ISSN : 1533-1520

GARDEN JOURNALS

Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

Issue 15 . No.1 2015

Developing Informational Competencies in Biology through Undergraduate Studies at the University of Havana

Soora J.

National Center for Biopreparations (BioCen). Havana Cuba.

ABSTRACT

This work aims to evaluate and train informational competencies in third and fourth year undergraduate students of the Faculty of Biology of the University of Havana. A diagnostic test was applied using SAILS for the biological sciences. It was determined, by calculating the difficulty index and the characteristic curve, whether there were difficulties in informational competencies. The subcompetencies in alert and critical states were identified using the population average; The status of each one and the differences between degrees were analyzed. The training actions carried out and the students' criteria regarding the experience carried out were described. The existence of difficulties with information skills and the need for training actions in students was detected .

Keywords : information literacy, information competencies, information competency management.

INTRODUCTION

The issue of competencies is increasingly present in university teaching. The knowledge, skills and attitudes developed by students during this training must be

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

relevant to what society needs, so that they can compete successfully in the labor market. Information-related competencies play an important role in lifelong learning.

Biology is a science that includes various disciplines that are sometimes treated independently, such as Microbiology and Biochemistry; That is why it should be considered as a set of sciences, which form the so-called Biological Sciences. The progress of basic and applied research in these areas has been spectacular since the 20th century and is currently one of the first in percentage of scientific contributions and impact in the international context.

Only with a high sense of responsibility for the selection, analysis and use of scientific information, can microbiologists, biologists and biochemists achieve an accurate understanding of the basic biological concepts and the scientific process that guarantee viable proposals for humanity.

As *Porter* (2005) expresses, "although the topic of informational competencies proliferates in the literature, there is not much research on it in the biological sciences," [1] which is why they are null in Cuban universities.

This article focuses on the evaluation and training of information competencies of undergraduate students at the Faculty of Biology of the University of Havana. The scientific questions are the following: Are there difficulties with informational competencies? What state are they in? Are there differences between the degrees? Are training actions required? What criteria do students present after the training experience?

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

INFORMATIONAL SKILLS IN THE BIOLOGICAL SCIENCES FROM HIGHER EDUCATION

Taking into account the literature, [2-6] we consider that information competencies consist of putting into action, in a context and with a specific content, the knowledge, skills and attitudes related to information.

To successfully solve problems and learn to learn, it is necessary to achieve a level of excellence in these skills. Therefore, it is necessary to put into practice a teaching-learning process that facilitates their training at the required level. Authors [7-9] address the need for these to be developed cooperatively between librarians and teachers.

Before, during and after the training stage it is advisable to evaluate competencies. Among the different existing projects for this, *Standardized Assessment of Information Literacy Skills stands out,* [10] an initiative of the University of Kent in which more than 60 institutions have participated. *SAILS relies on a multiple-choice test, based on the ACRL Standards, and item* response theory to determine how well the *test* works . The reviewed experiences [11-13] use within this theory the *Rasch* latent trait model , based on the fact that the probability of getting an *item* correct depends on its level of difficulty and the subject's level of the measured ability.

At Villanova University, in Portugal, [14] librarians together with biologists work on subjects in the curriculum where students receive training in information skills and are evaluated based on final papers and research projects.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

At Macquarie University [15,] first-year Biology students diagnostically self-assess information skills using CAUL standards, implement online training and face-to-face lectures, and then self-assess again.

At the University of Oklahoma [16] a librarian collaborates with the professor of Geomicrobiology. The ACRL standards were used for evaluation before, during and at the end of the course. At the beginning of the semester, a self-report questionnaire is distributed. *Instructional sessions are carried out that include the use of available bibliographic search tools and the OCLC's First Search , Chemical Abstract Service's SciFinder Scholar* and *Carl UnCover* databases . Each class consists of a 50-minute lecture by the teacher and where students must present an article published in the journal *Science* or *Nature* between 1982 and 1997; locate two related to the one presented (one from a non-referenced journal and another from a reference one); discuss the differences between the three documents and criticize the article. At the end of the semester, the initial questionnaire is administered again to monitor changes in students.

At the Philadelphia University of Science [1,] Cell Biology students undertake a series of assignments, with certain requirements, which have a point value and for which they receive instruction from the Faculty librarian. The first task, which is worth 50 points; It is introduced in the first week of classes, where they must read and understand an article to formulate a research topic; search for that topic in electronic and paper bibliographic sources (*Biosis, MEDLINE, Agrícola, FirstSearch, and Science Citation Index*); determine if the articles obtained are relevant to the topic; perform additional searches; refine the topic and prepare a

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

bibliographic list with a specified format. The second task, worth 50 points, is introduced 2 or 3 weeks after the first. It consists of that from the list of articles found in the first assignment, the student must choose five and prepare a written Abstract of the contents. As a third task, worth 150 points, they are asked to put together a document on the state of the art.

At the University of Maryland [17] a diagnostic survey is applied using a web interface to measure information skills. It consists of 51 questions based on the ACRL Standards. It includes types of resources, selection of tools, development of search strategies, evaluation of materials, and synthesis of information. Some questions examine opinions and understanding of copyright, as well as attitudes about information skills.

At the University of Alberta, [18] within the Biology 210 curriculum, Augustana librarians teach, for specific credits, biological studies and information literacy. It teaches about electronic resources in the specific discipline; the use of relevant databases (general and specialized, academic and popular) and the use of a specific bibliographic style (determined by the faculty of the discipline). Other initiatives are carried out, such as awards, workshops and promotional videos.

At the University of Maryland [19] the librarian helps students locate and evaluate sources of information within the General Microbiology course. At *St. John Fisher College,* [20] during the first session of an Introduction to Biology laboratory, a four-question questionnaire is applied, initiatives for the formation of informational competencies are carried out, and the same questionnaire is applied again. Instructions are given on locating a journal, on the styles and formats of each journal, on plagiarism, on finding scientific articles in PubMed and examples

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

of primary, secondary and tertiary sources are presented. Next, they are given a task where they are asked to locate an issue of *Scientific American,* evaluate the style and format, and compare it with the *Times newspaper;* search through PubMed for various topics, such as genetically modified foods, and note the number of articles returned; refine your search and take notes on a text. Finally, it is suggested that you read and sign a non-plagiarism policy.

In Abstract, the practices that appear in the literature demonstrate the carrying out of the diagnostic evaluation of informational competencies through different instruments such as: self-assessment, interview, pre-test, among others. From this, intervention is carried out to improve it, through training, conferences, guides, tutorials and web pages, both in subjects with credits from the study plan and as part of them. This last modality is the one that predominates in the literature analyzed, through joint teacher-librarian work. The training content addresses aspects related to the selection of the topic and its refinement; the characterization of the different types of information sources; locating and retrieving information on specific topics through the use of Boolean operators and term limits; the use of specific databases (*Biosis, Agricola, FirstSearch, Sciences Citation Index, SciFinder Scholar, ScienceDirect, Biological Abstracts, Zoological Record* and *Medline)* ; the evaluation of scientific articles; the preparation of summaries and the correct citation of the sources used. Once the training is completed, these competencies are evaluated based on different variants such as, for example, final projects, research projects, a oriented task, self-assessment, among others.

ISSN : 1533-1520
GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

METHODS

The research focused on undergraduate education at the Faculty of Biology of the University of Havana, as it is the governing center for teaching in this scientific area, during two academic years: 2008-2009 and 2009-2010. The degrees object of this study were the Bachelor's Degree in Microbiology, the Bachelor's Degree in Biology and the Bachelor's Degree in Biochemistry, and the unit of analysis was the students of these degrees. Those of 3rd. and 4th. years constituted the non-probabilistic sample used. Based on the literature consulted, the empirical-descriptive study was developed in several concatenated stages:

1. The application of a diagnostic test to the participating sample. [16,17,21]
2. Holding meetings with the participating sample. [1,16,20,22]
3. The application of a survey to the participating sample.

In the first stage of this work, informational competencies were studied through 14 variables or subcompetencies based on the ACRL Standards for Science and Technology. [23] For this, with prior authorization from the project manager *Carolyn J. Radcliff* , *14 items* were taken from the *SAILS test* for Biology. This was chosen because it is framed in real situations of specific disciplines. Each *item* measured an informational subcompetence; The selection of these was the result of joint work with faculty librarians (annex) . The response format for these *items* was multiple choice, where the one considered correct was chosen from more than two alternatives. Therefore, the level of measurement used was nominal, where two categories of the item or variable (dichotomous) were obtained, and the correctness was quantified with 1 and the error with

ISSN : 1533-1520
GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

0. "An *item* coded 0 indicates an incorrect answer on a skill or knowledge test...; an item coded 1 indicates a correct answer on a skill test.... These are the terms used in dichotomous scales. Many investigations have assumed the item Response *Theory* , with dichotomous scales, and most have written down the answers in this way. [24]

A pilot test was carried out with 24 students (10 times more students than items), so it was considered representative. "The authors recommend that when the sample is 200 or more, the pilot test be carried out with between 25 and 60 people...". [25]

After applying the provisional test in print, and once each student's responses had been coded, a student data matrix by *item* was constructed in Excel. With the results, the reliability of the instrument was calculated. *In this case, the slipt-halves* method was used , which requires only one application of the measurement, where the total set of components was divided into two halves and the results of both were compared. This was reliable because there was a correlation equal to 0.97 and "(…) if the instrument is reliable, the scores of both halves must be strongly correlated." [25]

Next, the test was administered in print in each group and in separate classrooms, for a total of 139 students. The representation of the courses and qualifications is shown in the table . The objective of the study was explained to all groups and similar instructions were given.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Tabla 1. Representación de las titulaciones y cursos en el instrumento aplicado

Cursos	Año	Muestra
Microbiología	Cuarto	21
Biología	Cuarto	17
Bioquímica	Cuarto	13
Microbiología	Tercero	21
Biología	Tercero	35
Bioquímica	Tercero	32
Total	-	139

With all the answers obtained, the characteristic curve of the test was constructed from the calculation of the difficulty index of an *item* D_j using the formula $D_j = A_j / N_j$ where: A_j is the number of subjects who got it right and N_j is the total number of subjects who have tried to solve it. The average difficulty was considered between 0.30 and 0.70. [26] This made it possible to determine the existence of difficulties. Next, based on the inferential statistics, with all the scores obtained, the population mean μ was estimated in a 95% confidence interval, using the formula $I(\mu) = [\bar{X} \pm Z_{1-\frac{\alpha}{2}} * \delta/\sqrt{n}]$ where the sample mean: $\bar{X} = \frac{1}{n}\sum Xi$; X = □□ = 0.05, Z □ 1.96; the variance: $\delta^2 = \frac{1}{n-1}\sum(Xi - \bar{X})^2$ yn = 139. This made it possible to determine the critical subcompetences, compare the degrees based on the status of the subcompetences (alert-critical) and analyze each subcompetence in detail using graphs.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

In the second stage of the research, meetings were held within the work practice subject, in 4th grade. year in the 2008-2009 academic year and 3rd. year in the 2009-2010 academic year of the three degrees. This subject links students to a scientific center with tutors and culminates with the delivery of a bibliographic review on a research topic. In this experience, the coordinating teachers of the subject incorporated the training of informational competencies in its programming. The thematic units that made up the training project were: information literacy in the information society; sources and resources of information in Biology; The search of information; the evaluation of information and economic, legal and social issues regarding the use of information. The resources that were used were the blackboard, the computer and the video *beam* .

In the third stage of the research, a brief survey was applied where the students expressed their criteria in relation to the meetings developed, whether these provided them with knowledge, skills and attitudes regarding the connection, interaction and use of information and whether experiences such as These would be useful in other subjects of the study plan. They also presented suggestions for future lines of work in this regard.

RESULTS

The informational competencies in biologists, microbiologists and biochemists were framed in the search for information in large collections, the storage and management of the large amount of information generated by their large-scale experiments, the creation of models with tests in the laboratory, the integration of information and communication with each other.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

In the first stage of the research (Fig. 1), the existence of difficulties with information competencies in the Faculty of Biology was generally determined, since 57% of the subcompetences studied presented medium difficulty and 36% maximum difficulty. Only one subcompetence did not have difficulties.

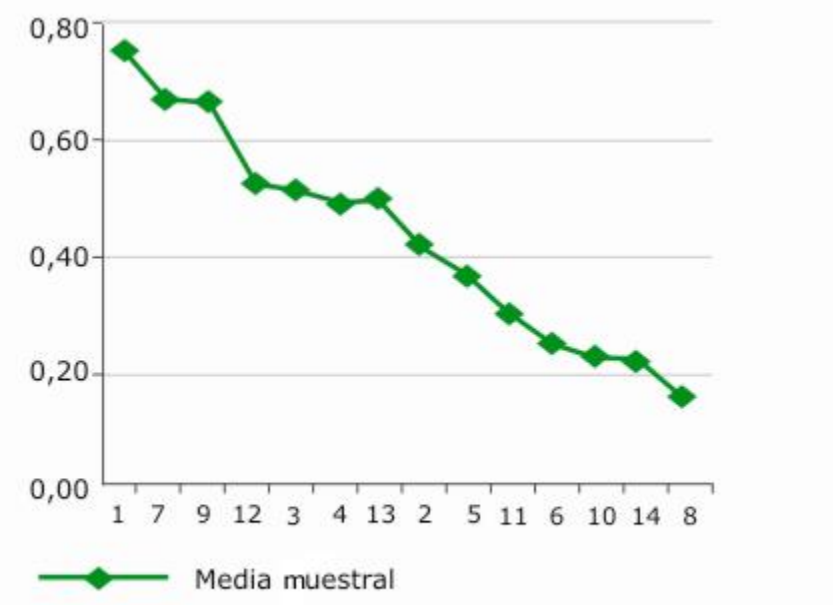

Fig. 1. Curva característica de los *items*.

When the population mean μ was calculated , within the values between 16 and 32% with a confidence level of 95%, it was observed that in those subcompetences that were presented with maximum difficulty (Fig. 1), their means were below the upper limit of this interval (Fig. 2), which were considered in critical condition; between them:

- (6): the implementation of search strategies (...).
- (8): the use of information retrieval systems... [chaotic, since its averages were below the lower limit of this interval (16%)].
- (10): the evaluation of the relevance of the materials (...).

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- (11): the understanding of intellectual property and rights (...).
- (14): Knowledge of bibliographic styles.

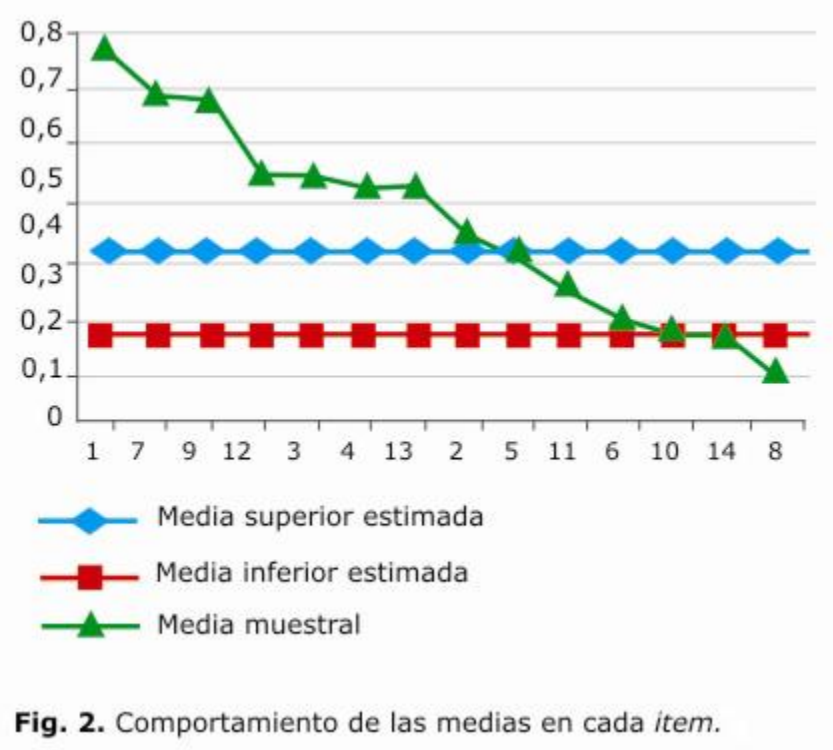

Fig. 2. Comportamiento de las medias en cada *item*.

When comparing the degrees in general, based on the status of the subcompetences, it was observed that the Microbiology degree is the one that distanced itself the most from the rest (Fig. 3).

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

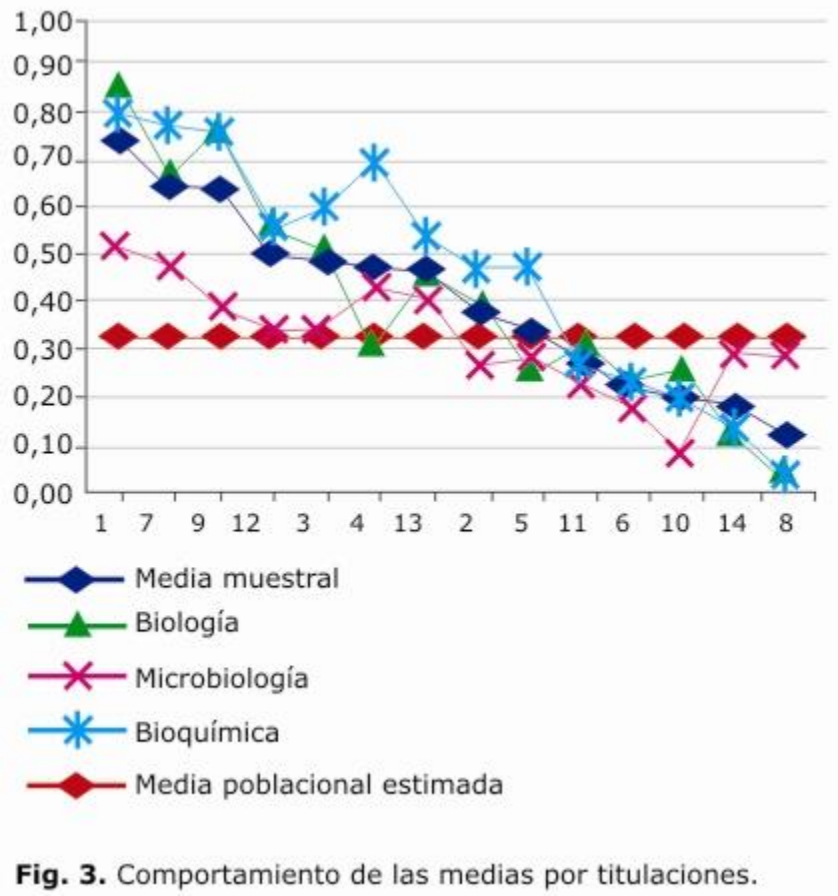

Fig. 3. Comportamiento de las medias por titulaciones.

A detailed analysis of each subcompetence showed the following results:

- 1 (identification of key terms and concepts...); 3 (knowledge of specific sources in Biology...); 7 (the use of advanced search facilities); 9 (the use of Abstract or conclusions for the main ideas...) and 12 (knowledge of accepted practices in communication...) were found in the three degrees above the estimated population average; However, in Microbiology he appeared in a state of alert.

- 2 (identification with the great variety of types and formats...) criticism appeared only in the Microbiology degree. *This result coincided with those of Ferguson* 's work , where "(…) only 20 percent (…) of respondents selected dissertations and

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

theses, and only 11 percent (…) conference proceedings. In contrast, 88 percent (…) certain websites". [17]

- 4 (determination of the availability of the required information and decision making) appeared below the upper limit in the Biology degree, and in Microbiology it appeared in a state of alert.

- 5 (knowledge of the content and organization of systems and resources) criticism appeared in Microbiology and Biology.

- 6 (the implementation of search strategies...) appeared critically in the three degrees. This result coincided with those obtained by *Ferguson* , since "66 percent (...) of Biology students indicated that they rarely or never use truncation, 66 percent (...) reported that they rarely or never use proximity operators, (...); less than 32 percent (...) use limiters infrequently or never, as well as a significant percentage of responses infrequently or never use other search techniques that include Boolean operators (...)." [17]

- 8 (the use of information retrieval systems...) appeared critically in the three degrees. These results coincided with the report from *the Center for Information Behavior and the Evaluation of Research* [27] which states that young university students think that everything is on the Web and that everything is free. *Brown* also obtained similar results when he stated that "students generally stop their search when they do not find information locally and do not use other resources." [16]

- 10 (the evaluation of the relevance of the materials...) appeared critically in the three degrees. "Some of the most difficult skills that students of the biological sciences have to learn are reading, understanding and interpreting scientific

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

literature (…) it is difficult for them to understand and digest scientific works." [1] Thus *Freeman* states that "Today, students depend (...) on online sources, but have difficulty judging whether they are academic. (...) students often evaluate the credibility of an online source by evaluating an aspect professional, for example, that there are no spelling errors. [twenty]

- 11 (the understanding of intellectual property and rights...) appeared critically in the three degrees. These results coincided with those obtained by *Ferguson*, since "(…) students are not familiar with the notion of copyright, with 33 percent (…), with the legality in the use of Internet images, with 21 percent (…) they stated that they could, without permission, make legal use of scanned photos from a magazine on their websites." [17]

- 13 (identification in the legal use of images and texts) were found above the estimated population average in the three degrees; However, in Microbiology and Biology they appeared in a state of alert.

- 14 (knowledge of bibliographic styles) appears critically in the three degrees.

In light of these results, the need for training actions for students of Microbiology, Biology and Biochemistry degrees was evident; That is why, as a second stage, meetings were held whose objectives and contents were based on the ACRL Standards for Science and Technology.

In meeting 1, the concept of information and its relationship with knowledge was explained; what the information society consists of; the importance of information literacy; What is meant by informational competencies and how the need for information is determined. Here, following *Porter*, [1] it was suggested to students, through *Current Contents*, to generate a list of current topics and consult teachers

to evaluate them. In addition, primary and secondary documentary sources of information were shown, such as the journals *Journal of Culture Collections, International Journal of Biological Sciences,* and *American Journal of Biochemistry and Biotechnology* ; The types of catalogs in the library of the Faculty of Biology were addressed; *Medline, Biotechnology and Biological Biological Abstracts* databases were introduced ; Internet portals: Microbeword *and* keyword, category, specific and metasearch engines.

In meeting 2, the structures "syntax and search logic" and "different operators and advanced searches" were worked on. Following *Porter,* [1] students were asked to prepare and execute a search strategy, where they retrieved a list of 30 to 50 articles from the last two years and, based on *Freeman,* [20] read the summaries of five articles from those recovered and determine if they fit the research topic.

In meeting 3, it was suggested how to take notes and make content outlines. The elements to take into account in written communication were addressed. Here ethical and legal issues, plagiarism, copyright were argued. The use of citations in the text and the different bibliographic standards and styles were explained. The Harvard style was used because it was indicated by the professors for the review they had to submit. *The EndNote* bibliographic manager was introduced . Some issues of oral communication were explained.

These meetings had a training support tool developed in *Exe-Learning,* which *was* structured into four topics, based on the ACRL Standards for Science and Technology. [23]

Within the third stage, the students expressed that the experience developed provided them with knowledge, skills and attitudes regarding the connection,

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

interaction and use of information. They expressed the need to train in these aspects, from the first years and in all years of the degree, as an elective or optional subject, or within other subjects. They expressed satisfaction and gratitude based on the usefulness, value and novelty of the content received and the way it was taught.

DISCUSSION

The diagnostic evaluation carried out in the Microbiology, Biology and Biochemistry degrees shows that students do not have the attitudes, knowledge and skills related to information.

Students of Microbiology, Biology and Biochemistry degrees present coincident gaps in establishing an action strategy to obtain information; the acquisition of the necessary information efficiently and effectively; the evaluation of information and its sources; understanding the economic, legal and social problems and issues regarding the use of information.

To improve the weaknesses detected, training meetings were held within a subject of the curriculum. The experience within the work practice became possible because there were groups of very collaborative teachers and the Teaching Vice-Dean's Office felt committed to the topic; However, the non-existence of a university policy in relation to information literacy and the lack of technological infrastructure negatively influence the management of these skills.

The meetings held demonstrated the benefits of training informational competencies within the curriculum; They allowed us to establish that integration is a viable way of offering training and served as a basis for the insertion proposal

with a view to curricularly locating the development of informational competencies in the undergraduate degree. Hence, it was proposed to the Faculty, for the 2011-2012 academic year, a set of elective and optional subjects in the degrees of Microbiology, Biology and Biochemistry, based on the fact that, as *Porter* points out "(...) an intervention, in itself alone, will not produce competent graduates…; equally important is the continuous and progressive development of these skills across the curriculum." [22]

If the categories according to the degree of incorporation of information literacy proposed by Uribe-Tirado are taken into account , [28] it can be stated that the Faculty of Biology is beginning to work with informational competencies, and on the way to becoming a committed faculty. with them.

REFERENCES

1. Porter JR. Information Literacy in Biology Education: An Example from an Advanced Cell Biology Course. Cell Biology Education . 2005;4:335-43.

2. Gómez JA, Pasadas C. Information literacy in public libraries. Current situation and proposals for a development agenda. Information Research [Internet]. 2007 [cited May 13, 2008];12(3). Available at: http://informationr.net/ir/

3. Pinto M, Sales D, Martínez-Osorio P. University library, CRAI and information literacy. Gijón: Trea; 2008.

4. Buschman J. Information Literacy, `New' Literacies, and Literacy. The Library Quarterly. 2009;79(1):95-118.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

5. Timmers C, Glas CAW. Developing scales for information-seeking behavior. J Document. 2010;66(1):46-69.

6. Uribe-Tirado A. Training in computer and information skills at the University of Antioquia. A work on three fronts in search of multiliteracy. Seminar "Lessons learned in information literacy programs in Latin America." INFO Congress; 2012 April 16-20; Havana Cuba.

7. Tovoté C. Information literacy and libraries in Scandinavia and the world. International Meeting on Development of Information Skills [Internet]. 2006 [cited March 13, 2008]. Available at: http://www.uacj.mx/dhi/DHI.html

8. Dotan G, Aharony N. Information literacy roles of library media specialists in high schools: Israeli perspectives. Journal of information literacy [Internet]. 2008 [cited April 27, 2009];2(1). Available at: http://jil.lboro.ac.uk/ojs/index.php/JIL/

9. Martin J, Birks J, Hunt F. Designing for Users: Online Information Literacy in the Middle East. Libraries and the Academy. 2010;10(1):57-73.

10. SAILS. Information and Training Session. ALA Annual Conference [Internet]. 2007 [cited December 25, 2008]. Available at: https://www.projectsails.org/pubs/2007ALAannual/2007.ALA.Annual_presentation.pdf

11. University of Guelph. Results of the Standardized Assessment of Information [Internet]. 2008 [cited August 15, 2010]. Available at: http://www.lib.uoguelph.ca/services/information_literacy_&_instruction/information_literacytesting/components/documents /SAILS_UG_results_2008.pdf

12. University of Jackson. Results of the Standardized Assessment of Information [Internet]. 2007 [cited August 15, 2010]. Available at: http://www.jsums.edu/jsuoaa/assessment/web2010_2/resources/docs/institutionwidestudentassessments/SAILS%202007.pdf

13. University of Weber. Results of the Standardized Assessment of Information [Internet]. 2003 [cited August 15, 2010]. Available at: http://faculty.weber.edu/chansen/SAILS/SAILSweber.pdf

14. Bowden TS, Dibenedetto A. Information literacy in a biology laboratory session: an example of librarian-faculty collaboration. Research Strategies . 2001;18:14-39.

15. Vickery S, Cooper H. Confidence or Competent? auditing information literacy skills of biology undergraduate students [Internet]. 2002 [cited March 11, 2002]. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.125

16. Brown C, Krumholz LR. Integrating information literacy into the science curriculum. Coll Res Libr. 2002;63:111-23.

17. Ferguson J, Neely TJ, Sullivan KA. Baseline Information Literacy Assessment of Biology Students. Reference and User Services Quarterly; 2006;46(2):61-71.

18. Goebel NE, Neff PJ. Information literacy at Augustana. Communications in Information Literacy [Internet]. 2007 [cited: June 3, 2008];1(1). Available at: http://www.comminfolit.org/index.php/cil/article/view/Spring2007AR1/30

19. Smith A. Information Literacy: A Collaborative Endeavor. CTE: Teaching and Learning News [Internet]. 2009 [cited: January 30, 2010];18(4). Available at: http://www.cte.umd.edu

20. Freeman E, Lynd-Balta E. Developing Information Literacy Skills Early in an Undergraduate Curriculum. College Teaching. 2010;58(3):109-15.

21. Pinto M. An Approach to the Internal Facet of Information Literacy Using the IL-HUMASS Survey. J Acad Librar. 2011;37(2):145-54.

22. Porter JA, Wolbach KC, Purzycki CB, Bowman LA, Agbada E, Mostrom AM. Integration of Information and Scientific Literacy: Promoting Literacy in Undergraduates. CBELife Scien Educ. 2010;9:536-42.

23. ACRL Information Literacy Standards for Science and Engineering/Technology. The ALA/ACRL/STS Task Force on Information Literacy for Science and Technology [Internet]. 2006 [cited June 10, 2007]. Available at: http://www.ala.org/ala/acrl/acrlstandards /infolitscitech.htm \

24. Wright BD, Stone MH. Design of better tests. Mexico: sn; 1998.

25. Hernández-Sampieri R, Fernández C, Baptista P. Research Methodology. Mexico: McGraw Hill; 2000.

26. Abad FJ, Garrido J, Olea J, Ponsoda V. Introduction to psychometrics. Classical Test Theory and Item Response Theory. Madrid: Autonomous University of Madrid; 2006.

27. CYBER. Information behavior of the researcher of the future: A CIBER briefing paper [Internet]. 2008 [cited March 14, 2009]. Available at: http://www.bl.uk/news/pdf/googlegen.pdf

28. Uribe-Tirado A. Information literacy at the university: description and categorization according to the levels of integration of ALFIN: case of the University of Antioquia. Rev Interam Bibliot. 2010;33(1):31-83.

ISSN : 1533-1520

GARDEN JOURNALS

Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

Design Of A Model For The Evaluation Of The Quality Of Services In University Libraries

Fatima A. Rahman,

Faculty of Law, National University of Singapore, Singapore

ABSTRACT

The quality of services in university institutions constitutes a key element for the development of the multiple activities they offer, which affects the obtaining of information and knowledge by the members of the organization. This work aims to offer the design of a model for the evaluation of the quality of services in university libraries in the province of Camagüey, appropriate to the characteristics of each institution. For this, documentary analysis methods, analytical-synthetic and modeling methods were applied, as well as direct observation techniques, written and electronic communication, personal and impersonal documentation and experimentation. The population chosen in this research grouped both people related to the provision of library services and users of the academic and scientific community of the six university libraries in Camagüey. The new model is made up of a computational tool, with a system of indicators and operations that facilitate the work of the specialist in charge of carrying out the internal self-assessment of library services in universities.

Keywords: university libraries, services, evaluation, quality.

INTRODUCTION

The university of this millennium is an industrial complex of information and knowledge that is required to assume a new paradigm to guarantee new social commitments. In it, the library constitutes the space where the information

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

resources necessary for the generation of new knowledge are organized. These information centers must undertake a transformation process not only to adapt to the digital age and all the changes, but also to not lose their central position in the provision of quality information.

The mission of the university library is to provide efficient and quality information services, aimed at satisfying the training and information needs of its academic and scientific community through collections, infrastructure and human resources that, in sufficient quantity and quality , contribute to the achievement of the teaching, research and extension objectives of the institution.

It is important to highlight that in the current context of the European space, Higher Education is witnessing a new mission and dimension of the university library as a systemic, complex, flexible organization with the capacity to adapt to new teaching/learning models, more versatile and personalized, focused on the transfer of informational skills and competencies for decision-making and for the use, exploitation and dissemination of information . [1]

As is known, the educational system and its information institutions in Latin America and the Caribbean are immersed in a scenario where radical changes are manifesting; It seeks to design and incorporate administrative strategies that achieve the efficiency and profitability of your organization, and with this the satisfaction of the demands of information services and products.

In the midst of the global trend, Cuba, with an appreciable development in education, is preparing to raise its quality. An educational system completely financed by the State, which rests on the continuous training of the new man, places special interest in higher education and within it, scientific-technical

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

information, generating knowledge. There is constant research and the information needs are constantly greater, which makes Cuban university libraries a key axis for progress . [2]

University libraries no longer have only printed materials; The electronic medium constitutes an impressive support for the transmission of scientific, technological, and humanistic knowledge, due to the high degree of information concentrated in the network of networks and the high added value represented by online databases and catalogs. In this new framework, a more dynamic, creative and unified action is required from these institutions as a portal for the information resources that this type of teaching requires.

Quality in libraries, as in any organization, cannot be achieved without executing evaluation processes; that is, without carrying out certain controls, activities, actions, that allow value criteria to be issued on the overall work that is carried out . [3]

It is required that the evaluation of each and every one of the library's activities is essential; However, the services are where the needs of users are reflected. Therefore, the evaluation of this activity takes a predominant role and is considered an important instrument to determine how effective the library is, as well as to identify its expectations and, based on the results, look for alternatives that allow it to overcome its weaknesses. .

Evaluation implies, therefore, a development program, its monitoring and rethinking to find quality and increase library levels, always based on the users served. [4] Currently there is a trend towards the evaluation of services, but not only from the subjective aspect, but also focused from the point of view of their quality.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

The services of the university library are the reason for the institution's existence, as they provide support for its functions. The evaluation of each and every one of your activities is unavoidable; However, services are where the needs and expectations of users are manifested. Therefore, the evaluation of this activity takes a predominant role and is considered an important instrument to determine how effective the library is, as well as to identify its expectations and, based on the results, look for alternatives that allow it to overcome its weaknesses. .

Addressing the issue of evaluating library services in Cuban university institutions becomes difficult, since there has not been enough interest to evaluate their quality with all the rigor that is required.

The information obtained from statistical data is viewed from a quantitative perspective partially associated with the objectives and goals of the library. The evaluation had focused more on what one had, as opposed to what one did, so quality was focused on the collection, not the services.

PROBLEM SITUATION

Among the reliable peculiarities that show the existing insufficiencies regarding the aforementioned topic, we can point out: the lack of national applications that directly promote, in higher education, the certification of libraries; the omission of the administrative and operational aspects necessary to provide the user with excellent services; the lack of a culture of evaluating the quality of services, as well as the lack of knowledge of the tools to carry out this process, the use of which is feasible and profitable for the system that is intended to be evaluated. From this

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

perspective, it is difficult to demonstrate the importance of evaluating the quality of library services as a strategic activity to support all undergraduate, postgraduate and extension programs offered by the university.

This work aims to study the existing experiences in the European context regarding the evaluations of library services, and accordingly create tools that contribute to the improvement of said evaluation in the university institutions of Camagüey. For this purpose, it is proposed to carry out a critical analysis of the bibliographies and specific sources of information on the evaluation of library services; identify the possible contributions of European systems for evaluating services in university libraries to take them into account in the Cuban reality, and design tools that allow the improvement of the evaluation of library services in the country's universities.

METHODS

To achieve the proposed objectives, the following methods were applied:

- *Document analysis* : this method has made possible the knowledge and application of standards, models and resolutions established for the evaluation of the quality of services in university libraries, extraordinarily important aspects that idealize the design of an evaluation scheme adjusted to the Cuban reality. A large number of information sources have been consulted, including books, brochures, magazines, ISO Standards (90005, 9001,11620) , [5-7] databases such as the E-LIS, the ANECA websites, SCONUL, REBIUN, ARL, EFQM, as well as the sites of several Spanish universities, among which the University of Salamanca and the University of Granada stand out. Academic search engines such as DOIS, DIALNET and EBSCO have also been used.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- *Analytical-synthetic* : this method has been used in two important stages:

a) *Literature consultation* : once the sources of information of interest were physically located, they were consulted. Only those that turned out to be useful for the work were selected. The information has been analyzed and compared with that obtained from various sources; In some cases, its validity, accuracy and reliability have been evaluated, and relevant texts have been highlighted.

b) *Extraction and compilation of information of interest in the literature* : several ideas were extracted, the reference was summarized and parts of the documents consulted were reproduced verbatim. Care was also taken to capture the complete reference from which the information was extracted for the various sources: books, magazine articles, works presented at symposiums, theses and other documents.

- *Modeling* : in this research the modeling method was used for the idealization of the theoretical model that serves to clarify the problematic situation presented in the introduction, and for the modification of the research object and specification of the evaluation model that influences the resolution. of the problem posed.

In addition to the methods described, several techniques were used that facilitated the collection and analysis of information on facts, data or opinions that have served to clarify the problem and obtain the expected results. In this research, the following techniques were used: direct observation, written and electronic communication, personal and impersonal documentation, and experimentation.

POPULATION AND SAMPLE

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

The population chosen in this research grouped both people related to the provision of library services and users of the academic and scientific community of the six university libraries in Camagüey. In figure 1 These academic institutions are represented, in which the information centers on which the results of this study are intended to be generalized are located.

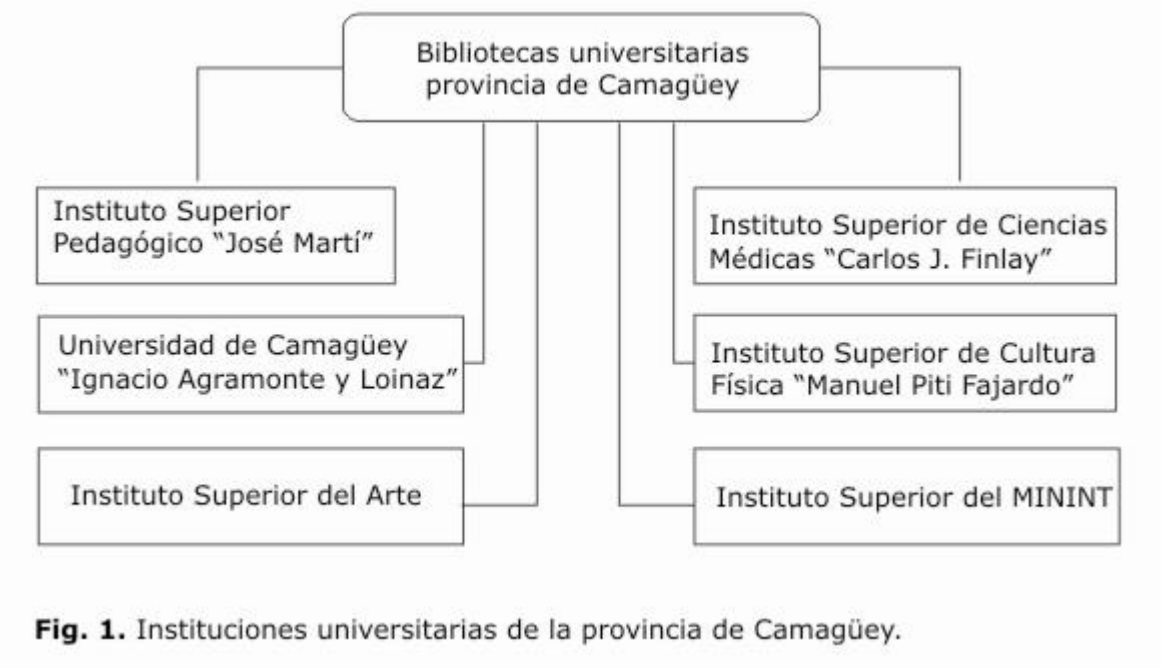

Fig. 1. Instituciones universitarias de la provincia de Camagüey.

The type of non-probabilistic sample was selected, since the choice of elements does not depend on probability, but on causes related to the characteristics of the researcher or the person conducting the study.

The selected sample belongs to the Information Management Center of the University of Camagüey. Currently, this center represents the largest in the territory; It has a CGINFO Node, a Cyber Room and two divisions: library and specialized services. It also constitutes a teaching unit for the Library and Information Sciences (BCI) and History careers. Its library offers a large number

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

of services to the university and scientific community, as well as to the business sector of the province.

RESULTS

SYNTHESIS OF REVISED MODELS FOR DESIGN

Currently, it would be difficult to conceive the performance of teaching, research and dissemination of culture carried out in universities if the information is not available at the right time and in the appropriate way, according to the various requirements of the users who Is attended. For this reason, the evaluation of library services takes a predominant role and is considered an important instrument to determine how effective the library is, as well as to identify its expectations and, based on the results, look for alternatives that allow it to overcome its points. weak. There are several models that are used to evaluate the quality of services in university libraries. Among the most commonly used are: SERVQUAL, LibQual+ ™ and EFQM, which were taken up in this research due to the valuable results that have been obtained from their application and are described below:

- *SERVQUAL Model* : [8] *Its* objective is to identify the difference between the user's expectation in relation to the quality of a service and their opinion regarding the services offered by the library. It constitutes a flexible, broad and generic evaluation instrument, aimed at the macro assessment of the library's performance and not to evaluate specific services. It is based on the premise that all users have an expectation of the quality of the service offered to them.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- *LibQual+ TM Model* : [9] allows observing the quality of services taking into account the data provided by users on their perceptions regarding the services received in information units. A comparison is established between users' previous expectations and the performance that they will actually perceive from the service.
- *EFQM Excellence Model* : [10] developed by the *European Foundation for Quality Management* , is aimed at the total quality of the organization and its continuous improvement. It is a flexible model that can be applied to any organization and allows it to be evaluated partially or completely. It contributes to developing action plans and establishing work methods aimed at achieving excellence in the organization, which are developed as a result of the self-assessment process carried out.

The models used to evaluate the quality of university libraries present very positive and important aspects when establishing a final evaluation of the performance of this type of institution; Hence, one or the other is used interchangeably but, without a doubt, the most used is the EFQM, 2010.

In Spain, library evaluation processes are carried out with increasing regularity based on this model, as a consequence of the agreement signed between EFQM and ANECA (National Agency for Quality Assessment and Accreditation) , [11] where the latter has initiated an evaluation program for university services and management units based on this scheme, which is based on self-assessment and defines the parameters that must be kept in mind to evaluate the degree of maturity of the organization's management system.

Taking into account the above, and as part of the doctoral program in Documentation and Scientific Information taught jointly between the Universities

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

of Granada and Havana, the aim is to design tools for the evaluation of services in university libraries in Camagüey.

To carry out this work, they carried out exchanges with renowned authors and specialists, national and international, in the field of Library Science and Information Science, among which the following stand out: Dr. José Luis Rojas *Benítez* , Dr. *Amed Leiva Medero* and Lic. *Elena Mojena Sánchez* , for the Cuban side; and Dr. *María Pinto Molina* and Dr. *David J. Guerrero Quesada* , for the Spanish part.

The recommended bibliographic materials, as well as the opinions made by these personalities regarding the initial proposal of the library services evaluation model, contribute to the improvement of said model, the result of which is presented in this research. The libraries of the University of Havana and the Universidad Central de Las Villas "Martha Abreu" were also visited. Experience was exchanged with the staff who work there regarding the subject of evaluation of library services.

DESIGN OF THE ECSB-UC MODEL (QUALITY EVALUATION OF LIBRARY SERVICES-UNIVERSITY OF CAMAGÜEY)

It is a practical model, whose fundamental concept is self-assessment based on a detailed analysis of the essential aspects that affect the quality of library services. It focuses attention on the institution's ability to satisfy its users in relation to its products or the service itself. The ECSB-UC model (assessment of the quality of library services-university of Camagüey) gives a privileged place to the processes

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

carried out by the management team in its actions on the planning of policies and strategies to obtain excellent levels of performance in the services librarians, whose innovation is fed back, which guarantees continuous improvement. The evaluation of the quality of library services is carried out taking into account three fundamental guidelines, as shown in Figure 2 .

The left part of the model evaluates all the documentation (objective evidence), which justifies the existence of policies and strategies that the management team develops through processes to achieve the organization's mission, and how these leaders promote a culture of quality in the provision of services. services. The evaluation at the center of the scheme is carried out taking into account the perception measures of both leaders and users and staff. In the first case, the aim is to know how the management team determines the degree of satisfaction of users, staff and the academic and scientific community; The full potential of the people linked to the provision of the service is used and their management style is encouraged to achieve the mission of the information institution in the context of the mission of the university. In the second case, the aim is to evaluate the role of leaders based on the criteria that emanate from users and staff. On the right, the effectiveness of the service provided is evaluated taking into account the behavior of the selected qualitative and quantitative indicators, the results of which are graphed in the *ECSB-UC (1.0)* Web tool .

Model Interpretation

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

For the interpretation of the model, it is proposed that the quality of library services (CSB) is proportional, fundamentally to the average of the sum of the qualities presented by three of the means that are contemplated in it: the quality of the processes (CP) carried out by leaders to enforce the mission, vision and objectives of the information institution; the quality of the librarian and the specialists who indirectly participate in the provision of the service, that is, the staff (CBE); and the quality of material and information resources, represented by infrastructure and collections (CIC), respectively.

As seen in mathematical expression 1: $CBS = \frac{1}{2}\left\{\sum_{i=1}^{n} CP + \frac{1}{2}\sum_{i=1}^{n} CBE + CIC\right\}$ (1), processes are assigned supreme importance in the conceptual field of quality means. This expression also establishes the directly proportional relationship between the elements that make up the model, which explains that the better the results of CP, CBE and CIC, the higher the quality of library services (CSB). To assess their behavior, the following rating is given: high-very high, from 4.50 to 5; satisfactory, from 3.50 to 4.49; medium-fair, from 2.50 to 3.49; low-bad, from 1.50 to 2.49; very low-hypothetical, from 0 to 1.49. These scales allow us to determine globally what level the quality of the library service is at. This does not limit the continuity of the study, but rather determines the impact of each of the media on the results.

Application of the model with the help of the ECSB-UC Software (1.0)

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

The ECSB-UC (1.0) software is a Web tool that aims to automate the evaluation activities of library services in the academic institutions of the Camagüey territory, consolidated in the Java programming language and included within international standards, which will allow a rapid, robust and secure development to specialized personnel for the evaluation process. This tool is made up of a system of indicators and a set of processes that range from the generation of information to be used for the evaluation of services to the actions that must be established for continuous improvement. It also enables the interaction of the evaluator with the users, which facilitates the application of techniques for collecting data and opinions that allow knowing the degree of satisfaction with the services. Among the main objectives pursued with its implementation, the following stand out:

- Determine the percentage of achievement of the information institution in relation to the quality of the library service taking into account the average score of the criteria of the evaluation model.
- Know the behavior or trend over time of the supply, demand or use of the service based on the weighted average of the different factors related to: the provision of infrastructure and personnel, funds, computerization, in-person use, the loan, the use of electronic resources and the interlibrary loan service.
- Determine the weak points that affect the quality of the library service so that timely corrective measures can be implemented.
- Record compliance and quality of objective evidence.

ISSN : 1533-1520
GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

DISCUSSION

The challenge of continuously improving the levels of service provision to users of the academic and scientific community requires appropriate evaluation instruments and tools, as well as the application of reference models that in themselves represent a challenge in its adaptation and implementation.

The adoption of the ECSB-UC Model for the evaluation of the quality of services in the academic information institutions of the Camagüey territory will help to measure and evaluate their performance, beyond the information provided by statistics. The diagnostic capacity that this model presents will anticipate some weak points in the evaluated libraries, mainly those related to processes (difficulties with the acquisition and supply of documents); with human resources management (especially with regard to the non-existence of adequate personnel in number and diversity to provide services that satisfy the requirements of the academic and scientific community, the lack of training programs and continuous training for the staff and users); with alliances *and* resources (insufficient management with external collaborators, frequent absence of a clear collections policy that values their use for learning and research, as well as new forms of electronic access to information); or with leadership (lack of communication mechanisms and teamwork methods that stimulate human relationships and solve problems). In this sense, the systematic and periodic use of the ECSB-UC Model by the management team will allow the establishment of improvement plans, based on objective facts and the achievement of a common vision on the goals to be achieved and the tools to be used.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

For its part, the ECSB-UC Web tool (1.0) has an integrative vision of the evaluation process and has the capacity to adapt to any information center that wishes to carry out said process with quality, under a collaborative environment of managers and the rest. of the institution's staff. Within this capacity is the possibility of adding, in addition to the quality factors (service supply and demand or use), a third factor: the economic factor, when conditions warrant it. It also makes it possible to insert the analysis of the criteria related to the results in the university and academic community, without affecting those that relate to the user and the staff, which are part of the software, and which serve as a basis for decision making and continuous improvement of the service provided. Within the aforementioned design, the use of a database generated from expert judgment can be highlighted, which can provide immediate solutions to the weak points detected by the evaluation specialist.

It is concluded that Cuban university libraries need a new perspective on evaluation that allows them to know the satisfaction, preferences and expectations of users. The systematic evaluation of library services strengthens the links of the library with its users and with the University.

The tools presented offer the possibility of evaluating different vital aspects related to the offer and use of services, and even with those activities that, although today Cuban university libraries do not have real possibilities of evaluating, correspond to the current trends of the context. European.

REFERENCES

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

1. Pinto Molina M, Balague N, Anglada L. Evaluation and quality in university libraries: Spanish experiences between 1994-2006. Rev Esp Scientific Document. 2007;30(3):364-83.

2. Sánchez Vignau BS . Strategies for change in the computerization process of the University of Havana. Acimed. 8(2):140-48 [cited June 14, 2013]. Available at: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1024-94352000000200006&lng=es

3. Duque Torre *s* D, (2008) Proposal for an evaluation tool for the network of Cuban public libraries. Thesis to opt for the Master's degree in Library and Information Sciences. Havana: Faculty of Communication, University of Havana. p. 32-4.

4. Rojas Benítez JL. (2001) Tools for the evaluation of information services in Cuban institutions . Thesis to opt for the degree of Doctor in Information Sciences. Havana: Faculty of Communication, University of Havana. p. 157.

5. ISO 11620 Standard. Information and documentation. Indicators of library work. Geneva: ISO; 1998.

6. ISO 9000 Standard. Fundamentals and vocabulary of quality management systems. Certified translation. Havana: Normalization Office. Geneva: ISO; 2005.

7. ISO 9001 Standard. Quality Management System. Requirements: certified translation. Havana: Normalization Office. Geneva: ISO;2008.

8. Grudiz L. Measuring the quality of a service: the Servqual model [Internet]. 2011 [cited October 15, 2012]. Available at: http://abc-calidad.blogspot.com/2011/05/servqual.html

9. Asemi A. Kazempour A, Rizi H. Using LibQUAL +TM to improve services to libraries. A report on academic libraries of Iran experience. Follow The Electronic Library [Internet]. 2010 [cited May 22, 2012]. Available at: http://www.deepdyve.com/lp/emerald-publishing/using-libqual-tm-to-improve-services-to-libraries-a-report-on-academic-5ARoToenrm

10. European Foundation for Quality Management. EFQM Excellence Model [Internet]. 2010 [cited February 5, 2012]. Available at: http://www.slideshare.net/repodoc/5-el-modelo-de-excelencia-efqm

11. ANECA. Institutional Evaluation Program. External Evaluation Guide. Madrid: ANECA; 2006.