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Looking beyond linguistic outcomes: active learning and professional competencies in higher education

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Abstract

This pioneer study is rooted in a constructivist paradigm and undertakes an empirical research based on a content analysis of 400 digital job vacancies to find out the employability skills required by the job market. The study is focused on introducing innovations in an English language subject in an engineering degree to enhance the development not only of linguistic skills but also of generic skills, a challenge aimed at professional competitiveness and employability. The methodology used and outcomes are discussed in this paper.

1. Introduction: conceptual framework

Higher engineering education must provide not only discipline-specific fundamental knowledge but also competencies and attitudes now demanded by the labour market. These requirements challenge students in their learning and necessitate new frameworks that may enable the development of professional skills (Lehto et al., 2011).

The European Higher Education Area (EHEA) was promoted in 1990 by thirty European countries to ensure more comparable, compatible and coherent systems of higher education in Europe. One of the greatest innovations of the Bologna Declaration signed by these thirty countries is that program content and the courses leading to each qualification are focused on the student's acquisition of competencies, rather than on the simple transfer of knowledge. The new Bologna system was adopted by all Spanish universities in 2010 as a result of which changes in teaching methodologies and assessment in higher education were required. The changes aimed at providing students not only with academic but also professional competencies that may facilitate their incorporation in the professional workplace.

Similarly, in the USA the transition to the Accreditation Board for Engineering and Technology (ABET) brought up requirements both on technical knowledge and on capabilities to prepare students for a broad range of careers and lifelong learning. ABET accreditation is a non-governmental, peer-review process that assures the quality of the postsecondary education, by determining if certain criteria are being met in the programs or institutions that volunteer to undergo this review periodically.

Demands of the labour market have contributed to the reform of university degrees claiming that graduating students, while technically proficient, lack many abilities required in real-world engineering situations. As pointed

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out by Crawley (2001) in the CDIO report, there is an irreconcilable tension between two growing needs in contemporary undergraduate engineering education: on the one hand, the technical knowledge that graduating students must command, and, on the other hand, the wide array of personal, interpersonal, and system building knowledge and skills that will allow them to function in real engineering teams and to produce new products and systems. To meet the demands of industry nowadays, several initiatives have come up with the concern of a reform in engineering education, as for example, the CDIO, an innovative educational framework for producing the next generation of engineer**s** (Crawley, 2001)**.** This framework provides students with an education stressing engineering fundamentals set in the context of conceiving, designing, implementing, operating real-world systems and products, and fosters the skills and abilities to form successful engineers.

Along this line, it can be stated that both Europe and the USA are entering an era of intense re-evaluation of engineering education (Bankel et al. 2003). Competencies must be first identified, then new approaches have to be developed to enable and enhance the learning of competencies and, finally, the acquisition of the competencies has to be assessed. The new competencies required cannot be taught via traditional lecture-based courses and exam-oriented learning. Active learning may contribute to a change in higher education teaching methodology to comply with these requirements (Gamero-Pérez, 2010).

2. Constructivism: active, collaborative and authentic learning

Experts in education such as Felder (2003, 2009) feel that traditional methods centered on the teacher have demonstrated less effectiveness than teaching centered on the student and based on active learning. A real involvement of the student in the learning process is achieved in the latter through problem solving, teamwork, debates and self- and peer assessment, both in and out of class.

Constructivism, a theory of knowing pioneered by Piaget, supported by Dewey or Vigotsky, claimed that knowledge cannot be constructed just by passively receiving it in class. The focus of instruction must be on the creation of meaning and understanding while encountering new information or new contexts. But while constructivism is a well-documented theory of knowing, it is not yet a well-documented theory of teaching (Fosnot, 1992, Karagiorgi & Symeou, 2005). In order to create a constructivist learning environment, several basic principles must be met: active and collaborative learning based on real life situations, i.e., authentic learning (Cennamo, Abell & Chung, 1996**;** Driscoll, 1994; Johnassen, 1991). Active learning refers to a constructivist model of instruction that focuses the responsibility of learning on learners (Bonwell & Eison, 1991); students, thus, take an active role in their learning process. In learning based on constructivist models, students actively develop new ideas and concepts based on present and past knowledge. The four elements present in Kolb & Fry's experiential learning circle (1975) are put into practice: concrete experience, observation and reflection, the formation of abstract concepts and testing in new situations. And what is more, this active involvement greatly correlates with better knowledge retention, as stated by Dale (1969) in his cone of learning.

Much has been written about the benefits generated by active participation in collaborative work compared with traditional lecturing. Basically, these comparison can be summarized as follows: more effective development of high-level thinking processes (Kulik & Kulik, 1979; Smith, 1977; McKinney & Graham-Buxton, 1993; Rau & Heyl, 1990, among others); more effective learning (Johnson et al., 1998; Slavin et al., 1985); greater retention of knowledge (McKinney & Graham-Buxton, 1993; Rau & Heyl, 1990); higher degree of student satisfaction (Bligh, 1972; Kulik & Kulik, 1979) and higher student self-esteem (Johnson et al., 1998; Slavin et al., 1985, Montero et al. 2009).

An important claim of the 21st century in educational environments is to go beyond content and get students immerse in authentic learning situations which bring into play multiple disciplines and facilitate the development of a number of skills in the learning process that can provide a path into employment (Hall, 2009). As stated by Lombardi (2007), students, immersed in authentic learning activities, cultivate the kinds of "portable skills" that newcomers to any discipline have the most difficulty acquiring on their own. Apart from developing a wide range of practical skills, these learning situations boost students' self-confidence allowing them to face future professional challenges effectively (Durán, 2011).

In this context, the justification for the present research is that practical teaching strategies and new learning opportunities must be provided so that learners may internalize new experiences and information into their existing knowledge. This approach will facilitate the development of new competencies of high demand in the labour

market. Although not necessarily taught in the traditional lecture format, professional skills can certainly be mastered as part of a modern engineering education format that utilizes active and cooperative learning and teaches engineering in its appropriate context (Shuman et al., 2005). This paper examines how the teaching and learning of these skills are integrated in an English course at a university degree.

3. Aim of the project

Discipline-specific skills, i.e., hard skills, which refer to the ability to perform a certain type of discipline-specific task, are included in various research studies (e.g., Arthur et al, 1999; Gulati & Raina, 2000 or Kuijpers et al., 2006, among others). However, as well as linguistic objectives, this project pursued the development of generic skills, i.e., transferable or soft skills such as behavioral competencies, interpersonal or personal skills, which are attributes that enhance the students' interactions, job performance and career prospects. The project was devised with the following objectives in mind:

General objectives
- To foster a process of knowledge creation
- To facilitate students' centred instruction
- To develop written and oral English language skills

Specific objectives
- To train students in searching and using information
- To train students to work in a team
- To create the network that graduates will need in working life
- To improve communication skills in English

In short, in an active learning environment, the objective of the project was, on the one hand, to develop fluency, accuracy, quality and correctness in written and spoken language; but, on the other hand, the innovative side of the empirical study was to look beyond these linguistic outcomes in the English language syllabus and pursue the acquisition of generic skills oriented towards the development of students' professional competencies.

4. Educational framework: context of the study

The present research was carried out with 46 students of English in a university degree of Library and Information Science over the course of a semester. The students' level of English was intermediate (B1); they were experienced in the use of new technologies. The course was designed to include active and collaborative learning techniques where research, communication skills and critical thinking play an important role. Students working in teams were required to find out information and learn from the project. Participants were informed that the research undertaken would be used to brief future students of the degree about employability skills required by today's international job market; this would guide them when making their choice of optional and elective subjects. Participation in the group project required regular class attendance so as to guide the students through the elaboration of the project and to learn from the performance of the different groups.

5. Methodology

This research obtained data from both a quantitative and qualitative approach. Firstly, as a point of departure, a preliminary survey was carried out in class to find out the students' perceptions on what the most important skills the labour market demanded and their practice at university. This warm-up activity familiarized students with the skills and competencies they will later encounter.

Secondly, a project was assigned to provide students with learning environments that support the emergence of competencies required in their future career. Finding an adequate topic for teamwork is always a challenge. The task had to be motivating and creative and had to facilitate the practice of a range of skills. The topic, "Research on job vacancies from the field of Library and Information Science", was chosen because of its relevance to prospective engineers, as participants were in the last course of their degree. Research undertaken by the students aimed at

finding out the most demanded skills for Library and Information Science professionals and to integrate the practice of generic competencies in the syllabus of an English course of a Library and Information Science degree. Thus, this empirical study draws upon the initial perceptions of students on competencies required in the labour market together with the findings of the research on the competencies demanded by employers through the analysis of 400 current job vacancies. Data was collected from quantifying, classifying and analyzing the sample.

Students were clearly informed about the different tasks to be fulfilled and the deadlines. They were required to make a written report on the topic of research and prepare a challenging presentation on it, in which professional environments, needs and requirements were studied through job vacancies. The project implied the following assignments both group and individually-based shown in Table 1: the research and analysis, report on the findings and debriefing were attained in groups, the language tasks derived from the oral presentation and assessment were individual.

Table1. Steps involved in the "Research on job vacancies project"

Step	Participation	Task assigned
Step 1.	Group	Find job vacancies from the field of library and information science.
Step 2.	Group	Analyze discipline-specific and generic skills required in the job vacancies you have found and relate them with the subjects in the syllabus of your degree.
Step 3.	Group	Make a written report on the research undertaken and compare the findings with your initial perceptions on competencies
Step 4.	Group	Make an oral presentation on the results obtained. -Time allowed for the presentation: 20 min. -PowerPoint slides may be used -Oral presentation will be video recorded.
Step 5.	Individual	Watch your oral presentation (students will be provided with a video recording of their delivery)
Step 6.	Individual	Make an assessment of your oral presentation Assess your team members' participation in the project following the rubric provided
Step 7.	Individual	While listening, write down the script of your oral presentation
Step 8	Individual	Highlight the mistakes you find in your recording, make the necessary corrections
Step 9	Individual	To be handed in: Revised version of presentation, group, peer and self-assessment
Step 10	Group	Debriefing session

A searching strategy was adopted and different job seek websites specific from the field of Library and Information Science were chosen to find the job positions, e.g., *RecBib* (Recursos bibliotecarios, Spain), *ALA Job List* (American Library Association, USA), *Jinfo* (Jobs in information, UK), *LIS JOBS* (Career information for librarians and information professionals, USA). More general websites, such as *Careerbuilding* (Job search, employment and careers site, USA), *Indeed* (One search. All jobs, USA), *Webrecruitjobs* (Recruitment industry, UK) and *Monster* (Global online employment solution, UK) were also sought. The sample should be synthesised and analysed by extracting the skills required by employers. The profile of professionals demanded in the market should be then compared to the profile of graduates being formed at university.

6. Results and discussion

6.1 The survey

In a first stage, a brainstorming process had identified an initial framework of nine generic competencies of high significance in the professional field of Library and Information Science. A quantitative analysis based on a Likert scale was then run with the respondents' specifications of their level of agreement to some statements in a questionnaire, so as to get feedback towards their initial perception on the generic skills required for their career.

Table 2. Initial students' perceptions on generic skills

Skills	Very important	Important	Not very important
1- Life-long learning skills	89%	10%	1%

2. Research skills	34%	61%	6%
3. Communication skills	83%	27%	0%
4. Teamwork	82%	26%	2%
5. Hands on experience	12%	70%	18%
6. Leadership	32%	31%	27%
7. Problem solving skills	64%	36%	0%
8. Willingness to learn	61%	39%	0%
9.Critical thinking	19%	63%	18%

In this first stage, the students' perceptions on professional skills revealed a higher rate of lifelong learning, communication skills and teamwork; leadership, critical thinking and hands on experience ranked lower.

Secondly, a sample was chosen made up of 400 digital vacancies requiring different library services specialties: documentalists (93) librarians (92), archivists (90), knowledge managers (52), community managers (27), cataloguers (10), database managers (10), project managers (17) and research analysts (9). These vacancies correspond to current job positions in different sources. An estimation of the average skill demands revealed the following percentages:

Table 3. Current job vacancies (Vacancies retrieved online from March to October 2011)

Skills	Skills presence in job offers
1.Life-long learning skills	20%
2.Research skills	31%
3.Communication skills	87%
4.Teamwork	73%
5.Hands on experience	49%
6.Leadership	10%
7.Problem solving skills	43%
8.Willingness to learn	11%
9.Critical thinking	46%

To carry out the empirical research, data was then collected from analyzing, quantifying, classifying and summarizing the skills and competencies in the job advertisements sample. Interesting results were revealed in the study:

- The ability to engage in life-long learning, an ability required by the EHEA and the ABET, was surprisingly overlooked in most samples analysed.

- Research skills, of the type of "Advanced research and skills, both online and traditional", were required in 31% of the samples under study.

- Communication skills, one of the highest ranked skills, were requested in 87% of the positions, e.g., "outstanding oral and written communication skills", "good communicator", "excellent communication and interpersonal skills".

- Teamwork skills were demanded in 73% of the vacancies, e.g., "demonstrated ability to work collaboratively, meet deadlines, and quality standards required", "ability to work well on cross-functional project teams, and foster team commitment to tasks".

- Hands on experience was required in 73% of the positions, e.g., "prior library experience is highly preferred".

- Leadership scored a lower rate; only 10% of the positions explicitly required this skill to the potential candidate, e.g., "leadership for the information literacy program is required", "ability to lead large multi-disciplinary teams through significant amount of varied work assignments".

- Problem-solving skills were a request in 43% of the vacancies under study, e.g., "strong analytical, problem-solving and conceptual skills".

- Willingness to learn was demanded in 11% of the positions, e.g., "demonstrated willingness to learn is required".

- Critical thinking was positively valued by 10% of the positions' seekers, e.g., "demonstrated ability to use good judgment and logical reasoning".

Data obtained from the students' initial perceptions on the skills and the research on their presence in the job positions analysed shown was contrastively observed.

Students' initial perceptions on generic skills   Skills presence in job offers
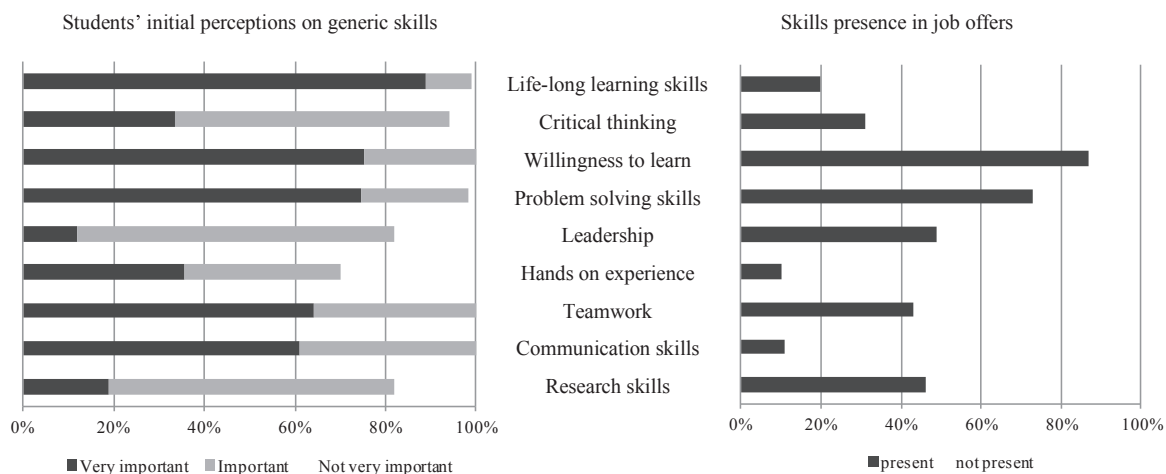

Figure 1. Students' initial perceptions vs. skills demanded online job offers

Finally, a qualitative study conducted through interviews with the students provided insightful information on the outcomes:

- There was a general consensus on the importance of communication and teamwork as key employability skills throughout the job vacancies, a fact that the students had previously foreseen.

- Students had expected the job vacancy advertisements to reflect the competencies suggested in the initial brainstorming, as a must. They were momentarily disconcerted at the findings obtained in the research; however, the differences encountered were a point of departure of in-depth reflection, and raised fruitful discussion. As seen in Figure 1, the most striking difference was observed in life-long learning, in which a much higher demand had been anticipated. Students argued that while process skills appeared to be present in most positions, life-long learning was not explicitly mentioned in most of them. However, its absence can be justified by the fact that skills are interconnected, i.e., they interfere with each other. As stated by Bankel et al. (2003), the attributes of lifelong learning include the competency of most of the above-mentioned skills. Teamwork, for example, may also involve the chance to develop leadership, communication skills and problem-solving skills when trying to achieve the goals assigned.

- An interesting point raised from the research undertaken is that competencies differ according to the kind of job being offered in relation to the functions attributed, as well as the specific tasks defined. Leadership, for example, is a skill which was required to candidates of a high-level position, as, for example, a project manager or a records supervisor, while a library assistant was expected to comply with physical requirements such as "bending, stretching, lifting books, and moving large book trucks", instead. It was also observed that even positions seeking the same kind of professional, demanded a different profile, according to the specific tasks to be performed, which entailed totally different functions. Some differences were also observed in hands-on experience, which was more frequently demanded in positions where higher responsibilities were involved.

- Other personal skills that had not been the focus of the present research were identified as a common requirement in some vacancies analysed. The importance of, e.g., decision making, facing risk and failure, dealing with customers, creativity and innovation was highlighted as a pathway to employability in some high-level positions.

- Focus groups conducted by the teams related the generic competencies observed in the samples analysed to their practice in the subjects of the degree. An increasing incorporation of the skills in the syllabus of most subjects was stated, with the exception of hands-on experience; the presence of an internship in the degree was then required so as to incorporate real work experience in the degree.

Discipline-specific tasks were also analyzed, and the fundamental knowledge required in the job vacancies was linked to subjects of the academic curriculum, thus providing a "road map" for students enrolling in the degree in their choice of optional and elective subjects.

6.1 Educational implications

The successful implementation of the project was obviously based on the active participation of team members. The classroom was transformed in a created environment that resulted in the type of teaching and learning that makes individuals lifelong learners through a process of knowledge creation. The project also supported the emergence of competencies required in the students' future career. The role of the teacher organizing and controlling the activities facilitated the students' development of research skills, an enhancement of communication and teamwork, problem-solving or critical thinking. These high performance competencies highly contribute to life-long learning.

As for the linguistics objectives, through the role adopted by the participants as analyzers, synthesizers and interpreters of specific information through the medium of English, written as well as spoken skills were developed as a result of close language contact. Successive drafts of the report produced by the groups were revised and discussed by the instructor in seminar sessions with each team. Students were provided with rubrics for their oral presentations so as to reach an optimal performance. Rehearsal sessions of the presentation in the presence of the instructor helped the students to concentrate on content, transitions, delivery and language used.

Regarding the practice of professional competencies, rather than be content with acquiring, organizing and providing information when asked for (Gulati & Raina, 2000), students integrated professional competencies throughout the project. The same skills identified in the recruiting websites were put into practice by the students. In the final steps, by a combination of tutor, peer and self-assessment, students received multiple perspectives on how each team member had performed in the team. As stated by Luca & McLoughlin (2002), these self-appraisals are useful skills which are well received by employers and obviously, contribute to the enhancement of critical thinking. It can be concluded that the project fostered the development of a variety of skills not only of a linguistic character but also generic skills, a challenge aimed at professional competitiveness and employability. A good command of these skills will be a major determinant of the career of engineers and will enable them to become confident communicators, skilled problem solvers, dynamic in teamwork, effective managers, creative and innovative professionals. In the debriefing sessions of the project, 88% of participants reported extremely positive experiences with feedback such as: "As a whole, I have learned from the project. It has helped me to feel more confident in the use of English", "I am more aware now of the profile that employers seek"; "The project has provided a framework for developing skills needed to adapt to most position offered". Both the students' and the instructor's assessment confirmed that, despite the different nature of the aims in mind, carefully designed learning activities, like the one here described, may greatly contribute to the achievement of their aims.

Conclusions

The study has shown evidence that for information professionals to be effective in the new age, appropriate competencies as well as personal traits are needed. As anticipated by Atkins (1999: 277), the international market demands "a combination of subject-specific skills and knowledge, generic intellectual skills, generic process skills, competencies and personal attributes". Thus, higher education must incorporate and implement a teaching approach that clearly allows the development of generic or transversal competencies which are increasingly valued in today's market. Due to the high level of interaction that a language course demands, the integration of generic skills in its academic syllabus can facilitate an increasing self-confidence of the students in their practice. The implementation of the project here described has fostered the students' awareness and competency in generic skills in an English language context, together with an enhancement of oral and written communication skills in English.

On balance, the innovative study undertaken has put into practice the new paradigms claimed by the EHEA and ABET framework. Learners have been exposed to authentic learning and the project has contributed to facilitate further links between what the students really learn in the classroom, and its practical application in the workplace)e (Vázquez y del Árbol et al, 2001). Further research will be focused on other highly demanded skills, such as creativity and innovation, and will refer to the development of valid and reliable measures for their assessment, a topic which has attracted limited attention among researchers up to now (Nikolai, 2003).

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