
***Experiencia pedagógica en la formación laboral
investigativa del profesor de Biología-Química***
***A pedagogical experience in the education of the Biology -
Chemistry teacher for research and work***

Marelis Aviles-Sierra

Mirna Isabel de la Fuente-Leyva

Facultad de Educación, Universidad de Guantánamo, Cuba

Correo electrónico(s):

aviles@cug.co.cu

mirna@cug.co.cu

Recibido: 2 de marzo de 2017

Aceptado: 6 de septiembre de 2017

Resumen: La formación de profesionales de la educación competentes y comprometidos es una de las aspiraciones de la Educación Superior en Cuba. En este artículo se muestra la experiencia que desde la disciplina Química General se utiliza para el diseño de la formación laboral investigativa de los estudiantes que se forman como profesores de Biología-Química, a partir de un enfoque sistémico en lo académico- laboral- investigativo. Con la aplicación de métodos del nivel empírico y teórico se logró elevar la motivación de los estudiantes hacia la carrera y el desarrollo de sus habilidades laborales e investigativas.

Palabras clave: Química General; Formación laboral investigativa; Enfoque sistémico; Formación de docentes

Abstract: Educating professional teachers to be competent and committed is one of the main objectives of Higher Education in Cuba. This paper presents the experiences of its authors, professors of General Chemistry, regarding the design of the program of Biology -Chemistry aimed at developing research and work skills from a systemic approach. Using empirical and theoretical methods the professors accomplished better motivation in the students of the major and the development of their research and work skills

Keywords: General Chemistry; Research and work skills; Systemic approach; Educating professional teachers

Introduction

The research work training of professionals who are trained as educators is one of the main tasks of Cuban universities, so the improvement of it is a way to raise the quality of the educational process, so that they are every day better prepared to face the professional problems of their future work activity and respond to the demands of society.

Professional training is based on two main guiding ideas; the first refers to the link between instruction and education, and the second, to the work -study link in each of the activities carried out by students.

From this perspective, the criterion of Fuentes (2000) is shared when he states "the importance that within the system, the training process of professionals, has the integration between the components: academic, labor and research, these parts are inherent to the study plan" (p.5)

It is the opinion of the authors that in this process the design of the analytical programs of the subjects requires a transformation that attends in all its breadth, in addition to the knowledge and skills of the sciences, those related to the future profession of the student.

In the educational practice it corresponds to the main nuclear integrating discipline to the rest of the disciplines, so that the research work training is fulfilled and the modes of action of the professional in training are specified, but, in spite of the continuous improvement of it, There are still insufficiencies in the design of the analytical programs of the subjects that guarantee, from their conception, the treatment of labor and research training with a systemic approach.

For this reason it is considered appropriate to socialize the experiences that in this sense are achieved from the program of the General Chemistry discipline and its conception from a systemic approach between the academic, the labor and the investigative.

Development

The research professional training skills introduced during the teaching of Chemical Biology must ensure its preparation for the determination, analysis and solution of complex problems in their professional pedagogical activity; in other words, it must prepare students for the fulfillment of their professional functions.

Within these professional functions are the methodological teaching function, the guidance, and the research. In this sense, Recarey (2004), states that the methodological function includes, among others, the following elements: the mastery of the content of the program it

teaches, the methods and techniques of the specialty, as well as the educational and guidance, namely the knowledge of the educational potential of the subject.

In relation to the investigative function, this same author states that it involves the constant search for ways and means to improve their work in all areas where mediated by the inquiry and update in the content of the subject taught.

The aspects addressed by Recarey (2004) related to the functions of the teacher become a starting point for the analysis of the ways teachers should use in their disciplines to give treatment to the research work training, and can be concretized with the action set of the disciplines of the curriculum the way of professional performance that society demands from the teachers of Chemical Biology.

Garcia and Addine (2003), cited by Páez and others (2010), consider the following as essential features of the mode of action in the pedagogical activity:

- The system and sequence of actions of a generalizing activity
- Acts based the object of the profession.
- Through it, a competent activity is modeled
- Reveals the level of skills, abilities, construct that make up their own professional identity.

On the other hand, Addine (2006), cited by Páez *et al* (2010), determined the characteristics that characterize the pedagogical professional performance mode that are presented below:

- Acts on the pedagogical process, modifies it, and perfects it from the basic tasks of educating and instructing.
- Reveals the level of skills, abilities, constructs or other ways in which students and teachers express their professional development.
- The specific and generalizing historical character of the pedagogical activity developed by students and teachers in the initial training process is evidenced, which by its nature is creative.

- A pedagogical activity is modeled projectively of the functions of the education professional (educational, communicative, didactic -methodological, investigative, overcoming and directing guidance).

All these elements must be defined in the methodological work carried out in the major, where the discipline and the year have an important role as minor subsystems that have the responsibility to organize the work of the pedagogical collective.

The disciplines vertically integrate the contents of the different subjects that compose it and, in general, respond to the logic of one or several of the sciences that are the subject of study during the major, these understood, from their pedagogical concept, incorporate other aspects that enrich it and guarantee the integral formation of the professionals.

From the perspective that this analysis is carried out, it is in line with what Horruitinier (2006) expressed when he states:

If the aim is that the major integrates as a whole actions that ensure the achievement of the most general objectives, then from the disciplines will have to also assume the treatment of certain knowledge, skills or competencies, specific to certain curricular strategies that also constitute objectives of that major. (p.45)

Being consistent with what was previously expressed it is then up to the disciplines to pay attention from their design of the research and working skills that are indispensable to the Biology-Chemistry teacher for their future professional work.

Therefore, the design of academic disciplines should take into account the influences derived from the role of the discipline in the curriculum, those of the educational strategy of the major, and the other curricular strategies.

On the other hand, the academic year is the result of the horizontal integration of the contents of the disciplines that constitute it according to the moment in which the students find themselves in their training process, and acts as a system to achieve certain objectives that exceed the scope of each of the subjects in particular.

Similar to the disciplines, the academic years also respond to certain systems of pedagogical influences, among which are those derived from the curriculum; that is, of the different subjects that make it up; the derivatives of the diagnosis and characterization of the group of students that are formed in that year and those derived from the different strategies of the Faculty and the University.

The systems of influences referred to both the disciplines and the years, have a determining influence on the design of the programs of the subjects, so, for the achievement of a coherent approach of the research work training in the analytical programs of the subjects that must take into account the following aspects:

1. The analysis of the general objectives of the discipline and of the subject in the year in which it is taught.
2. The place occupied by the discipline and the subject in the study plan.
3. The curricular strategies derived from the methodological indications of the race.
4. The potential offered by the content for the development of professional skills, determined by the major in relation to job training and research.
5. The psycho-pedagogical diagnosis of the year and the brigades that comprise it.
6. The systemic link between the academic, the labor and the investigative.

In relation to this last aspect, the ideas addressed by Bermúdez (2004) on the areas of professional training are assumed in this paper when it proposes:

In academics, the activity of study predominates in its different forms of execution: external (fundamentally materialized) and verbal; the student usually works with models or representations of the objects or processes and the relationships between the teacher, the students and between the members of the group in modeled situations of reality.

The academic component provides the theoretical and methodological elements that allow the development of skills and the formation of habits for the organization and execution of

the teaching and homework activity in which it must be focused on the professional problems that the student faces in his work and social context, therefore, as previously stated, it is necessary that the disciplines of the tasks designed allow to model the processes to which the student will face in the future.

The investigative component must provide the approach for solving the professional tasks performed by the student.

In the work aspect, the productive activity predominates in its different forms of execution; the student operates with the objectives and studies the real processes. It is related to other people of the centers where they practice.

The research is characterized by the scientific research approach and the application of scientific research in the activity that is carried out including the class.

Taking into consideration the previously discussed aspects, in the subject General Chemistry, identified as a basic discipline in the training of the Biology-Chemistry major, which general objective allows to consolidate and deepen the basic knowledge of chemical science in the students, being the first discipline taught in the specialty in the first year of the major, in other words, this discipline provides the theoretical and practical foundations of the professional work that graduates will develop and provides the platform for the rest of the chemical disciplines in the upcoming years.

All of the above allows that in the design of the two subjects, special interest it is paid to achieving an approach to its methodological and research teaching based on the guidelines issued by the major related to research training.

In this case it was determined by the major that the subjects that the students receive in the first year should lead to cooperative actions to achieve that the students characterize the community, the school, the group, the family, from the application of methods and techniques of the scientific activity that allow the approach of problems and their possible solution in the direction of the educational teaching process in correspondence with their diversity, demonstrate mastery of the chemical and biological contents that they receive in

the study plan and can establish relationships with the levels for which they are prepared, of which they can refer:

1. Use empirical methods and techniques that allow the collection of information in the spheres of action of the professional.
2. Prepare content sheets, summaries and reports based on the search and processing of information in different bibliographic sources, including digital ones.
3. Communicate the results of their independent work through the appropriate use of the mother tongue and the technical vocabulary of the subjects they receive, supported by traditional teaching-learning methods or new technologies, in some cases built by their own efforts.

The subject General Chemistry I is taught in the first semester of the first year, and is composed of the following topics: The teaching chemical laboratory; Structure of the atom; Periodic Law; Nomenclature of inorganic compounds; Chemical calculations based on chemical formulas, and Laws of chemical combinations.

It begins with the theme: *The teaching chemical laboratory* paying attention to the diagnosis of students who join the major with deficiencies in the basic knowledge of this science, a low level in the development of experimental skills and insufficient professional motivation.

Once the subject of the teaching chemical laboratory has been completed, students should achieve the assembly of simple devices used in fundamental operations of the chemical laboratory, taking into account the procedures and safety rules for working with laboratory tools in order to develop basic experimental habits for their use in professional performance.

The subject is to be taught in 14 hours, two hours of lectures, two hours of seminar, two hours of practical classes and eight hours of laboratory practices; In the first six hours the classes were dedicated to the identification and classification of the main laboratory tools, as well as the procedures and safety rules for their use, in which students are used to familiarize themselves with the experimental activities they perform in secondary school from the location of the content in the grade, unit, epigraph and the discussion of the level of

depth with which the content is treated, also to investigate the value of each of the tools used in a way that prepares for the economic training of their students.

All the above is ensured from the proper orientation of the independent work that includes the consultation in the texts used for the teaching of chemistry in secondary school.

An important moment followed by the subject for the research work training of the students was the planning from the learning strategy of the subject of the spaces in which the students could show the experimental skills reached in the subject, one of them was the activities that makes the race in the celebration of the Day of the Chemist every November 4th , and the selection of the best students to participate in the open doors as part of the strategy of vocational training towards pedagogical majors.

The quality of the presentations in these spaces is guaranteed from the creation in the brigade of several teams and the appointment of a boss who had the responsibility of selecting, planning, organizing and evaluating the activities that would make the members of his team before, during and after the activity has been carried out.

As you can see, the actions that are carried out from the subject are not only limited to getting students to assemble simple devices and demonstrate manipulative skills, but students in the development of these activities also show their communicative, organizational and aesthetic skills related to the mode of action of the professor of Biology-Chemistry.

The activities were thought and executed in a way that serves as a model of their future professional performance that gets them in an entertaining way to their methodological teaching function for which they must self-prepare in specific aspects in the technical language domain of the subject by recognizing the name of each of the tools that are used, in addition to their functions and the safety rules for their use.

From the assembly of devices and the need to explain their parts the student becomes familiar with the guiding ideas for the teaching of chemistry referring to the relationship between the properties of substances with the provision of tools and equipment in the

device, on the other hand, it serves as training for the future direction of the teaching-learning process.

The coherent way in which these activities are planned also results in the professional reaffirmation of the students from the understanding of the meaning of the realization of experimental activities for the scientific understanding of the world from the subject of which they will be professors, encourages the need for experimental activities with their students after graduation, and also stimulates their creativity by replacing some of the tools by easy-to-use alternatives.

Conclusions

The research work training is one of the aspects that should continue to be perfected in the training of education professionals. The programs of disciplines and subjects that comprise it must respond to the system of educational influences determined by the major and its design, it must constitute a space for collective discussion so that all the pedagogical experiences in its improvement can be used.

The activities designed in the different organizational forms of the subjects must be linked to the work aspects and the self-preparation of the students using the tools of scientific research, only in this way the harmonic link of the different areas of training can be achieved: the academic, the work and the research.

Bibliographic references

- Bermúdez Morris, R. (2004). Sistema de condiciones psicopedagógicas que propician el aprendizaje formativo y crecimiento personal en el proceso de enseñanza aprendizaje. En. R. Bermúdez y L. Pérez. *Aprendizaje formativo y crecimiento personal*. (pp.190-194). La Habana: Pueblo y Educación.
- Escobar Lorenzo, R. y Pérez Vallejo, J. R. (2015, ene.-abr.). La Química General como contribución a la formación laboral del ingeniero agrónomo. *Revista Cubana de Química*, 27(1).

- Fuentes, H. (2000). *Didáctica de la Educación Superior*. CEES "Manuel F. Gran", Universidad de Oriente. Santiago de Cuba.
- González Pérez, N. (2013, ene.-mar.). La práctica laboral. Escenario propicio para el desarrollo habilidades investigativas y profesionales en los estudiantes de segundo año de la carrera Psicología-Pedagogía. *Educación y Sociedad*, 11 (1).
- Horruitinier Silva, P. (2006). *La Universidad Cubana: el modelo de formación*. La Habana: Félix Varela.
- Ministerio de Educación. (2009). *Modelo del profesional de la educación de la carrera Licenciatura en educación: Biología-Química, Plan "D"*. La Habana.
- Páez Rodríguez, B.; González Ortega, A. M.; Marín Cándia, O. y Echevarría Ceballos, O. (2010, oct.-dic.). Modo de actuación y desempeño profesional: iguales o diferentes. *Avances*, 12(4). Recuperado de <http://www.ciget.pinar.cu/revista/no.2012-3>