



## Scientific Language Learning and Ict for The Real World

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### Abstract

*Scientific language learning has encountered dramatic changes in the knowledge-based economy. Its roles and functions are increasingly 'pragmatized' as a result of emerging new players and competing markets for knowledge production, the availability of higher education to a wider range of social classes, evolving needs of the more demanding language student as customer, as well as the assimilation of ICT into the field. The curriculum and dynamics of scientific language learning in English for Specific Purposes (ESP) settings, in particular, has correspondingly become more sensitive to industry collaboration opportunities, commercial exploitation, and is increasingly Transdisciplinary. As new scientific methods, terms, and concepts are continuously added and outdated ones removed as they emerge, the field of scientific language learning pertaining to ESP has been unable to keep pace with the speed of scientific knowledge and progress. This has resulted in a widening gap between scientific language learning courses and applied needs of the real world.*

*As a result of these developments, this paper argues that it is timely for scholarship in 'ICT and language learning' to move beyond current integrative and pedagogical debates which emphasizes disciplinary duality, and consider the increasing symbiotic relations between the two in meeting the challenges of today's reality in scientific knowledge generation and production. In particular, the paper stresses the urgent need to reexamine the relevance of ICT and language learning vis-à-vis a model of 'performativity' whereby applied needs perform, shape and format ICT and language needs, rather than observing how these fields function. By tracing through a multimedia and interactive course English for Biotechnology that is offered at Warsaw University of Technology, it is argued that an epistemic culture of scientific knowledge production is continuously and contingently fed back and forth in the enactment and structuring of knowledge. Consequently, it highlights the prospects of reconciling the dichotomy between scientific language learning and ICT, the role of the language instructor as both an educator and mediator between curriculum and industry, and the flow of scientific knowledge between classroom and practice. Examples of classroom activities and recommendations for course design will be presented in support of a joint ICT and language learning's relevance for applied needs in scientific ESP settings.*

### 1. ICT and Language Learning in the Real World

ICT for English teaching has grown rapidly, and most teachers and experts recognize the need for a kind of teaching method using ICT. Before the 1980s, questions whether or not computers should be used for language teaching were often raised. However in the 1990s, the question gradually changed into 'How can the computer best be used in language teaching?' (Chapelle 2001)[1]. Everyday language use is so tied to technology that learning language through technology has become a fact of life with important implications for different actors in ESP. Examining such taken-for-granted 'facts' is a necessary exercise since coupling two disparate subject areas as ICT and language learning usually runs the danger of one subject discourse dominating another depending on which side of the fence an actor may belong. It appears that the scholarship on ICT and language learning has followed a trajectory that seeks to address two dominant concerns. First, ICT and language learning is presented



as a dichotomy in which an integrative imperative is in constant negotiation. Second, the integrative value of the two fields is acknowledged, and effective strategies that try to marry the two are proposed. A review of these two strands is not the focus of this paper, and can be found extensively elsewhere (e.g. Chambers and Davis 2001; Warschauer 2000, 2006)[2][3][4]. Instead, I argue for a focus on real world concerns. MacKenzie's (2006) [5] fascinating metaphor of theory being 'an engine and not a camera' shows that ICT and language learning should be an 'engine' of inquiry that collectively takes an active participation in responding to the concerns of the real world, and not a 'camera' passively reproducing arguments for each other's existence, influence, and/or integrative potential. The environment in which both ICT and language learning are expected to perform should be the focus.

Searle (1995) [6] provides tentative insights by distinguishing between "brute facts", "social facts", and "institutional facts". Brute facts, are objective physical entities that do not depend on our attitude to explain their existence. Social facts, on the other hand, are the attitudes that we adopt in relation to brute facts. For example, the five Euro note is merely a piece of paper – a brute fact – that only takes on value when we agree that piece of paper is worth something (i.e. social fact). However, to establish a five Euro value to paper necessitates "institutional facts" (e.g. European Central Bank) who institute rules and activities that ascribes the value. Similarly, Callon (2007) [7] drew on Austin's (1970) [8] work to explain how 'performative utterances' can lead to situations where saying something was doing something, rather than simply reporting on or describing reality. Callon also argued that such utterances are subject to agencements whereby the success (or failure) of an act of language becomes clear only at the end of a test to confirm its validity. There are also several struggles among different agencements competing to perform the world. Unless such competing explanations are put to the test in real world contexts, we can never know how these explanations actually perform.

Computers, textbooks, internet, and course Cd-roms are merely brute facts and physical entities that do not possess any meaning nor value until institutional actors such as teachers, course developers, provide and enact activities and methods to give meaning to such brute facts. However there are competing perspectives by these actors depending on how sympathetic they are to their different training and background knowledge in ICT and language learning pedagogy. To simply provide meaning to each of the two fields does not test its effectiveness. Its effectiveness only becomes apparent when they are subject to real world conditions. Scientific language learning provides a useful case to examine how knowing real-world conditions of the discipline can affect how the field should be approached.

## **2. ESP and Challenges from Science and Technology**

In recent years, the English language can be found with major shifts in global industrial development and economic modernization. The ability to communicate and engage with developments in the modern world can be argued as a means to stay 'specific' and 'relevant'.

To remain relevant in such knowledge-based environments as Biotechnology, more and more individuals are seeking to improve their specialised language skills. Courses that fall under the heading 'English for Specific Purposes' hold particular appeal. The implications of introducing biotechnology to the ESP field, however, are not without its challenges. The field of ESP has correspondingly encountered dramatic changes in the knowledge-based economy that is increasingly focused on the life sciences and biotechnology. Its roles and classifications are increasingly blurred and 'pragmatized' as a result of emerging new players and competing markets for knowledge production, the availability of higher education to a wider range of social classes, and the evolving needs of the more demanding ESP student as customer (see also Loh et. al 2003) [9].

### **3. Issues of Time and Relevance in Biotechnology ESP**

The challenges suggest that the field of ESP is indeed undergoing changes at least with its scientific branches. ESP has encountered greater challenges in ensuring the 'specificity' component of ESP can and is adhered to. In particular, the usual routes to identifying the associated ESP knowledge in biotechnology cannot remain easily within the confines of academic knowledge. In order to stay 'specific' and 'relevant', the ESP teacher is now necessarily introduced to a host of new institutional knowledge providers, linking the ESP teacher with government, industry, universities and private consultancy sources with which the teacher must broker relations and sources. Closely related is the theme on time. It has been established that there is a greater likelihood for knowledge of scientific varieties of ESP to have an 'expiry date'. The field has been unable to keep pace with the speed of scientific knowledge and progress, which has resulted in a widening gap between courses and applied needs.

#### **3.1. The temporal dimension**

The mapping of similarities and regularities of what knowledge is taught with what knowledge is used in real life settings can be done, naturally, at a fixed point in time by comparing static images across contexts. For example, the current emphasis on the development of specialized corpus comprising representative oral and/or written texts which reflect the kind of language of a particular domain is an important activity that organizations such as Cambridge University Press and ESOL are researching as well as developing.

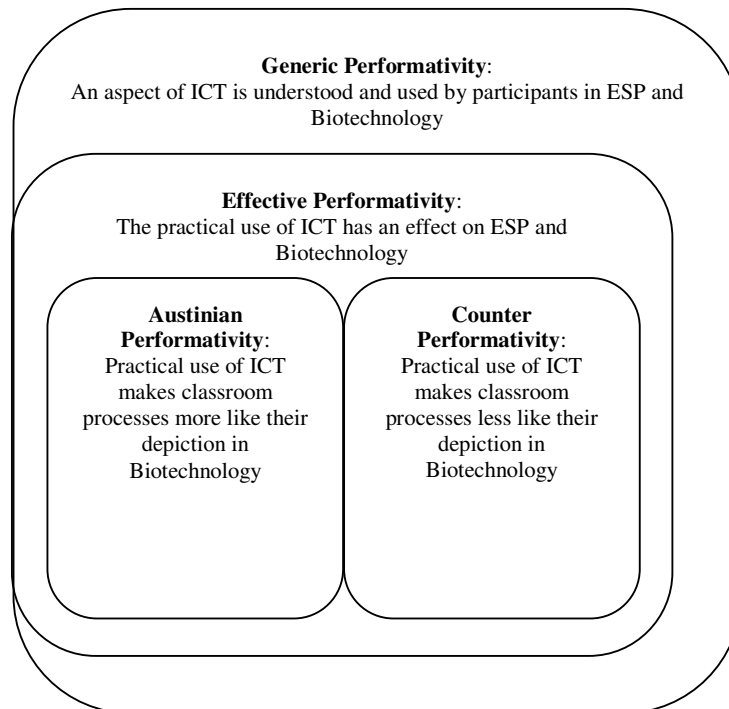
This, however, will lead the ESP practitioner only so far – the description might be rich and convincing; the explanatory leverage is less obvious. A more complete exploration of similarities and regularities requires the inclusion of a temporal dimension. The social scientific project is not merely to demonstrate that there are similarities or regularities across contexts. It is also to try and understand why and how these differences may come about through time. Time, therefore, should be an important dimension in analyzing the performative value of ICT and scientific language learning.

#### **3.2 Relevance as performativity**

The above example also highlights the fluid nature of increased relevance as 'performative'. In particular, if we are capable of building a linguistic specialised corpus of biotechnology, are we just as able to detect, update and/or remove individual lexical entries as they become outdated? I argue that this is difficult and that the field of ESP in scientific varieties of English has been unable to keep pace with the speed of scientific knowledge and progress, which has resulted in a widening gap between courses and applied needs. Here the role of ICT and ESP needs to step in to remedy real world problems.

ICT can be performative in relation to ESP and Biotechnology. At least three levels of the performativity of ICT seem to be possible (Figure 1). The first, weakest level is what might be called "generic performativity." For an aspect of ICT to be performative in this sense means that it is used, not just by academic teachers and students, but has an effect on "real world" understanding.

Figure 1: The Performativity of ICT in ESP and Biotechnology



(Adapted from Austin 1962,1970; Callon 2001; MacKenzie 2006)

What is important is to determine what effect the use of ICT has on the ESP and Biotechnology. The presence of such an effect is what is required for a stronger meaning of "performativity": the subset of generic performativity that one might call "effective performativity." For the use of an ICT tool to count as effective performativity, the use must make a difference (e.g. does it make possible an explanation of scientific process that would otherwise be impossible?).

Most intriguing of all the varieties of the performativity are the two innermost subsets. There the use of ICT is not simply having effects on ESP and Biotechnology processes: those processes are being altered in ways that bear on their conformity to an actual use and understanding of the aspect of ICT in question. The following case study proceeds to explore how performativity of ICT in relation to ESP and Biotechnology can materialise.

#### 4. The Case of 'English for Biotechnology' at Warsaw University of Technology

##### 4.1 Design of the course

The course design process took almost a year with several difficulties; the biggest of which was my lack of training in biotechnology. External materials had to be consulted as there were no current biotechnology ESP teaching materials available. Paradoxically, this raised more questions than answers in selecting materials relevant for the course since biotechnological theories are seldom static and can be replaced by a new one in a short period of time.

Knowledge glimpsed from these sources had to be verified to ascertain its relevance. The role of subject networks became important in this respect, and became the source of answers and guidelines.



I was subsequently directed to the work of University of Utah on virtual laboratories, and was encouraged to incorporate relevant sessions into the course: DNA extraction, gel electrophoresis and microarray technology.

The interactive form of these sessions was developed to cater to different learning styles: visual and auditor learners, and learners with reading-writing preferences. The virtual experiments allowed students to delve into laboratory procedures on the spot and in a logical order. A typical session starts with brainstorming of ideas connected with the subject, presentation of these ideas, and ending with semi-controlled practice of logical sequencing in describing procedures with the lexis of action verbs and new vocabulary.

The final issue was to determine the balance between English instruction and subject knowledge dissemination and, in particular, whether there was a need to reformulate the classroom roles of a teacher and a learner. Students from general English classes perceive the teacher as a language expert, however this role perception in ESP courses may not be as clear-cut – ‘information gaps’ had to be overcome during the course. The solution was bidirectional – the ESP teacher should be familiar with the materials in addition to his or her role of English instruction, while the students may provide feedback and fill-in necessary knowledge when a suitable occasion arises.

## **4.2 Conduct of the course**

Developing communication skills was one of the prime objectives. Aside from article discussions that were assigned as home reading, students were asked to perform websearches on a particular theme as homework. Several role-playing activities were also conducted (e.g. simulate a bioethical committee meeting which had to make typical bioethical decisions). Finally, students practise a mock job interview in which they market themselves for biotechnology positions. Numerous authentic video reports, interviews and news bulletins were used to help students improve their listening comprehension skills. A variety of listening comprehension check exercises were prepared and emphasis was also paid on professional writing skills.

To sum up, a plethora of tasks included in English for Biotechnology proved helpful and successful. Binding elements of presentation, brainstorming, elicitation, but also project work and agreement reaching debates contributed to students’ enrichment of ESP lexis but also professional soft skills.

## **4.3 Feedback**

Student’s feedback in the form of questionnaires and in-class discussions and comments were very positive. Virtual laboratory sessions were mentioned many times as the most innovative and engaging component of the course. Students commended the highly interactive form of the sessions which helped immensely in making the learning process of a difficult topic easier. They reported that the virtual laboratory session on DNA microarray was something that they could only read in books with no practical laboratory sessions available in their faculty – microarray chips were simply too expensive for the university to afford. This is certainly concrete evidence supporting a form of Austinian performativity whereby students are able to transfer knowledge into practice, together with the language used in both their native language and English. This Austinian performativity would otherwise be not possible to students because of the equipment costs. Students’ feedback is important as it allows subsequent revision and reconsideration of the course design and implementation.

## **5. Prospects and Recommendations for Biotechnology ESP**



The implications of issues of time and performativity in scientific varieties of ESP are manifold. Firstly, the development of a corpus in scientific varieties of English does not follow exponential growth, but is more likely to experience a shifting equilibrium whereby old terms are removed as new terms are added. Other important issues to consider are as follows: (i) there is an expiry date of biotechnology ESP knowledge base/corpus; (ii) teaching biotechnology ESP needs to institute a feedback mechanism to ensure that current ESP materials stay relevant; (iii) the role of the ESP teacher has become more of a knowledge broker; (iv) the tight distinction between EAP and ESP is increasingly blurred with the purpose and type of knowledge that is in question; and (v) there must be greater sensitivity to the shifting nature of relevance in ESP, and how ICT can rise to this challenge.

## References

- [1] Chapelle, C. (2001) *Computer Applications in Second Language Acquisition: Foundations for Teaching, Testing and Research*, Cambridge: Cambridge University Press.
- [2] Chambers, A. and Davis, G. (2001) *ICT and Language Learning: A European Perspective*, Lisse: Swets and Zeitlinger.
- [3] Warschauer, M. (2000) "The changing global economy and the future of English teaching" *TESOL Quarterly* 34(3): 511-535.
- [4] Warschauer, M. (2006) "Literacy and technology: Bridging the divide", in Gibbs, D. and Krauss, K.-L. (eds.), *Cyberlines 2: Languages and cultures of the Internet*, Albert Park: James Nicholas, pp. 163-174.
- [5] MacKenzie, D. (2006) *An Engine, Not a Camera: How Financial Models Shape Markets*, Princeton: MIT Press.
- [6] Searle, J. R. (1995) *The Construction of Social Reality*, New York: Free Press.
- [7] Callon, M. (2007) "What does it mean to say that Economics is performative?", in MacKenzie, D., Muniesa F. and Siu, L. (eds.), *Do Economists Make Markets? On the Performativity of Economics*, Princeton: Princeton University Press, pp. 311-357.
- [8] Austin, J. L. (1970) *Philosophical Papers*, 2nd ed., Oxford: Oxford University Press.
- [9] Loh, B. Tang, A. C., Menkhoff, T., Chay, Y.-W., Evers, H.-D. (2003) "Applying knowledge management in university research", in *Governing and Managing Knowledge in Asia*, Menkhoff, T., Evers, H.-D. and Chay, Y.-W. (eds.), Singapore: World Scientific, pp. 221-248.