EXEMPLIFICATION OF THE STRATEGY FOR INTERDISCIPLINARY RESEARCH TRAINING UNIVERSITY BASED ON ICT

Monica Alexandra Pozo Vinueza[1]., Mayra Elizabeth Cáceres Mena[2]., Hernán Eriberto Chamorro Sevilla[3]., Pablo Andrés Almendáriz Pozo[4] and Lida de la Caridad Sánchez Ramírez[5]

[1]Dr.C. Higher Polytechnic School of Chimborazo, Riobamba,Ecuador
[2]Higher Polytechnic School of Chimborazo, Telef
[3]Polytechnic School of Chimborazo, Riobamba, Ecuador. telef
[4]NationalUniversity of Chimborazo, Riobamba, Ecuador. telef
[5]Dr.C. Eastern University. Cuba.telef

A R T I C L E   I N F O

A B S T R A C T

An exemplification of the strategy for interdisciplinary university research training based on Information and Communication Technologies (ICT) is presented. The aforementioned strategy is based on a model of the interdisciplinary university techno - research dynamic. Hence, the purpose of this work is expressed in an exemplification of the strategy for interdisciplinary university research training based on ICT. Methods such as observation, criteria of specialists, users, as well as the pedagogical experiment were used. The exemplification distinguishes two phases the interdisciplinary techno-research culture and the interdisciplinary techno-research methodology, and is carried through an integrating project called: the eco tourist potentialities of the Canton "Chambo" belonging to the line of research: Sustainable Tourism. In each of the actions of the strategy, the development of the teacher and the student is represented, as a pattern for the execution of integrating projects with the use of ICT. It was concluded that the reception of the criteria of specialists, users and the experiment allowed to reaffirm the pertinence and feasibility of the practical proposal, which had its expression in the transformations in students and professors in the selected career.

INTRODUCTION

The university as a social institution has the mission of preserving, developing and disseminating universal, national and regional culture. In this way, it also has a significant influence on the society to the extent that the latter is reaching a greater development; However, such a purpose does not occur spontaneously (Fuentes, H. *et al*., 2011). Training is an inherent aspect of human condition, a category that is addressed by Horruitiner, P. (2010), Fuentes, H. and col (2011) and Pizzul, M. E. (2013), among others.

These authors agree when they define the term training as a process that develops with the objective of preparing an individual in a particular career or profession and that develops through three dimensions: educational, instructional and developer. Consequently, they are erected as guiding ideas in the process of formation, the link of study with work and the unity between education and education, asserted by Horruitiner, P. (2010).

From this perspective, the training process should provide the subjects with certain skills (learning), for the resolution of the problems of the profession, from the appropriation and application of various contents (Coll, C., Sarabia, B. and Valls, E., 1992, Mauri, I., 1993, Díaz,

---

Corresponding author: **Monica Alexandra Pozo Vinueza**
Dr.C. Higher Polytechnic School of Chimborazo, Riobamba,Ecuador

F. and Hernández, G., 2004), Hernández, Y. (2010), so that from the connection of the different elements of knowledge, build knowledge, as well as develop skills and values, as essential elements of the social insertion of this process, since it is based on the fundamental pillars of education, issued by UNESCO (1995).

In this way, these pillars will be (for each subject and in the course of life) the foundations for their development: learning to learn (know what, or declarative content); learn to do (know how, or procedural content); learn to be and learn to live together (know how to be or attitudinal content).

In the opinion of the authors, a higher education is required that empowers the formation of human transforming capacities in the subjects that participate in the university training processes, with the use of technologies according to the level of social progress, that enhance authentic levels of development and that at the same time, transform their contexts and incorporate the universal culture.

In this way, the deepening of socio - cultural content constitutes a process based on a systematization of the educational - pedagogical structure and on a generalization of cultural content in human beings: knowledge, skills, values, which leads to a diverse, essential, flexible formation and it arises in the essential generalization and complexity of the various factors that influence and condition the process of the formation itself. This is so, that for deepening, appropriation and apprehension to occur, systematization is required, as an essential category, which, according to the Pedagogy of Higher Education of Fuentes, H. *et al*. (2011), is the process that gives a character of continuity and continuity to training at higher levels, in the scientific construction of sociocultural content.

The systematization answers the questions why? and for what?, as it has as objectives not only the continuity, but also the replicability, understood as not letting lose the experiences of analytical appropriation, from the own experience of the participants.

In the same way, systematization reconstructs one or several experiences to explain or discover the logic of the lived process and the factors that have intervened. In this way, a first level of conceptualization is produced from the concrete practice that enables its understanding and aims to transcend it.

Regarding the above, particularly Sánchez, L. (2009) addresses the training process for the scientific research of university students and in this regard refers to different categories such as the techno-investigative systematization, stating that it has a dynamic character of said process, promote, update and sensitize students regarding the use of technological resources suitable for the development of scientific research.

That same author recreates the so-called techno-investigative content as one that covers the technological aspects and scientific research in terms of: the development of basic skills in the management of information (browsing and interacting), in the processing of digital documentation , the domain of a group of general tools related to the search, review, processing and communication of digital information, so that technology is related to ICT and, therefore, to all the contributions associated with these technologies.

In this way, the university research training seeks to develop in the students skills to think critically and creatively, abstract, analyze, discern and synthesize, deliberate on an object of knowledge from the theoretical categories of the different disciplines, contrast and verify knowledge and apply it In practice, contextualize research techniques, identify, pose and solve problems, search, process and analyze information from different sources, formulate and manage projects.

To this is added the so-called techno-investigative skills (Sánchez, L., 2009): being able to navigate and interact through computer networks for the search, location, review and processing of information in digital format, the elaboration of frames Theoretical, the novel solution to the problems that they investigate as well as the corroboration of the results with other specialists.

The author considers training for scientific research, based on ICT, as the process of obtaining scientific content, as a collaborative construction of meanings and meanings among the subjects involved, aspects that are assumed in this research.

It should be noted that for the purposes of the present investigation the problem situation is interpreted as a situation formed from a real context. From this perspective of analysis, a diagnosis was made in the courses September 2013 - February 2014, in the Engineering career in Ecotourism. ESPOCH, Riobamba, Ecuador, revealing the following insufficiencies:

- Student research work of a disciplinary nature, decontextualized and disconnected from social problems.
- Little use by students and teachers of virtual environments for the exchange of information and professional experiences, in the solution of research problems of common interest.
- Insufficient dissemination through the computer network of student scientific results, with a view to avoiding duplication of efforts in the investigations.

Hence, the present work aims to perform an exemplification of the strategy for interdisciplinary university research training based on ICT, in an integrating project, in the Ecotourism Engineering career of the Faculty of Natural Resources of the Polytechnic School of Chimborazo in Ecuador.

MATERIALS AND METHODS

Research was carried out in the Ecotourism Engineering career, Faculty of Natural Resources at ESPOCH, Ecuador. The race was selected on the basis that it is where the author of the present investigation works as a teacher.

The method of observation and the criterion method of specialists and users were used. In this case, the following

Methodology was followed

- Delivery of the summary to the participants (containing the contributions of the research), four days in advance, so that they could analyze them.
- Reception of the suggestions and concerns of the participants.
- The evaluations offered by the participants were collected as evidence of their contribution to the improvement of the research results obtained. These assessments were read and subsequently approved by the participants.

The pedagogical experiment was used. It was considered as independent variable X, the strategy for university interdisciplinary research training based on ICT. The same was applied to a subgroup of 31 students in the study race (experimental group), during a period of 20 weeks of the year 2014. The weekly frequency was three meetings of two hours each, that is, of 6 hours per week, face-to-face and non-contact hours were distributed.

It is specified that both the control and experimental groups received the same contents of the selected subjects and that the second (experimental) group also received contents of an integrating project supported by the strategy.

For the experiment, the dependent variable was: university interdisciplinary research training. Considering that this training is in correspondence with the phases of the strategy and with the evaluative criteria and achievement patterns that it contributes.

The post-pedagogical test is applied to evaluate the effectiveness of the strategy.

RESULTS AND DISCUSSION

The exemplification was carried out on the basis of an integrating project, and the actions of the professor and the student are modeled during the execution process of said project, with the intention that it serves as a guide for future investigative processes.

It was based on the diagnosis made in the career, from which the premises and requirements present in it were established, which allowed to develop the exemplification of the strategy for interdisciplinary research training of students, with the use of ICT.

Premises

- The Ecotourism Engineering career has a modern technological infrastructure that allows it to undertake the development of any project in which ICTs are involved, for the interdisciplinary research training of its students.
- The cloister has a limited pedagogical and technological culture, as well as interdisciplinary research.
- The contents of the methodology of scientific research have a place relegated in the subjects of the curricular mesh of the career.

Requirements

- Guarantee the continuous renewal of technological resources associated with the virtual environments with which the race consists (virtual classroom, virtual community of research), for the development of the integrating projects.
- Guarantee the constant updating in the virtual environments of the race, with respect to those technological tools that favor the interactivity between the subjects that participate in the training process.
- Guarantee the continuous updating of the faculty in technological, investigative and pedagogical matters to face interdisciplinary research, with support in ICT.

As a prelude and to achieve an adequate motivation of the students regarding the use of ICT, a "practical" activity was developed, specified in the forum of novelties of the virtual classroom of the career (which is supported on the Moodle platform).

The activity consisted in forming 5 groups of 6 students each and the forums were used: Technical, Social and the Wiki to answer the proposed topic: "Advantages and disadvantages of ICT in research" for which they should place the summary of the work done by the team in the specified link, to later review their qualification and make their feedback in the virtual classroom, all of which allowed to diagnose the knowledge, abilities and motivations of the students to carry out a collaborative work through the Virtual environment.

This diagnosis revealed limitations in the students when performing collaborative work as a team and in the exploitation of the technological and methodological resources of the virtual classroom and its use to respond to any academic and research situation they faced.

The students, through the forum, raised certain dissatisfactions when using the virtual classroom, arguing that the variety of technological and methodological resources is limited, since the professors only use it as an informative medium, when they mainly place documents in Word.

They stated that in general the technological training of them and of the professors themselves is a necessity.

Based on the aforementioned, of the two lines of research (Sustainable Tourism and Geomarketing) with which the Ecotourism Engineering career counts, this research is exemplified by one of the integrating projects belonging to the first line, which is described then:

Career: Ecotourism Engineering
Institution: ESPOCH, Riobamba, Ecuador
Project 1: Evaluation of the eco tourist potentialities of the Canton "Chambo". Research line: Sustainable tourism
Problem to solve:
Need to carry out a study of the flows of tourism in Canton Chambo, with a view to finding a balance in the location of tourist activities.

Participants

Teachers from different disciplines of the race: Ornithology, participatory methodologies, cartography, ICT II, English for specific purposes, cultural heritage and students of the fifth semester of the race.

Background and justification of the Chambo project, "the lady of agriculture", is a canton of the province of Chimborazo, well known for its agricultural qualities and beautiful landscapes and landscapes that make it very visited by domestic and foreign tourists.

It is located in the northwest of the province, 8 km from the city of Riobamba.

It is one of the smallest cantons of the Chimborazo Province. However, it has an important agricultural and tourist potential. Its population is 11 885 inhabitants and its average temperature is 14º C.

In relation to its economic activity, its people dedicate themselves to agricultural cultivation, mainly of vegetables, and to the manufacture of bricks.

Among the tourist attractions that stand out are: Complex the pool, Tourist Complex Pampa, Tourist Complex El Vergel, Hot springs of Guayallamba.

General Objective: To design a methodology for evaluating the tourism potentialities of the region, specifically, the capacity of this to host the practice of activities specific to ecotourism and active tourism.
Specific objectives

Evaluate the potential resources of the sector for the realization of tourist activities.⌋

Use GIS (Geographic Information Systems), for spatial analysis and the generation of cartography.⌋
Apply GIS in the planning of tourism in the sector.

We determined the cognitive nodes associated with the subjects (Participatory Methodologies, ICT II, Digital Cartography, English for Specific Purposes, Cultural Heritage, Ornithology) of the fifth semester involved in the project.

Through a cartographic image of the canton Chambo and its visualization by layers, the teacher explains to the students how the disciplines mentioned in the project intervene.

The participatory methodologies subject encourages group work and the development of communication of the main results and knowledge that students should have; ICT II allows the use of different technological tools to carry out integrated group activities; Digital Cartography refers to the management of digital cartography and geographic information systems for obtaining, storing, processing and disseminating geographic information; English for specific purposes, for comprehensive reading of authentic texts in that language and exposure of the research; Cultural Heritage, for the location on the digital map of the cultural assets of the canton studied, which favors its inventory and valuation; Ornithology, allows inventories of bird species and their characteristics, and represent them on the digital map.

In this way, students use the essential knowledge of each discipline, but use technology in the process of searching for a unique solution to solve the problem.

Methodology of work to face the problem (that guarantees the quality in the execution and the results)

- Diagnose the problem bank of the territory.
- Formulate all aspects of the integrating project.
- Establish a face-to-face and virtual link between professors and stakeholders of the Chambo canton.
- Create research groups.
- Organize and systematize the work of the research groups.
- Establish communication between the coordinators of the canton
  Chambo, the professors of the different disciplines of the career and researchers.
- Carry out the systematic exchange and continuous monitoring of the analyzes and partial results that are arriving in the research groups, to consolidate the proposals, as well as to conceive and know in depth the process to develop, decide the instruments to be used and establish a common language of domain of all.
- Develop communication among those involved in the project through videoconferences through Hangout or Skype.
- Carry out an experiential physical exchange between those involved in the project through workshops, to negotiate the application of the instruments and their processing, the preparation of reports and the socialization of results.
- Perform a continuous follow-up and direct exchange between those involved in the project, necessary for its proper development and for compliance with the established schedule.
- Carry out the territorial diagnosis.
- Carry out the tourist diagnosis.
- Establish a theoretical framework around the concepts of ecotourism and active tourism.
- Inventory the potential tourist resources of the sector.
- Create databases.
- Perform georeferencing.
- Represent different thematic maps of the sector with the information collected.
- Calculate tourist potentiality indexes.

Actions developed

1. An interdisciplinary work team was formed consisting of a methodological advisor and two technical advisors (one from the race and another from the Chambo canton).
2. The presented project and the problem were reviewed, based on the fieldwork previously carried out.
3. The problem was reconsidered and the fieldwork was reconfigured, as well as the theoretical framework of the project, defining more clearly

the object of study and formulating a categorical scheme that would serve as a guide for the construction of the theoretical framework and the methodological strategy.

4. The construction of this scheme took as a basic reference the subjects of the two academic programs involved and established as metacategories those that had the greatest impact on the project. After them the specific topics were separated, dividing them into categories, subcategories and units of analysis.

5. At the same time that progress was made in the research work, a plan was formulated and progress was made in the theoretical approach in each discipline involved in the project.

6. The progress in the research project supported the proposal of an investment plan taking into consideration the creation of a specialized consulting service of the career, in matters of environmental security, to the subjects of the canton Chambo.

In general, the following activities were carried out in the execution of the project:

- Necessary links were established between the disciplines involved in the project.
- Links were established between the teachers and staff of the Chambo canton.
- A workshop was held to establish a schedule of joint activities.
- The scientific-student groups involved with the project were organized.
- The training of students, professors of the different disciplines and staff of Chambo was organized in relation to the employment of diverse technological tools (through face-to-face and virtual meetings in the virtual classroom of the career).
- Training was developed (face-to-face and virtual) for those involved in the project.
- A meeting was held to exchange experiences among the participants in the project, raising the difficulties identified and their possible solution through the development of collaborative work among all.
- The territorial and tourism diagnosis of the canton Chambo was carried out.
- The theoretical framework was established around the concepts of ecotourism and active tourism.
- The potential tourist resources of the sector were inventoried.
- The databases were created.
- Geographical information was collected (geo referencing).
- Different thematic maps of the study area were compiled with the information collected.
- Tourist potentiality indexes were calculated.
- 2 scientific - student forums (one face and one virtual) about the project were carried out.

- The results of the project were socialized with the personnel in charge of the Chambo canton, through 2 video conferences.

These activities were socialized through the Virtual Research Community of the career (CVIECO).

It should be noted that when using the Hangouts, the Youtube channel and the information placed in the cloud, the participants in the project had to specify the respective link, to proceed with the evaluation and feedback through the network.

Once reviewed the activities via network, in the qualification session of the Virtual Classroom, the students could see their note as well as the feedback made by the tutor and other advisers, in all the process of project development.

They were given the opportunity to improve their qualification in a certain period of time, so that they would take into consideration the suggestions made, sending the link of the site in the network where they published the results of the research tasks carried out.

System of evaluation and control of the strategy

Objective: To evaluate the qualitative transformations in the interdisciplinary techno-research training, with the application of the strategy, through the verification of the validity of the actions proposed in it.

In this regard, through the option of the Virtual Classroom Survey, students were asked about the interdisciplinary investigative dynamics for integrating projects, based on the TlC.

In this regard, they literally issued criteria such as:

- The preparation that we have received from the professors in the use of the TIC in function of the investigation and with the purpose of integration of knowledge has been beneficial since the student population of the Ecotourism race is of varied origin.
- Technology allows us to work simultaneously at the same time and from different spaces from the use of my cell phone or my Tablet, even when I'm traveling to my province, it's a wonder.
- The ability to investigate in an interdisciplinary manner and with the use of technology is more attractive; you give dynamism to the investigation; it breaks with the monotony; It allows me to fix more knowledge and has aroused in me the research interest because the exchange is live and I can identify common contents of the topics that are researched and this allows me to take more time and reach consensus about which aspects each of the group can work and not wear out in the same search.
- I learned to use technology better for the benefit of research and to work as a team, since before it was tortuous, traditionalist, abstract; now it becomes more attractive, dynamic; We build new knowledge online, we store information in the cloud and it is easier to access from our mobile devices and from anywhere.

- Through videoconferences with other participants, emotions, feelings can be transmitted, human warmth is felt, the linear character of the research is eliminated and a space for investigative interaction can be created that enriches us all at the same time.
- New friendships are created, new forms of communication, new relationships, I have learned to feel respect for people who investigate and think in a different way.
- Investigate interdisciplinarily through ICT allows to establish equitable relationships between ancestral knowledge and academic scientific knowledge and in that interaction the construction of a new scientific knowledge enriched by what each culture brings.
- Being familiar with ICT and the characteristics of each of the disciplines gives us a more complete picture of how much each of them complements our professional training.
- Working on integrative projects such as "Evaluation of the ecotourism potentials of the canton" CHAMBO ", allowed me to understand how the subjects are related: in the cartographic map (discipline Digital Cartography), the birds of the sector and their characteristics are located (discipline Ornithology). In the same map, an inventory of cultural goods is made (Cultural Heritage discipline), being able to make the translation into English, using technical words of ecotourism as well as reading authentic texts in that language (English discipline with specific purposes). The exchange of information, communication via the web, use of Web 2.0 tools, (ICT II discipline) and my active participation, learning by doing (discipline participatory methodologies).

In order to assess the transformations achieved by students and teachers during the proposed dynamic, the indicators and patterns of achievement were used, which are manifested through the qualification (Excellent, Good, Fair) reached by these in the interdisciplinary university techno-research dynamic which are the result of the transformations experienced by them.

These transformations could be verified in the course of the process, by:

- The observation of their activity.
- Follow-up of your interactions, participations and construction of individual and group knowledge through virtual environments.
- Application of online test to students and teachers through the virtual community of research of the career of Ecotourism
- Diffusion of the results of each research activity in different sites of the network.

In this way, the patterns of achievement achieved by students and professors for the two evaluation indicators required (level of use of the possibilities offered by the virtual environment for interdisciplinary research and Level of initiatives and individual and collective contributions to work in the virtual environment for interdisciplinary research), showed that for both indicators, the subjects evaluated reached a grade of 4, which can be summarized as follows:

1. Level of use of the possibilities offered by the virtual environment for interdisciplinary research

Patterns of achievement for teachers

1. They managed to carry out a greater exchange of scientific information of common interest through the virtual environment, with professors from different disciplines of the Ecotourism career and related careers.
2. They achieved a better use of Web 2.0 tools for interactivity, the publication of academic materials through blogs, their Youtube channel, virtual environments and online evaluations with feedback.
3. They carried out a collaborative work via the network, which enabled them to detect and raise professional problems from different contexts of career performance, which constituted the source of the student integrating projects.

Patterns of achievement for students

1. Systematically consulted scientific texts and information of professional interest, located in the CVIECO.
2. Frequently clarified doubts with colleagues from different disciplines, using videoconferences, Facebook, Skype, among others, to undertake the solution of the professional problem raised in the project in which they participated.
3. They made frequent exchanges via network with other research groups, which allowed them to share criteria and experiences in the resolution of professional problems associated with projects.

Level of initiatives and individual and collective contributions to work in the virtual environment for interdisciplinary research

Patterns of achievement for teachers

1. Systematically checked the individual and group progress of the students in their research activity based on their work in CVIECO.
2. They made frequent updates of the bank of professional problems in the context of the career.
3. Incorporated new technological tools to CVIECO, making them available to those registered in it.

Patterns of achievement for students

1. They carried out scientific debates to solve the research problem in which they participated, from the exchange with colleagues from different disciplines (using wikis, forums and videoconferences).
2. They collaborated with information, criteria and experiences with other colleagues, with a view to solving a certain research problem.
3. They made the disclosure of the results (partial and final) of the research carried out, through the virtual environment.

The integral assessment of the transformations shown by students and teachers allowed us to conclude that they (according to the pattern of achievements) were in an intermediate state in interdisciplinary techno-research training.

As a result of the dynamics carried out, the students achieved a set of techno - investigative competences (related to knowledge, doing, being and living together), as an expression of the knowledge, skills, values and values achieved by them.

These competences are expressed as follows:

Competencies related to knowledge (Knowledge)

- To nominate the most suitable technological tools for carrying out collaborative activities, both individually and as a group in the research activity.
- To take advantage of what different disciplines can provide them in solving the various professional problems that may arise in their context, offering integral solutions to them.

Competencies related to doing (skills, abilities)

- To use the technological tools that facilitate the exchange of information and communication through the computer network with related subjects, with a view to conducting joint investigative work.
  Competencies related to being (Values, attitudes)
- To acquire responsibility in the use of technologies, based on strict compliance with existing regulations about these.

Resolve information and communication problems, as well as ethical dilemmas in digital environments.

- It should be noted that through the CVIECO, the professors of the Ecoturism Engineering career also developed techno-investigative skills in relation to:
- Collaborate and exchange with colleagues from different disciplines, performing an interdisciplinary work that takes as a basis the realization of integrating projects.
- To use methods that promote the conscious and active activity of students in the development of interdisciplinary research.
- Involving different colleagues in the student research activity, expanding the boundaries of the latter.

The results obtained in each of the phases of the developed pedagogical experiment are shown below.
The pre-test was applied and scored on the basis of the ordinal scale (2, 3, 4, 5). Subsequently, for each of the 31 students in each group (control and experimental) grades were ordered from lowest to highest. For which the Mann-Whitney no paramometric test U was used.

The hypotheses formulated were:

H o: the pre-test scores of the control and experimental group do not have significant differences with respect to their central tendency.

H A: the pre-test scores of the control and experimental group have significant differences with respect to their central tendency.

It was determined that there is no evidence to reject H0, being able to conclude that both samples belong to the same population.

Then it was analyzed if there were significant differences between the experimental group and the control group with respect to its central tendency, based on the obtained qualifications, after applying the strategy.

The level of significance that was used was $\alpha = 0.05$. In order to know if there were significant differences between the grades obtained by the experimental group and the control group, the Mann-Whitney U-test was used for unrelated samples. For these purposes, the following hypotheses were proposed:

- Ho: The grades of the experimental group students are lower or equal than those of the control group in the post test.
- HA: The grades of the experimental group students are higher than those of the control group in the post test.

The level of significance that was used was $\alpha = 0.05$, Ho was rejected.

The following aspects are summarized:

Therefore, it was concluded that there is sufficient empirical evidence in the data obtained to suggest that there are significant differences between the results of the students of the control and experimental group in the post test, the latter being significantly better, which implies a better interdisciplinary research training.

Recognize the contributions of research as a response to the problems in the interdisciplinary research activity of students, approving that the link technology - university research activity imposes the need to continue to deepen future research.

The proposed strategy is feasible to develop it in the different university careers, as well as in various institutions; However, teachers must constantly work on the methodological practice to implement it.

They assessed the relevance of the strategy developed to be applied throughout the course selected (Engineering in Ecotourism), from first to fifth year.

They recognized that the proposal can be applied in any career, not only in Ecuador but also in Cuba and other countries in which problems similar to those addressed in this research are evident.

As a result of the dynamics developed it can be concluded that the development of interdisciplinary research, with the use of ICT, acquired a meaning and meaning for students and professors of the career, becoming an important aspect to reach higher levels in the training process and therefore, in the approach of new challenges for both.

CONCLUSIONS

The presented exemplification prepares and broadens the understanding of the strategy to mitigate the limitations detected in the didactic-methodological platform and allows to overcome the contradiction between the conception of interdisciplinary research based on these technologies and its methodological approach in the university training process.

Bibliographic reference

Coll, C., Sarabia, B. and Valls, E. (1992). The contents of the reform. Madrid: Editorial Alianza Psicología.

DíazBarriga, F. and Hernández, J. (2004). Teaching strategies for meaningful learning. A constructivist interpretation (6th ed.). Mexico: McGraw Hill Intericana.

Fuentes, H. *et al*. (2011). The formation in higher education from the holistic, complex and dialectical of the construction of scientific knowledge. CEES "Manuel F. Gran", Universidad de Oriente, Santiago de Cuba.

Hernández, Y. (2010). The importance of research training in university teachers in the 21st century. Gestiopolis Retrieved February 5, 2015 from http://www.gestiopolis.com/organizacion-talento-2/importancia-formacion-curricular-docentes-universitarios-siglo-21.htm.

Horruitiner, P. (2010). The Cuban university: the training model. Havana: Editorial Félix Varela. Retrieved from http://books.google.com/books?id=TclJAAAAYA AJ&pgis=1.

Mauri, I. (1993). The school contents. Educational Innovation Madrid: Morata Editions.

Pizzul, M. E. (2013). The humanistic formation, essential end of the university. Argentina: Member of the Network of Private Publishers of the Argentine Republic.

Pozo V. M., Sanchez R. L., Cruz P. M, and Bodero P. E. (2017). The alternative collaborative research method for research training in university students. Retrieved February 10, 2018, from http://journalijces.com.

Sánchez, L. (2009). Information and Communication Technologies in the dynamics of the training process for scientific research in higher education. Thesis presented as an option to the scientific degree of Doctor of Pedagogical Sciences. Higher Education Studies Center "Manuel F. Gran", Universidad de Oriente, Santiago de Cuba, Cuba.

Schiavo, E. (2007). Scientific and technological research in the ICT field: technical, contextual or transversal knowledge? Retrieved January 7, 2015, from http://www.revistacts.net/files/Volumen 3 - N% FAmero 9 / doss03.pdf.

Schiavo, E. and Ruiz, J. (2012). Methodological strategies, collaborative learning and ICT: a case in the Latin American Complutense School. Retrieved January 8, 2015, from http://portal.uned.es/pls/portal/docs/page/uned_mai n/launiversidad/ubicaciones/03/docente/jose_manu el_saez_lopez/9 saezlopez 2012complutense_029-2011.pdf.

UNESCO. (nineteen ninety five). Policy document for change and development in Higher Education. Paris France.

****