. The review of the lesson plans also showed that the most used resources were: videos, fragments of films or documentaries, bibliography in digital format, books, magazines and power point presentations.

These data reflect the reason for the percentage of students who considered that only sometimes digital educational resources were used, since as can be seen only 33.33% of the total considered books as digital educational resources. It is significant to mention how no student made reference to the web page as a digital educational resource.

It is noteworthy that the teaching-learning process improved with the use of this proposal in the 2022 academic year, since the results of its application are qualitatively superior if we compare them with the teaching results at the beginning of the school year. In the questionnaire, for example, 52.38% of

the students said that they were only sometimes involved in the development of the digital educational resources used in the subject, making up the majority of the sample.

The teachers expressed the same opinion, stating that in previous courses they sometimes used digital educational resources when teaching the subject. In this sense, they stated that they only used the students' cell phones to search for concepts at certain times of some teaching activities, the preparation of diagrams, power point presentations and the search for audiovisuals to help them to present in seminars and practical classes, as teaching organizational forms. However, other more interactive resources, such as the web page, were not used.

In the observation guide, it was observed that teachers always promoted activities for students to construct the meaning or meanings of the content and its application in the classroom to improve academic performance. It also confirmed greater motivation of the students with the use of the web page in classes, they participated more actively and that teachers took into account their opinions at the time of class development; as well as that they promoted self-learning activities, from teaching assignments, studies and independent work in the main, with the use of this digital educational resource.

The 97.31% of the students considered that with the use of digital educational resources they achieved a better learning in the subject and the remaining 2.69% stated that they did not know if these had an influence on their learning. The teachers agreed that with the use of the web page as a digital educational resource they achieved a better teaching performance, since the students were more motivated by the contents they received. At the same time, they agreed that it was possible to ensure that students understood and interpreted the subject better, in a more dynamic way. These results were seen in academic performance.

Of the total number of students who obtained grades between 90 and 100 points, 96.71%, only 3.27% obtained grades of less than 85 points. These results are very positive.

In the questionnaire, 90% of the students stated that they liked the subjects taught. This result is interesting; given that in the introductory class of the subject an approximate percentage of students had referred that they were not interested in the contents of the subject, because they considered it boring. The data were reversed at the end of the course and probably the use of the web page as a digital educational resource influenced these results, taking into account that 97.22% of the students expressed that it was important for teachers to use this digital educational resource in the classes and

that 100% stated that they would like more digital educational resources to be used to improve the learning of the contents.

Discussion

In the teaching of the subject Biology 4 tenth grade, students have traditionally had a passive role. Their limited participation in the learning process is undoubtedly one of the reasons why they consider the topics to be treated in the same as uninteresting and far from their social context. The authors consider that it is not possible to continue exchanging in the classroom, pretending that students are passive subjects of knowledge.

Therefore, it is considered that alternatives should be sought to enhance motivation, which in turn will lead students to become active subjects of knowledge in order to achieve the quality of professional we are trying to train, based on the needs of the current times.

ICTs allow the development of methodological innovation possibilities that result in the achievement of a more effective and inclusive education. With their use, teachers' initiatives to create digital educational resources that encourage student participation in the contents of the subjects in a more active and motivating way increase.

Among the main advantages of the use of digital educational resources are: the approach of students to the contents in less rigid spaces, with which they are more familiar and that allow them greater autonomy; they feel more involved in learning; they understand the need for constant search for information; they approach abstract concepts through sound, image, animations, hypertextual language and even simulations; teachers reduce their effort by relying on dynamic presentations; learning is faster; it covers more content and communication between students and teachers is improved.

Teachers should continue to develop the ability to generate different "entry doors" to the same content, so that all students acquire knowledge according to their learning capabilities. The authors of the research are of the opinion that managing different sources of information in the classroom with students makes it possible to create these different doors to knowledge, because each of them will search in a personalized way for the educational resource through which it is easier for them to understand the content. Hence, strategies were designed to achieve greater student involvement, which was demonstrated by the results obtained.

On the other hand, the link between theory and practice turns students into producers of knowledge, they develop the capacity for critical reflection, achieving more independence and assimilation of the

contents that they themselves elaborate, creating in turn technological skills and interrelating contents from different subjects. This makes the integral formation of the students viable.

The participation of students in this sense is essential for the results of the teaching-learning process to be effective. The involvement of the students in the development of the resources also had positive results as could be seen.

However, the use of ICTs in educational processes does not ensure that learning is effective. The inclusion of digital technologies in the classroom must be accompanied by methodological strategies designed and implemented by the teacher, which promote collaborative and cooperative learning spaces that favor the management of learning and the acquisition of digital competencies, where the critical spirit prevails.

The lesson plans clearly reflect the objectives and specific activities that were carried out with the web page developed, which was accompanied by specific teaching tasks, aimed not only at the formative but also the educational part of the classes, and always promoted debate, encouraging student protagonism.

The authors considered that by using the proposal correctly, they were able to improve the teaching process in the subject Biology 4 tenth grade. The use of the web page as a digital educational resource made possible a more dynamic learning process by directly involving the students, taking the contents, sometimes very theoretical, to formats easier to understand or even to practice, always accompanied by well-founded pedagogical proposals, with clarity in the stated formative and educational objectives.

Likewise, students were more involved in the elaboration of the digital educational resources to be used in classes; a greater motivation for the contents of the subject was achieved; as well as an active participation and the academic performance of the students was positive.

Conclusions

The use of digital educational resources makes them essential tools for the successful development of the teaching-learning process. In the case of the Biology discipline in pre-university education, school textbooks are outdated in some of the contents they deal with. In the present circumstances, it is necessary to complement them with the elaboration of the web page of marked scientific updating. The web page corresponds to the needs and potentialities of the students and teachers who make up the research sample and confer a high value to it, so it is considered feasible to be used as a digital educational resource to contribute to motivate students to learn the contents of the subject Biology 4 tenth grade.

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