

SKILLS DEVELOPED BY STUDENTS OF THE BIBLIOGRAPHY RESEARCH

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Abstract

The process of teaching and learning on post-graduate courses should cover the ability to stimulate the academic environment through research and investigation, encouraging teachers and students to take a constructive attitude that challenges academic-scientific productivity. For scientific ability and the maturity of built knowledge to take place, the incentive to undertake research is fundamental, as is the corresponding mastery of electronic instrumentation and technologies. In this sense, the Library Service of the São Carlos School of Engineering of São Paulo University, in partnership with the Department of Mechanical Engineering has offered formal and specific training since 1995, within the User Education Program in the proper use of available information resources. This enables students to plan and carry out bibliographic research and to undertake various kinds of scientific work. This covers checking the skills attained by the students who take the SEM 5892 Module – Bibliographic Research in Mechanical Engineering in terms of using correctly technical documentation standards in force in Brazil. The sample was taken from students who took the module in the first and second semester of 2005 and who responded to questionnaires sent by e-mail used in data gathering. The instruments used in the evaluation of skills attained followed the instructions and guidelines for social research methodology. The questions asked were to do with ideas for devising projects; development of research methodology, norms used for structuring and presenting scientific papers. It was observed that the lack of formal guidance for students to suitably develop the technical skills for scientific research could cause difficulties in, amongst other things, carrying out the bibliographic survey from Brazilian and foreign sources and in mastering the use and application of the norms of writing and in the preparation and presentation of academic papers. The data gathered presents a positive result that points out the advantages obtained by students who took the module and provides contributions that justify the implementation of

similar initiatives for incoming students in twelve post-graduate Master and Doctorate programs at the São Carlos School of Engineering at the University of São Paulo.

Key-words: Technical Documentation Standards; Bibliographic Research – skills; User Education Program.

1 Introduction

The challenge to facilitate initiatives in order to increase the level of researches and the knowledge generated through the under-graduation and graduation courses in the São Carlos School of Engineering (EESC) of São Paulo University (USP) has been taken by the team of librarians of the reference section of the service of library (SVBIBL) of the school, as members of one of the greatest educational systems of Latin America.

[4] points out the bibliographical instruction as an extremely important element, which goes beyond the services offered by the university library and constitutes a characteristic of the teaching program, where the participation of students may change the behavior or performance, obtaining higher accomplishment in the location of the necessary materials in order to carry out in an efficient way a course work.

Nowadays, the educational unit serves to a community of 1745 enrolled students in 12 graduation programs, 1713 students enrolled in 10 under-graduation courses and actively contributes to the scientific production, having published, only in the year of 2004, 973 scientific articles, in Brazil and abroad [8].

The graduation in Mechanical Engineering at EESC counts with the subject “SEM 5892-Bibliographical research”, belonging to the user education program of the SVBIBL and it has the following objectives:

- Confirm the importance of observing logical methodology in order to have access and apply the actual knowledge and , with its use confirm the originality of their academic contribution avoiding unnecessary duplication or repetition;
- offer methodological subsidies to achieve the best level of quality in the academic documents which result from the master and doctor degrees work;
- propitiate higher skills in the access to the essential information for the research in graduation level and in the finding of documents;
- enable the mastery and skill for the writing of academic work of “literature and /or bibliographic review” and reports of “state-of-the-art”;
- provide subsidies for the planning, execution and management of research.

According to [7] the presence of the subject is justified for offering conditions so that the work presented by the graduation students contain, besides a normalized structure, the quality which is expected in works of this kind:

- a. Access, analysis and evaluation of the knowledge in engineering: Brazilian and international situation; types of institution, activities and programs of service: library, documentation and information services, databank and database in Brazil and abroad;
- b. structures and types of documental, numerical and cadastral information in information systems (database and databank); analysis and evaluation of the formal knowledge- documented, organization of its structure and synthesis (abstracts, tables, charts, cadastral sheets); access and search methods; categories and types of specialized documents;
- c. Thematic delimitation of research, through terminology determination; describers, keywords, sub-areas of subject: planning and organization of specific specialized information systems; thesaurus glossary and index;
- d. Documentation standardization; standardizing institutions; presentation of periodical articles, congress works, reports, references; abstract writing;
- e. Review of literature and state-of-the art reports; evaluation and analysis of this type of documents, organization and writing orientation; organization of quotation and notes;
- f. Structure and writing of dissertation and thesis: introduction body and complement of these documents; analysis and evaluation of samples of these type of material and documents elaborated in Brazil and abroad.

This way the methodology of research taught to the students at EESC constitutes a valuable tool to the search of knowledge in the areas of engineering and architecture, as an auxiliary subject in the course and its accomplishment

depends on the use that is made of it by all the individuals involved in the teaching, research and extension processes.

It is appropriate in this moment to evaluate the effective skill acquired by the students who have taken the subject, under the technical responsibility of the library service using the 50 students enrolled in the first and second semesters as samples.

2 Evaluation

It is expected that the teaching and learning processes in the graduation courses stimulate the ability to make the academic environment dynamic through research and investigation activities, stimulating teachers and students to consolidate a posture that is both constructive and critical of the scientific-academic productivity. However, in order for the scientific competence and emancipation of the built knowledge to occur, it is fundamental that the research and the mastery of electronic and technological instrumentation be stimulated as well as the ethical conscience of its use.

But how to access whether the obtained results are the ones aimed at?

How can the quality of performance of this activity for the academic community be measured?

[4] proposes some reasons for the library administrators to evaluate the offered services, amongst them it is included: to establish a scale that measures the level or performance of a service or product; to compare the performance of several libraries or services; or to justify its existence or identify possible causes of low performance. The evaluation, however, is only justifiable if carried out with the specific objective of identify means to improve its performance.

In the case of the evaluation of this subject in question, where it is proposed to measure the results obtained by the enrolled students, it is expected that changes in habits and behaviors are presented in their academic life in relation to the others. In this sense, according to [4] “[...] if the learning evaluation is difficult, the evaluation of behavioral change in students constitutes a problem which is even bigger [...]”. It goes beyond the learning by itself reaching the application of the acquired knowledge. The obvious concern in this evaluation is to find out how the students benefited in long term, with the participation.

It is also possible to add that the evaluation of this process is considered and important thematic in the field of Educational Science, and the investigation in this area is quite extensive. The evaluation is not something exogenous to the teaching-learning process, nor is it independent of the several components which involve the same process. It must be holistic (analyzing the several intervenient in the teaching-learning process), it must take into consideration the different perspectives and interpretations of the several actors, and it must also contribute to the analysis of its own evaluation.

It is in this sense that [1] declares that it is necessary the development of an evaluation system which corresponds simultaneously to an information process, resource analysis, support to decision and enriching of schools or libraries, as it is in this specific case.

The evaluation must, therefore, not only take into consideration the whole process and all the intervenient but also help to promote the improvement of its quality. This way, this study sees an evaluation as a process and as a system [6] that is how it must be: integrated (it is a part of the comprehensive and meaningful learning process, enabling a critical dialogue among students about the problems they face in accomplishing their tasks); holistic and globalizing (interested in the intellectual aspects of the student as a person and in dimensions such as affective, social and ethical); continuous (tries to develop a process of reflection-action-reflection).

The proposed subject has the aim of taking to the academic community the possibility of discussion about the adequate concept of research so that, as the researchers learn the scientific methods and techniques, they may promote the development of knowledge and information in the university and in the society.

Does, a teaching plan based on the expectations of students, responsible professor and the librarian as an educator agent has been idealized. The evaluation of all the teaching-learning process offered in the subject must make it possible to answer the following research question:

- What are the effective contributions of the subject to students and teachers in the process of elaboration of academic researches and their dissertation or thesis?

In this moment, therefore, it becomes the objective of the study to evaluate the skills developed by the students “SEM 5892- Bibliographical Research” in the graduation program in mechanical engineering of the Sao Carlos School of Engineering- University of Sao Paulo (EESC-USP), aiming to provide fundamental information for the process of taking decisions in the school administration and improvement of the technical quality of the academic employees.

3 Methodology

The application of the questionnaire proposed by [3] has been chosen aiming to gather information about the profile of the graduation students evaluating the mastery and the knowledge on information resources which already exists in exact technological sciences for the planning and execution of research projects. Such instrument follows the instructions and orientations of the social research methodology and of the concepts of field research largely used in the science of education [5].

The proposed questions discuss about the concepts of elaboration of projects; development of the research

methodology; technical standards used for structuring and presenting a scientific community and foresee the selection of meaningful attributes in order to judge the value of what is being evaluated; procedures which may describe these attributes in an objective and precise manner and a synthesis of evidence reached by these procedures in a final judgement of value [2].

The questionnaire has been applied to two distinct groups so that afterwards the answers could be comparatively analyzed. The first sample (group A), of former students, was chosen from the 50 individuals which took the subject in the first and second semesters of 2005 and who effectively answered the questionnaires electronically sent. The second sample (group B), constituted of 50 individuals was randomly chosen among graduation students who never took the subject.

4 Obtained results

In order to clearly measure the knowledge acquired by students, the values obtained by the two groups have been tabled and afterwards disposed in form of graph, so that it would be possible to obtain a comparative representation. The group of former students is represented by the letter A and the group of students who have not taken the subject os represented by the letter B.

4.1 Elaboration of research project

For the questions related to the elaboration of research projects, the expected answers were “Excellent/Good” or “Regular/Insufficient”. The item had the following questions:

- Delimitation and definition of the topic as a problem;
- Elaboration of the objectives;
- Elaboration of justifications;
- Elaboration of the theoretical reference;
- Definition of research techniques;
- Definition of instruments and procedures for the collection of data;
- Definition of data treatment;
- Elaboration of chronogram.

From the interviewees, 66% of the group A considered their level of knowledge to elaborate a research project “Excellent/Good”, while in group B this number is lower (55%). It is noted, however, that the higher number of “Regular/Insufficient” for the group B were specifically in the question “definition of research techniques”, where curiously, the participants from group A have the higher number of “

Excellent/Good”, which means that this deficiency had been detected in a determined moment and there has been orientation in order to solve it.

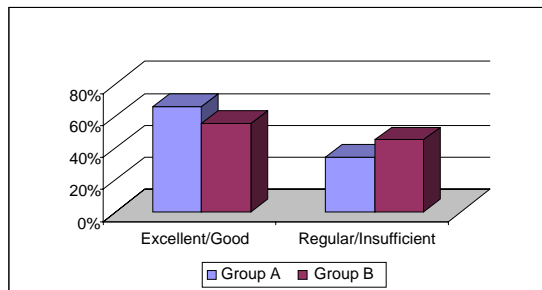


Figure 1 – Skills in the elaboration of research projects

4.2 development/execution of research

For the questions related to the development/execution of the researches the expected answers also were “excellent/good” or “regular/insufficient”. The questions were:

- elaborate questionnaires;
- make observations and interviews;
- carry out tests and experiments;
- update bibliographical reference;
- Statistically treat quantitative data;
- Categorize and organize qualitative data.

Among the answers obtained by individuals of group A, 63% of the interviewees considered their level of knowledge in developing and executing research “excellent/good”. In group B, this number is also lower “47%”. The difficulties and the main abilities in this matter are also distinct between individuals from both groups: the higher difficulty for the interviewees from group A are in statistically treat quantitative data: 54% claim to have level of skill “regular/insufficient” in this matter, whereas their higher ability is in carrying out tests and experiments (75%). This fact, probably, is due to the experimental nature of engineering.

According to the general figures on the questions covered by item 02 of the questionnaire, group A has level “excellent/good” of knowledge in the phase of development/execution of research of 63% against 47% from group B “figure 2”

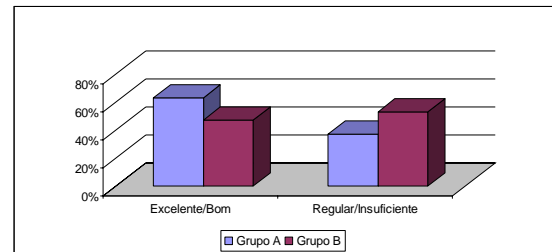


Figure 2 – Level of knowledge on the phase development/execution of research

4.3 Elaboration of report or scientific communications

For the third question, also with expected answers “excellent/good” or “regular/insufficient”, the questions related to elaboration of academic works were:

- cover and summary preparation;
- preparation of summary/abstract;
- planning of the content in sections;
- technical-scientific writing;
- preparation of quotations in the text;
- description and analysis of the results;
- exhibition of the conclusions;
- preparation of bibliographical references;
- appendixes and attachments.

The differences in the answers obtained between the two groups in this opportunity have become more evident. A expressive number of people from group A “74%” answered that their levels of knowledge were “excellent/good” for a formal presentation of academic work. Unlike that, 60% of the individuals from group B declared the same level. It is pointed out the presentation of citations in the text, for instance, where 69% from group B confessed having levels “regular/insufficient” of skill, only 33% of the students from group A declared the same difficulty (figure 3)

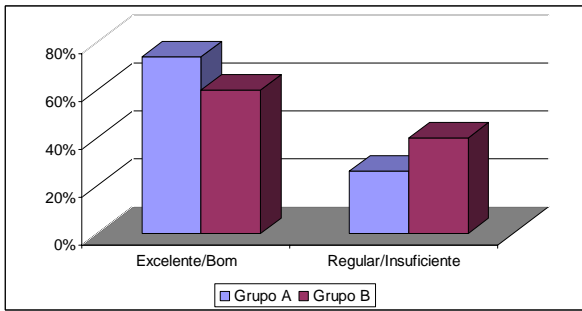


Figure 3 – Level of knowledge in presentation of formal academic works

4.4 Database

Figure 4 shows the degree of knowledge of the students as for the existence of scientific database in the areas of engineering of online access, be them public or restricted. Also, in this moment, it becomes clear that the individuals from group A have higher knowledge about the existence of these informational resources. The interviewees from group B have shown higher knowledge only related to the database from American society for testing and materials, which gathers technical standards that regulate specific procedures for the area

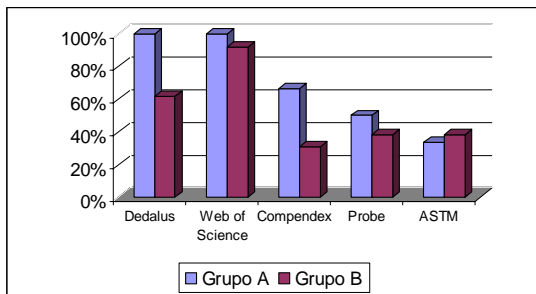


Figure 4 - Knowledge on database on Engineering

4.5 Standards or directives for the preparation of reports and research projects

The results obtained through question 5 were related to the level of knowledge of the students about standards and directives specifically used for the preparation of reports.

Among the individuals from group B 31% confessed “Not” to know any standard and 38% cited some standard in the preparation of research reports. However, among the cited standards only 8% were from the Brazilian association of technical standards (official standardizing Brazilian organ). Among the individuals from group A 100% claim to know the technical standard in effect in the preparation of academic

works necessary for the Sao Carlos School of Engineering (figure 5).

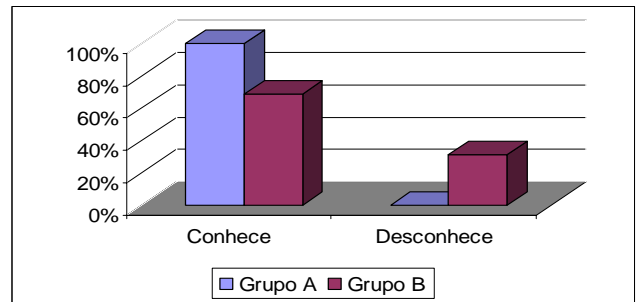


Figure 5 - Knowledge on standards and directives for the preparation of academic works

4.6 Relevance and compulsion of the subject

The question 6: face to the difficulties in obtaining and/or providing technical-instrumental information to the elaboration of the research projects, do you consider the inclusion of the subject “Scientific Methodology and Bibliographical Research” very relevant, relevant, little relevant or unnecessary.

With the obtained answers it has been possible to depict the degree of relevance of the subject according to the students of both groups. In this case, the answers of both groups were similar: for the great majority (100% from group A and 92% from group B) it is “Very relevant/ Relevant”.

This question may be complemented with the answers obtained in question 8 about the compulsory or optional character of the subject. In this occasion, 83% of the participants from group A indicated the preference for the compulsion of the subject, whereas 69% of the participants from group B declared the same preference. Still, the preference declared by both groups is significant (figure 6)

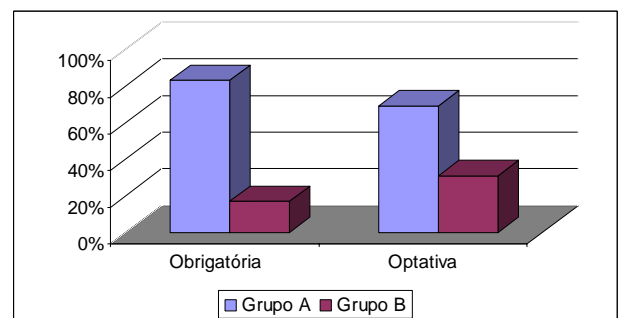


Figure 6 – preference for the compulsory or optional character of the subject

4.7 Approached Topics

Through the analyses of the results from question 07, it is possible to sketch a teaching plan that answer to the needs presented by both groups. In this question topics of syllabus

for the interviewee to check the ones that, according to their opinion were essential have been listed. There also was room for the inclusion of other subjects, not primarily expected in the question. The results presented by both groups, with their respective count in percentage numbers are in table 1

Table 1 – Subjects of Interest

Topic	%
Research project: formulation of problems and development of theme	80
Writing techniques for abstracts and scientific texts	74
Research and bibliographical search	72
Scientific methods and processes	69
Techniques of data collection in inter-subject researches	64
Directives for the oral and written scientific communication	63
Structure and standardization of academic works	54
Information resources available for the recovery of bibliographical material	52
Nature and evolution of scientific work	29
History of Science	20
Ethics in the work environment	1

4.8 Suggestions

In question 8, it has been requested from the students to make suggestions about the technical characteristics of the subject, about the number of credits, ideal semester and the maximum number of students per classroom. From the interviewees from both groups 68% indicated the end on the second year as the ideal period for the application of this subject. As for the number of credits, 56% stipulated the maximum of 2 credits for the subject and 72% considered that the maximum number of students per classroom should be of 40 people.

The suggestions pointed out by the two groups in relation to the actual curricular structure are listed below.

Table 2- Presented Suggestions

Suggestion	Occurrence
Decrease in the class hours	20
Further information about research and bibliographical research	19
Practical activities with application of acquired concepts	8
Availability of the subject in the beginning of the course for a better use of the concepts	6
Approach of topics in sociology, business administration, economy and information	3
Qualify professionals for the academic and entrepreneurial areas	2
Establishment of alternative timetable, different than the normal class hours	1
Link the discipline to other subjects	1

5 Conclusions

The data in the table point out, essentially to a positive result, clearly showing the advantages obtained by the students that take the subject in relation to those who don't. Basically, the competences include security in writing and presenting of academic works, mastery of bibliographical research techniques and information and organization.

As the subject, in the graduation, has a direct relation to the production of thesis these abilities as well as the collection of books available in the University of Sao Paulo and the technological resources to which the academic community has access through the library services, the researchers have the possibility to develop their researches finding adequate, unbiased, objective and rational solutions to the problems they face in the academic production.

On the other hand, we can also deduct that the lack of global vision over the evolution of research in science and technology and the insufficient familiarity with the scientific methods, their process techniques and standards may compromise the quality of work and doubt the propriety of the research in development.

The library service at EESC, try to serve the students of all habilitations who don't have the opportunity to take place in the subject "bibliographical research" has implemented effective initiatives as, for instance, the organization of events with the presentation of thematic lectures related to the research and publication of academic works.

In this sense, the students who take the other graduation programs, in the levels of master and doctor degree, at the Sao Carlos School of Engineering, at University of Sao Paulo also have the possibility to acquire practical and theoretical knowledge which subsidize their researches and contributes with the generation of knowledge in their areas.

This way, from the results obtained in the analysis of the collected data and respected delimits of the research, it is possible to conclude that the evaluation of the students who took the subject "Bibliographical Research" was positive and is of a fundamental importance for the development of the graduation area at the Sao Carlos School of Engineering, specially because it contributes with the process of preparation of dissertation and thesis as well as other technical scientific publications.

Finally, the subject, which is systematically offered by the library service, shows growing demand since its implementation, due to its value and importance. It offers applicability also for the under-graduation students, awakening the conscience for the search and value of research.

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