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## GENRE-BASED STRATEGIES FOR INTEGRATING CRITICAL AND CREATIVE THINKING IN ENGINEERING AND JOURNALISM

### Abstract

In this paper we propose genre-based strategies for integrating two key lifelong competencies, critical and creative thinking, in Engineering and Journalism. In both disciplines there is a need to apply professional expertise in various contexts and to communicate with different audiences. Drawing on previous studies, we sketch a basic needs analysis in these professional fields, point to major learning obstacles, and provide guidelines for collaboration between language and content teachers in English-medium instruction settings. In such collaboration, genre is simultaneously the hub, the framing structure, and the shared middle ground between content and form and even between disparate disciplines. Our goal is an *integrative pedagogy* that merges the acquisition of disciplinary content and procedures with the practice of 'soft skills' and the ability to transform and interrelate knowledge. Our contention for both Engineering and Journalism is that by allowing students to understand genres and explore their potential, we can provide them with learning experiences in which critical thinking and creativity are engaged.

196

### Key words

genre-based strategies, English-medium instruction, critical thinking, creativity, engineering, journalism.

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## Sažetak

U radu predlažemo žanrovski zasnovane strategije integriranja dve ključne kompetencije doživotnog učenja, kritičkog i kreativnog razmišljanja, u oblasti inženjerstva i novinarstva. U obe discipline postoji potreba za raznim vrstama komunikacije i za primenom stručnog znanja u različitim kontekstima. Na osnovu prethodnih studija, pružamo nacrt osnovne analize potreba u ove dve profesionalne oblasti, ukazujemo na najvažnije prepreke u učenju, te dajemo smernice za saradnju između nastavnika jezika i nastavnika stručnog predmeta u nastavi na engleskom jeziku. Kod takve saradnje žanr istovremeno predstavlja središte, okvirnu strukturu i tačku spajanja sadržaja i forme, pa čak i različitih disciplina. Naš cilj je *integrativna pedagogija* koja spaja usvajanje disciplinarnog sadržaja i procedura sa uvežbavanjem "mekih veština" i sposobnosti transformacije i povezivanja znanja. Smatramo da i u oblasti inženjerstva i u oblasti novinarstva studentima treba pružiti mogućnost da se upoznaju sa žanrovima i istraže njihov potencijal, jer će takvim načinom učenja angažovati kritičko i kreativno razmišljanje.

## Ključne reči

žanrovski zasnovane strategije, nastava stručnih predmeta na engleskom jeziku, kritičko razmišljanje, kreativnost, inženjerstvo, novinarstvo.

197

## 1. INTRODUCTION

Although more than ten years have already passed since the European Parliament and the Council of the European Union published their *Recommendation for key lifelong learning competencies* in 2006, many university content teachers are still at a loss as to how to foster those competencies in the classroom. Their difficulties have been exacerbated by the spread of English-medium instruction (EMI) environments in European universities since the 1999 Bologna Declaration (Airey, 2016; Wächter & Maiworm, 2014). In such contexts, the use of a foreign language as a lingua franca may inhibit both teachers and learners, slow down syllabus coverage, especially in mixed-ability classes, and possibly retard the learning pace (Ament & Pérez-Vidal, 2015). In this article we argue that in contexts such as these, genre affords a fertile site of intersection between content and form, disciplinary and transversal lifelong skills, and different areas of expertise, which opens avenues for productive educational ventures. Our objective is to explain the need to promote critical thinking and creativity as part of this suite of skills in EMI contexts, and to provide examples showing how these aims can be achieved.

Critical and creative thinking are necessary to perceive the communicative needs, backgrounds, and interests of different audiences and, according to them and to the communicative situation, choose the most adequate genres or adapt their rhetorical conventions. They are also needed to interpret written genres appropriately, and to develop a deep understanding of the way information is communicated in real-world contexts. In this paper we build on the framework we have outlined elsewhere (Breeze & Sancho Guinda, 2017) to explain two concrete applications of critical and creative thinking to teaching genres in EMI classrooms in two very different disciplines: Engineering and Journalism.

### 1.1. Why critical and creative thinking?

We have set our focus on critical thinking and creativity because they underlie all the other key lifelong competencies mentioned in the European *Recommendation* – more specifically in the Annex of the European Reference Framework (European Parliament and the Council, 2006): communication in the mother tongue and in foreign languages, mathematical and digital competences, sense of initiative and entrepreneurship, social and civic competences, cultural awareness and expression, basic competences in science and technology, and learning-to-learn. Critical and creative thinking are pervasive in these foregoing competencies, which involve the interpretation of concepts, thoughts, feelings, and intercultural nuances when communicating in the mother tongue or the foreign language; problem solving as a basic constituent of the mathematical, scientific, and technological competencies; a critical use of the information when employing digital media; the creative transmission of ideas; and the capacity to motivate oneself and regulate their own process of learning. It is important to note that, while the EU educational literature uses the term ‘competences’, we prefer the label ‘competencies’ (Thornbury, 2006), which not only emphasizes the result (i.e. the internalized knowledge of a certain concept or field) but also the process of combining knowledge, abilities, mindsets, or behaviors to teach or train in a specific practical skill with a view to successful performance.

A second powerful reason for selecting critical thinking and creativity from among the other competencies is that they hold a circular relationship and feed into each other. As some renowned educational scholars (Guilford, 1956; Sternberg, 1988) have pointed out, being creative requires analyzing what is new or original, categorizing ideas (by grouping or separating them according to coherent criteria), making connections among them, taking decisions, and implementing the outcome (Fredericks, 2005; Sawyer, 2011). Likewise, thinking critically demands imagination to envisage alternatives and predict consequences and situations, and thus creativity has been considered a subset of critical thinking (Halpern, 2010), or even an element, on an equal footing with analytical thought, of an intersection space of conjecture that has been called ‘possibility thinking’ (Craft,

2010), and is based on questioning, exploration, connection-making, interpretation, evaluation, argumentation, risk-taking, and reflection. From the last two wider-angle perspectives, then, critical and creative thinking may be regarded as flexible stages within a 'larger whole' or 'bigger picture' of reasoning abilities, whether embedded or occurring consecutively. The traditional misconception when it comes to encouraging critical and creative thinking in the classroom, however, has been to treat them as separate, or at most complementary, unrelated competencies. To mitigate this gap, we adhere to Moore's (2011, 2017) claim for a "transdisciplinary pedagogy" to seek critical thinking connections across fields, but at the same time recognizing the unquestionable role of background knowledge and genre constraints: critical thinking is always context-bound. Indeed, somebody with expertise in a certain area is, in Moore's own words, "usually better positioned to bring a critical approach to it" (2017: 29), and different genres call for "different types of critical practices and judgements" (2017: 33).

## 1.2. Advantages of genre-based approaches

One of the advantages of viewing discourse in terms of genre in the teaching of professional communication is that we incorporate contexts to extend reflection beyond the textual product, which entails paying attention not only to linguistic features but also to ethnography and social cognition, and taking into account how the text in question is exploited to meet specific disciplinary objectives at an individual, communal, and organizational or institutional levels. Bhatia (2004: 22-23) remarks that, despite the different foci within genre theory, namely the typification of social action (Bazerman, 1994; Berkenkotter & Huckin, 1995; Miller, 1984), the regularities of staged, goal-oriented social processes (Martin, 1993 among others), and the consistency of communicative purposes (Bhatia, 1993; Swales, 1990), the main emphasis is laid on conventions. These bring along a highly structured recognizable form, albeit dynamic and subject to private and organizational intentions – therefore to 'bending' and manipulation in the service of scientific and technological divulgation and vested interests alike, two aspects that are currently furnishing (Critical) Discourse and Genre Analysis with abundant food for research. Bhatia's theory (2004: 18-19) contemplates a plurality of 'communicative spaces' (i.e. textual, tactical, professional, and social) that configure a *multi-perspective model of professional discourse* and join the knowledge of document types, tactics, socio-pragmatic norms, and professional expertise.

With this theoretical framework as the starting point, we have turned to the recent work of three fellow scholars who have developed fruitful genre task-based pedagogies for higher education: English (2011) and Nesi and Gardner (2012). They coincide in shifting the focus from genre as pedagogical goal towards genre as pedagogical resource (English, 2011: 4). Leaning on this distinction, and evoking

Austin's *How to do things with words*, we set out to 'do things with genres': help our students learn disciplinary contents and procedures, and become *knowledge transformers* able to attune their communication critically and creatively to the various audiences, purposes, and circumstances they may encounter. This is the second advantage of a genre-based approach. We have devised our own strategies, building on Nesi and Gardner's (2012) didactic use of disciplinary families of genres informed by the 'dimensions' identified by Biber (1988), such as involvement and interpersonality, informativity and vagueness, and persuasion and promotion in verbal (oral or written), visual, or multimodal channels. Another pillar of our proposal is English's (2011) regenring experience; that is, the creation of tasks involving reworking and recontextualization, which often affect register, the degree of engagement, rhetorical organization, and format. This is, of course, inevitably also informed by the genre-based pedagogy of the Sydney School (Martin, 1999), particularly as far as our pedagogical methodology is concerned.

In this vein, the third advantage of a genre-based pedagogy is *interdisciplinarity* in a twofold sense. First, there are cross-disciplinary genres that may lead learners to the spontaneous transference of generic knowledge and the subsequent noticing of communicative traits across disciplines. As Bhatia (2004: 31) observes, for instance, the research article, the manual/textbook, and the academic essay are common to the law, science, and business domains. If students and professionals from one of those fields happen to share specialized activities with experts from the other two, they may transfer their disciplinary generic knowledge to notice similarities and differences with the texts used in the other communities of practice (Wenger, 1998), and through them understand how those professional groups interact in society and why they proceed the way they do. Second, genres are 'no-man's land territories' where content and language lecturers meet and may provide an opportunity for team-teaching the discourse of the discipline. Insightful initiatives in this regard have been reported by Arnó-Macià and Mancho-Barés (2015) and Moore, Ploettner, and Deal (2015), the latter pairing-up content and language specialists in 'development groups' to discuss the planning and implementation of their subjects and provide mutual and dialogical feedback to one another.

## 2. WHAT ENGINEERING AND JOURNALISM STUDENTS NEED

In what follows we will comment on the communicative needs of Engineering and Journalism students in the current EMI learning environments at universities, and outline the major learning impediments detected. As we shall show, although the communicative challenges facing these groups of students are very different, the concept of genre is key in both (even though the genres themselves are dissimilar). Moreover, our approach based on critical thinking offers considerable pedagogical

potential to open students' eyes to the workings of professional genres in both subject areas, and thus to empower them as professionals.

## 2.1. Critical and creative thinking in Engineering

The profession of aeronautical and aerospace engineer has been described as 'polyhedral' (Gabinete de Comunicación ETSIAE-UPM, 2017) because, like some other branches of Engineering (e.g. Industrial design and Telecommunications), it embraces many facets and contexts: design, operation, maintenance, exploitation, research into new materials and technologies, and different kinds of control through supervision, norm-making and laboratory assays, to mention some. Several applied linguistics experts in Engineering Education, such as Hanauer and Curry (2014: 5), have emphasized the need for future engineers to identify these disciplinary practices or 'facets'. Other gaps they mention are the need for learners to experience professional communication and socialization, and to receive an improved disciplinary instruction, which implies, we would add, the feeling of being part of a learning community with a sense of membership and immersed in a learner-centered atmosphere. Like Hanauer and Curry (2014), we do believe that the integration of applied linguistics and engineering literacies may assist in bridging these deficiencies.

Classical components of the engineers' identity are their keenness on problem-solving (Male, Bush, & Chapman, 2010; Sales, 2006) and visualization (Curry, 2014; Riemer, 2007), their discomfort with promotional or persuasive discourse in general (Sales, 2006, 2008), and their solution-oriented creativity (Sales, 2006), although they may not envisage themselves as creative, given the importance they attach to protocols and procedures (Sales, 2006: 24-27). For this reason, some technical universities (e.g. the University of Toronto, London's Imperial College, the University of Crete, and the Daffodil International University of Bangladesh) have been actively fostering a more subjective kind of solution-oriented creativity through alternative programs, for example, based on mind-mapping, both manual (Zampetakis, Tsironis, & Moustakis, 2007) or computer-aided (Mahmud, Islam, & Rawshon, 2013), since for engineers, graphics function as "invention heuristics" (Curry, 2014: 93) that constitute "a form of writing" (Winsor, 1992) in support of their arguments and may be crucial to innovation.

In today's globalized world, attributes of engineers now include an anthropological and pragmatic dimension (Ahearn, 2000; Stapp, 1992) necessary for communicating cross-culturally, either internally in multi-organizational projects or externally with the local populations affected, and across disciplines and types of audiences (Giménez, 2014). Equally vital attributes are entrepreneurial skills, in which the communication of ideas plays a cardinal role (Riemer, 2007), teamwork (Giménez, 2014; Male et al., 2010), emotional intelligence to transmit empathy to the group (Male et al., 2010), multimodal

literacy (Curry, 2014), and an understanding of the broader context of decisions (Male et al., 2010).

Contemporary graduate engineers must be ready to grapple with technological surveillance, increasingly demanded by corporations and institutions. This implicitly requires analytical thinking and a creative mind to identify the usefulness, originality, feasibility, and profitability of an invention or discovery, and as a result of all this, evaluate its investment potential. In order to do so, technology surveyors must also know how to 'read between the lines' in scientific and technology descriptions, distinguishing between tacit and implicit information and the motivations behind those two encoding choices. They are to realize that science (embodied by the research article) and technology (represented by the patent) are but the sides of the same coin (i.e. problem-solving, the *raison d'être* of Engineering), and that the two genres are epistemologically convergent and discursively divergent (Myers, 1995) owing to their distinctive aims and ways of dissemination and marketing.

All in all, engineers are facing the challenge of responding to the ever-growing specialization of their disciplines while becoming more 'complete' professionals (De Graaff & Ravesteijn, 2000), which involves being able to think and act strategically across fields, cultures, and varying levels of knowledge of different audiences; acquiring soft skills; keeping up with scientific and technological innovation to evaluate the achievements of colleagues and disseminate one's own; and find investors, sponsors, and market niches. As usual, the type of hands-on and learner-centered training required to help them cultivate these qualities runs into the problem of crowded curricula and little time for covering syllabi (let alone in EMI programs), as well as meeting with mixed feelings about who should teach the discourse of the discipline – whether this should be done by content or language teachers. Our answer is: both. The synergy of engineering and ESP lecturers converging on professional genres may prove a most empowering pedagogical tool. The intervention of the applied linguist or language instructor consists in teaching genre conventions, the major features of the registers involved (i.e. technical and legal), the main devices used in promotional discourses (e.g. lexical items, emphatic structures, and metadiscourse items such as boosters and hedges), as well as in offering a diachronic panorama tracking the discursive evolution of the genre according to the changes in the engineer's profile and in his/her technological or scientific environment.

## 2.2. Critical thinking skills for journalists

The need for critical and creative thinking skills is particularly acute in journalism, because those who work in the media are constantly faced with contradictory accounts by different stakeholders, one-sided campaigns by pressure groups, biased stories told from personal perspectives, and so on. Journalists need to be

able not only to find information, but also to identify its sources, evaluate their reliability and the probable existence of bias, understand how differing accounts of the same events or issues come into circulation, distinguish fact from opinion or conjecture, and so on. Furthermore, in the era of fake news, it is now even more essential that would-be journalists should develop a critical stance to what they read or hear in the media, and learn how to unpack media messages to see what they are made of, where these elements come from, and what their emissors and retransmitters are trying to achieve by relaying them in that way. All of this has led specialists in training for journalists to place critical thinking high on the list of desiderata. For example, Lynch (2013: 250) sets out a list of “21<sup>st</sup> century skills” to prioritize in training for young journalists, which gives prominence to effective reasoning and problem solving skills, the ability to analyze a story and all the multimodal elements that go into a media report, and decision-making skills, particularly applied to what to include and what to omit.

The approach to teaching critical thinking to students of Journalism described here is influenced by Ennis’s definition of the notion as “reasonable, reflective thinking that is focused on deciding what to believe or do” (1987: 10), but informed also by the more discourse-oriented EAP approaches such as that developed by Hood (2004), who suggests that “[m]aking the implicit in discourse explicit is a means by which we can enable critical awareness and critical participation” (2004: 244). Above all, however, the focus adopted here has been shaped by Critical Genre Analysis (Bhatia, 2016), and by the authors’ own background in the area of discourse and media studies (Breeze & Olza, 2017). We would argue that to understand media texts, students of Journalism need to adopt a critical stance to media production practices. They need to understand the pressures of genre as a constitutive principle (Bhatia, 2004), as well as the contingencies and constraints operating in research and representation processes (Breeze, 2015). Moreover, they need to see how these forces operating on a macro-level are visible in the text on the micro-level, so that a major ideological bias, for example, can be detected in the details of language use such as a choice of reporting verb.

However, although critical reading skills are undoubtedly conveyed and modeled by many course teachers on degree programs in Journalism who deal with texts in the L1, when it comes to the English-taught component of the syllabus, critical thinking may be left out of the equation. The main reason for this is the assumption that students already have the necessary cognitive skills in the L1, and can easily apply them to the L2 as long as they have the right language tools (Schoonen, Snellings, Stevenson, & van Gelderen, 2009). This may be appropriate in the ‘languages for specific purposes’ paradigm, but the EMI context means that such an assumption can no longer be made. Since the English-taught course is no longer a language course, but rather an integral part of the students’ education as journalists, such transversal competencies need to have a much higher profile, while the language itself, though still important, is relegated to a

secondary position. Depending on the EMI teacher's background, this may prove challenging: the "way of thinking" in a particular profession is usually embedded in the habitus of that profession, is part of a dense network of interrelated practices, and is acquired by novices over a long period of time through processes of observation and peripheral participation (Lave & Wenger, 1991). Although recent moves towards defining professional competencies have gone some way towards bringing these out into the open, it is still quite difficult to map out learning paths and see how skills should be acquired in specific professional areas. In the case of journalism, EMI teachers need to gain deep insights into the way that journalists work, in order to understand how to promote competencies such as critical reading skills. At the same time, EMI teachers need to keep their students' incipient language competencies in mind in order to deal with any comprehension issues that arise and provide support for students' ongoing development.

### 3. FOSTERING CRITICAL AND CREATIVE THINKING THROUGH GENRE

#### 3.1. Hands-on, interdisciplinary genre literacy for technological innovation

204

The genre-based team teaching experience reported on here was implemented over two academic years (2014-2015 and 2015-2016) in the Schools of Agronomic and Aerospace Engineering at the Universidad Politécnica de Madrid. In both editions, two lecturers – an agronomic engineer and an applied linguist – together with a heterogeneous class of around 20 masters and doctoral students (a different mixed cohort each year) from the agronomic and aerospace fields, worked on a patent document by contrasting it with a 'twin' research article written by the same authors and on the same technology (i.e. drones applied to agriculture), of interest to both disciplinary populations. They also undertook the collective endeavor of reworking technical contents across related genres (e.g. research article and patent abstracts, visual and verbal, and legal claims) to suit the interests, backgrounds, and situations of diverse potential audiences.

During the course, which was a ten-hour seminar entitled "Understanding the Inventor's Mind through Patent Analysis", the participants worked in mixed groups to examine the differing features, contexts, and textual and social outcomes of the research article and patent genres, and had the chance to write patent claims for the first time. With this hands-on approach, the instructors intended not only to facilitate the learning of *disciplinary* and *procedural contents*, but also to create *learning communities* with a *sense of identity* as engineers who interact in a climate

of *interdisciplinary collaboration* and *communication* that spurs the exercise of critical and creative thinking.

Engineers' identity or communal sense of belonging rests on three basic pillars (Wenger, 1998: 73): a 'common goal' (e.g. problem troubleshooting and solving), 'engagement actions' (e.g. design, calculation, experimentation, consulting, creating and maintaining relationships, etc.), and 'shared media' (e.g. routines and procedures, roles, discourses, visual and numerical literacies, jargon terms, and genres). They define the scenario for the pedagogical 'mission statement' of the course, which invites students to experience how their disciplinary identity is shaped by *procedures* (some of which are teamwork via collaborative writing, group discussion, peer review and feedback, technological surveillance, the vindication of intellectual property, and the dissemination and divulgation of science and technology), *literacies* (graphical, multimodal, numerical, and verbal), and *texts* (genres and their variants within the boundaries of disciplinary conventions).

Daily class dynamics (Figure 1) were made up of three slots: a brief slide-show input on all the technical, rhetorical, and linguistic information necessary to accomplish the task of the day, peer workshop time for completing the worksheet, and a closing class discussion to share views and outcomes and generate opinion. Extra 'food for thought' and pending tasks, if any, were assigned as homework and commented on in the next session. The team teaching scheme adopted Lyster's (2007) advocacy of a 'counterbalanced instruction' with an 'adjunct model' (Brinton, Snow, & Wesche, 1989; Greere & Räsänen, 2008) in which language and content have more or less the same weight during the lectures and both teachers are present in every session.

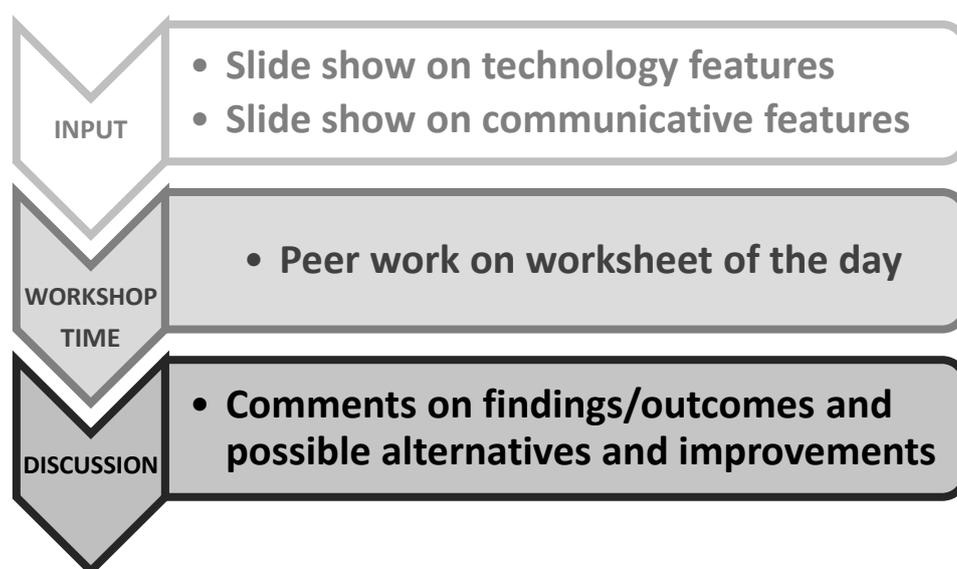


Figure 1. Outline of daily class dynamics

The topical syllabus pivoted around contrastive textual awareness and explanation (Figure 2), which concerns differences in authorship, publication dates, titles, abstracts, type and location of visuals, rhetorical organization, patterns of promotional and vague language, and even word keyness, determined with the aid of *AntConc*, a freeware concordancing program used by corpus linguists (Anthony, 2007).

|   |  |
|---|--|
| <b>DAY 1</b><br><b>Genre 'twinness'</b>     | <ul style="list-style-type: none"> <li>•Mirroring nature of articles and patents</li> <li>•Differences in purposes, publication dates, target audiences, registers, in-text keywords, value of intertextuality, abstracts</li> </ul> |
| <b>DAY 2</b><br><b>Visuals</b>              | <ul style="list-style-type: none"> <li>•Treatment of visuals: kind, function, location, relationship with verbal text</li> <li>•Implicit and explicit information: causes and repercussions</li> </ul>                               |
| <b>DAY 3</b><br><b>Promotional language</b> | <ul style="list-style-type: none"> <li>•Praise and criticism strategies and evaluative language</li> </ul>   |
| <b>DAY 4</b><br><b>Legal claims</b>         | <ul style="list-style-type: none"> <li>•Validity criteria for patents and articles</li> <li>•Matching descriptions with claims</li> <li>•Claim structure identificaton &amp; claim writing</li> </ul>                                |
| <b>DAY 5</b><br><b>Changing contexts</b>    | <ul style="list-style-type: none"> <li>•Evolution of textual format</li> <li>•Changes in inventors' profile, contexts and procedures for intellectual property claim</li> </ul>  |

**Figure 2.** Outline of topical aspects covered in the seminar

The students' responses to the quantitative and qualitative exploration of discourse and the 'dissection of texts' through the concordancer were enthusiastic, to say the least. Figure 3 displays a worksheet with a list of items to be electronically searched so as to pinpoint stylistic features. In groups, seminar participants were asked to detect terms and structures for addressing the expert and lay communities within the patents' readership (i.e. reader pronouns, direct appeals to the reader, expressions of shared knowledge), and to evaluate the impact of vague and emphatic language (i.e. lexicogrammatical boosters and hedges, affect-loaded words) and metadiscursive reader-considerateness (e.g. glosses and markers of inference), as well as to construct arguments justifying the asymmetries found between the research article and patent genres.

## Worksheet 3



- With the aid of the concordancing program, search for the following items in both documents:

|                           | Hits (section) |                  |                            | Hits (section) |                  |
|---------------------------|----------------|------------------|----------------------------|----------------|------------------|
|                           | Patent         | Research Article |                            | Patent         | Research Article |
| • Community pointers      |                |                  | • Informative Guides       |                |                  |
| ○ We                      |                |                  | ○ This/which means         |                |                  |
| ○ Inventor(s)             |                |                  | ○ That is                  |                |                  |
| ○ Skill in the art        |                |                  | ○ e.g.                     |                |                  |
| ○ Obvious(ly)             |                |                  | ○ i.e.                     |                |                  |
| ○ Clear(ly)               |                |                  | ○ For example/for instance |                |                  |
| ○ Understood              |                |                  | • Attitudinals             |                |                  |
| ○ Known                   |                |                  | ○ Surprisingly             |                |                  |
| ○ Seen                    |                |                  | ○ (Un)expected(ly)         |                |                  |
| ○ Shown                   |                |                  | • Loaded items             |                |                  |
| • Hedges (vague language) |                |                  | ○ Advantageously           |                |                  |
| Modal Verbs               |                |                  | ○ Straightforward          |                |                  |
| ○ May                     |                |                  | ○ Good/better/best         |                |                  |
| ○ Can                     |                |                  | ○ Sufficient               |                |                  |
| ○ Could                   |                |                  | ○ Effective                |                |                  |
| Numeral determiners       |                |                  | ○ Facilitate               |                |                  |
| ○ Various                 |                |                  | ○ Desirable                |                |                  |
| ○ Many                    |                |                  | ○ Helpful                  |                |                  |
| ○ Most                    |                |                  | ○ Preferred/preferable     |                |                  |
| ○ Several                 |                |                  | ○ Sufficient               |                |                  |
| ○ One or more             |                |                  | ○ Conveniently             |                |                  |
| ○ At least                |                |                  | ○ Improved                 |                |                  |
| ○ Diverse                 |                |                  | ○ Easier                   |                |                  |
| ○ Small                   |                |                  | ○ Reliable                 |                |                  |
| ○ Large                   |                |                  | ○ Problematic              |                |                  |
| Approximators/mitigators  |                |                  | ○ Damaged                  |                |                  |
| ○ Has been found          |                |                  | ○ Incompletely(ly)         |                |                  |
| ○ Typically(ly)           |                |                  |                            |                |                  |
| ○ Common(ly)              |                |                  |                            |                |                  |
| ○ Frequent(ly)            |                |                  |                            |                |                  |
| ○ Often                   |                |                  |                            |                |                  |
| ○ Nearly always           |                |                  |                            |                |                  |
| ○ Approximate(ly)         |                |                  |                            |                |                  |
| ○ Suggest                 |                |                  |                            |                |                  |
| ○ Potential(ly)           |                |                  |                            |                |                  |

Figure 3. Worksheet sample for the electronic search of textual corpora

Patent analysis lends itself to practicing a combination of higher-order cognitive skills: research, synthesis, systemic thought, explanation, criticism, prediction, extrapolation, solving of open-ended problems, hypothetical ‘what if...’ questions, design, and conceptualization based on identification. This practice may be guided in turn by metacognition, another higher-level skill per se, during the joint elaboration (by students and teachers) and negotiation of rubrics for claim writing, for example. On the whole, genre awareness is gradually raised by means of contrast, reflection (a list of questions posed in each daily worksheet is provided in Appendix 1), and tasks of identification and production. In this fashion, the students were confronted with:

- Tracing the evolution of technologies and their successive improvements through their patents’ history
- Identifying different traditions (e.g. US and European) in science and technology by comparing national patent text conventions
- Deducing the technical and commercial priorities and concerns of inventors over time in a given field
- Comparing the disclosure of the same technology in different genres and disciplines

- Contrasting how deference towards the audience varies across disciplines, genres, and even sections of the same document, judging whether they all require the same degree of expertise to be understood
- Becoming familiarized with the academic, technical, and legal registers
- Distinguishing which information should be tacit and which overt
- Exercising creativity in the visual representation of the invention or discovery to avoid patent competitors and thus claim maximum intellectual property
- Understanding claim hierarchies, writing claims creatively and critically to avoid undesired ambiguity, and using vague and accurate expressions at convenience (to respectively dissuade patentee competitors and ensure the feasibility of the invention)

The part of the seminar requiring the highest level of critical thinking and creativity was claim writing. The students were taught the structure of claims (preamble + linking term + inventive body), to identify its constituents in the claims section of the patent document, and finally to match each claim with its corresponding description in the other sections. After they completed this task of guided identification, they were asked to write their own claims for a fictitious technology (Figure 4, image), sorting out first the attributes (Figure 4, features) most likely to meet the validity criteria for patent granting (i.e. novelty, utility, feasibility, maximum intellectual property), whose rank into a hierarchy may be shown in a mind map, a tree diagram, or an outline.



Figure 4. Fictitious invention and its key attributes

The seminar closed with a discussion of the changes in patent texts written by inventors in different social and historical contexts. The solitary self-made

inventor (e.g. Edison, Tesla), who wrote first-person epistolary patents in the first quarter of the 20<sup>th</sup> century, has given way to the hybrid corporate profile of university consortia and to more concise, de-personalized patent documents with a header-organized format and bulleted or numbered legal claims.

Critical thinking and creativity were encouraged all throughout the seminar and not only during claim writing. Table 1 encapsulates the tasks assigned for each competency and classifies the concrete aspects of critical thinking demanded (in square brackets).

| DAY/SECTION                      | CRITICAL THINKING TASKS  | CREATIVITY TASKS   |
|----------------------------------|--|--|
| DAY 1<br>GENRE<br>'TWINNESS'     | Spot differences between the research article and the patent regarding format and headings. Justify them.<br>Spot keyword differences in both genres and explain them.<br>[Aspects of 'possibility thinking' (Craft, 2010; see section 1.1 in this paper) exercised in the tasks above:<br>EXPLORATION, QUESTIONING, REFLECTION, ARGUMENTATION]  | Design a single all-purpose document for disseminating the discovery or technology in academia and applying for a patent at the Patent and Trademark Office.<br>Justify the inclusion/exclusion of elements and the format chosen. |
| DAY 2<br>VISUALS                 | Contrast the placement of visuals in both genres.<br>Identify their type and function (anticipation of information, illustration, summary, complementary information).<br>Identify the differences of the graphical abstracts and justify them.<br>Evaluate the clarity and efficacy of peer designs.<br>[EXPLORATION, REFLECTION, ARGUMENTATION, EVALUATION]                                      | Design a graphical abstract for the research article sample and another for its patent.  |
| DAY 3<br>PROMOTIONAL<br>LANGUAGE | Identify promotional discourse and criticism in both genres.<br>Contrast and justify strategies in each genre.<br>[EXPLORATION, REFLECTION, ARGUMENTATION, EVALUATION]   | Think of alternative ways to appraise the discovery or technology and persuade, as well as to criticize previous work.   |
| DAY 4<br>LEGAL CLAIMS            | Identify claim constituents and find their descriptive match outside the claims section.<br>Mark independent and dependent claims in the text.<br>Identify the key attributes of the fictitious invention according to the patents' validity criteria.<br>Rank those attributes in a tree diagram or mind map.<br>[EXPLORATION, CONNECTION, REFLECTION, INTERPRETATION, ARGUMENTATION, EVALUATION] | Design, if possible, alternative visual representations for claim hierarchy.   |
| DAY 5<br>CHANGING<br>CONTEXTS    | Brainstorm market niches and patentable ideas in our everyday contexts.<br>Spot and discuss the differences in a patent from the XIX and early XX centuries and a current one.<br>Discuss whether it would be a good idea to create multimodal patents online. Enumerate pros and cons.<br>[EXPLORATION, CONNECTION, REFLECTION, INTERPRETATION, ARGUMENTATION, EVALUATION]                        | Sketch a format design for an online multimodal patent.  |

**Table 1.** Summary of tasks encouraging critical thinking and creativity throughout the seminar

### 3.2. Getting inside news genres: Strategies for teaching critical thinking to journalists

The three-credit course “Communication Skills for Journalists” was taught to a group of local and international students at the School of Communication at the University of Navarra, Spain, from 2012 to 2016. The group generally consisted of at least fifty percent international students from countries as far afield as China, Israel, and Argentina, all of whom had at least a high intermediate level of English and some of whom were native speakers of English. Although the course evolved out of a language-focused ESP course (“English for Journalists”), the internationalization of the university meant that the basis for the course shifted. It ceased to be an ESP course with an emphasis on professional language, but rather evolved into an EMI course with an emphasis on communication-related competencies in Journalism. The course was designed to promote critical thinking skills, particularly in the evaluation of information sources through personal experiences and interviews with professionals in different countries. The international profile of the students made the task of teaching critical thinking easier because the situation made them receptive to the notion of challenging received opinions and providing explanations for phenomena that are usually taken for granted (see Breeze, 2017). The course was also structured so as to give students free rein to explore some of the key ideas taught over the semester in contexts of their own choosing, thus engaging them creatively with the course objectives.

Regarding the course design and organization, although critical thinking was a transversal objective across all the different areas of the course, the critical thinking module was presented as a distinct module within the course. This module consisted of five stages taught over five double sessions, in which critical thinking skills were explicitly discussed and promoted in the classroom in the context of our study of news genres. Although these stages were generally organized sequentially, the middle stages (two to four) could also be ordered differently, according to the particular interests of the group, and were sometimes applied recursively in different workshop activities over a few weeks. The first and last stages, however, only made sense if they were understood as the beginning and end points of the course. The five stages of the critical thinking module are illustrated in Figure 5. In planning the module, a series of activities was factored that would facilitate critical and creative thinking in different ways (see Tables 2 and 3 and Appendix 2). These started from basic genre awareness, including a focus on the way different news genres and different types of newspapers present the same information. Following on from this, students carried out activities on important aspects of news writing (and reading), such as selection and representation of sources. They investigated how meaning was conveyed through linguistic and paralinguistic aspects of the text. As they progressed through the module, they began to link their findings creatively to broader ideological and cultural issues, an aspect which reached its culmination in their final project,

where they presented a critical analysis of media texts from different countries and publications.

|   |   |
|---|---|
| <b>STAGE 1</b><br><b>Consciousness-raising</b>    | <ul style="list-style-type: none"> <li>• Overview of different media (style, bias, etc.).</li> <li>• Comparison of the same story in different media.</li> </ul>  |
| <b>STAGE 2</b><br><b>Decoding</b>                 | <ul style="list-style-type: none"> <li>• Choice of sources: whose voice is in the text?</li> <li>• Direct speech: choice of reporting verbs.</li> <li>• Reporting of indirect speech: quoting, paraphrasing, summarising.</li> </ul>          |
| <b>STAGE 3</b><br><b>Critical genre analysis</b>  | <ul style="list-style-type: none"> <li>• Comparing the same information in different genres: critical awareness of regenerating.</li> <li>• Identifying the key features of each genre and considering their communicative impact.</li> </ul> |
| <b>STAGE 4</b><br><b>Production process</b>       | <ul style="list-style-type: none"> <li>• Controlled role plays to simulate production process to gain critical understanding.</li> <li>• Situated writing exercises.</li> </ul>   |
| <b>STAGE 5</b><br><b>Research across contexts</b> | <ul style="list-style-type: none"> <li>• Researching differences in reporting across cultures and media.</li> <li>• Applying skills learned in stages 1 to 4.</li> </ul>  |

**Figure 5.** Outline of critical thinking elements in course

The first of these stages, which could be described as consciousness raising, involved making students aware of the salient features of different types of news genres. This started with a simple exploration of the differences between tabloid and broadsheet contents and style, leading into a discussion of reliability and bias, and also a consideration of the socio-pragmatic space and the reasons underlying the different discourse practices that can be detected (Bhatia, 2016). The worksheet displayed in Table 2 provided a useful starting point: the broad categories identified mean that it can be used productively with a wide range of texts, from football reports to articles about celebrities, health or politics. Although the British and US press usually formed the basis for these activities, students also brought examples of a news story from their own country, and an explanation of how this article was typical of its genre, and of the publication in which it appeared. Where possible, students were asked to contrast their article with another version of the same story from a more popular, or more serious, publication. The comparison that resulted was then used in an informal “show and tell” session in which students could compare different types of language and presentation, become more aware of different styles of reporting, and microgenres, and touch on issues of bias, censorship, and control. The informal nature of the “show and tell” activity meant that students could ask each other questions, which usually sparked animated discussion.

| FEATURES OF THE TEXT      | POPULAR NEWSPAPER | SERIOUS NEWSPAPER |
|---------------------------|-------------------|-------------------|
| Level of detail           |                   |                   |
| Colloquial expressions    |                   |                   |
| Dramatic accounts         |                   |                   |
| Sentence length           |                   |                   |
| Role of emotions          |                   |                   |
| Details of who said what  |                   |                   |
| Analysis: your impression |                   |                   |

**Table 2.** Worksheet: Raising consciousness of differences between news reports

Moving on from this, the course then led the students through several other stages to bring out different aspects of critical thinking in the context of news genres. The second stage was the simplest of these: a decoding exercise in which we took apart news articles to find out what sources were used to write them and how these sources were used (Breeze, 2000). The importance of the choice of sources was usually clear to the students, but they were less accustomed to paying close attention to the way in which a source is used (direct quotation, rephrasing or summarizing, use of reporting verbs or adverbs, description of sources, etc.). This involved reworking the parts of a news article in table format, as illustrated in Table 3:

| CONTENTS | STATED BY JOURNALIST, SOURCE NOT GIVEN | SOURCE GIVEN | DIRECT QUOTATION | REPHRASING OR SUMMARY | REPORTING VERBS, ETC. |
|----------|--|--------------|------------------|-----------------------|-----------------------|
| 1. Point |  |              |                  |                       |                       |
| 2. Point |  |              |                  |                       |                       |
| 3. Point |  |              |                  |                       |                       |

**Table 3.** Worksheet: Identifying and analyzing the use of sources in a news article

This activity brought out interesting differences between publications, and showed clearly how the journalist had assembled the article, given a voice to some protagonists and rendered others inaudible, used specific verbs to dramatize or delegitimize particular actors, etc. It also led to a fruitful initial discussion of the way these choices work with other aspects of the text (images, headlines, subheadings, and highlighted quotations) to make a different impact on the reader. By the end of this activity, the students had explored one news story in detail, and had learnt to disentangle the different sources, and assess the extent to which the framing and perspective introduced by the writer influenced the way the messages were conveyed.

A particular issue that proved to be important for raising critical genre awareness was to draw students' attention to the British media's habit of representing every issue as having two sides, which are often presented as having equal validity, even though one may represent the scientific establishment and the other an alternative theory that lacks validation (Clarke, 2008). This insight helped to shape the third stage of the critical reading program, namely critical appreciation of genre, in which students were asked to examine the use of sources in more detail, this time trying to understand how information makes the transition from an informational genre (e.g. an article about health or diet from a government health website) to a newspaper text. The idea was for students to gain familiarity with the way genre conditions the language and, ultimately, the messages in different types of text (Bhatia, 2004). This activity involved considering some of the following issues, among other points, which led to a deeper understanding of how individual writers tried to reconcile the concern for objectivity with the need to be newsworthy:

- Deployment of strategies to engage reader attention in different genres
- Textual macrostructure in media and scientific genres
- Uses of hedging to qualify truth claims in scientific texts
- Use of boosting to increase newsworthiness in media texts
- Communicative need to adapt the amount and depth of information to different types of reader
- Frequency of emotive vocabulary and metaphor in media texts
- Foregrounding effects of headlines, subheadings, images, and captions
- Different roles of "experts" and "authorities" in scientific and media texts

By consideration of all these factors, students developed a critical understanding of the way that regenerating affects the messages communicated through news reports. These sessions led to lively discussions of the ideological implications of genre-related issues, and afforded deeper insights into the possible social afterlife of media texts. At this stage, active regenerating activities were also introduced (English, 2011), in which students reformulated the same information for different audiences and different communicative purposes (i.e. for a sensational newspaper and for a public health leaflet, or for websites aimed at different age groups). Such activities harnessed student creativity while affording further useful insights into the constraints inherent to different genres.

A fourth stage in the course involved the need to understand the reporting process underlying media productions. In this, it is important for students to gain inside knowledge of the difficulties that reporters face, and the need to reconcile seemingly conflicting accounts in order to build a coherent narrative that fits with the conventions of news writing. The type of activity that was incorporated involves role plays, in which students were given different eye-witness accounts of a particular event, and they had to interview each other in order to elicit all the

information they needed to write a news article about it. Local news stories were used for this, but so were stories from international sources, which have the advantage of featuring a short “breaking news” video available to set the scene and plenty of different accounts that can be used to prepare the role plays. This activity was popular with the students not only because it provided some hands-on practice with reporting skills in English, but because it proved intellectually stimulating to have to reconcile different accounts, and then to order the information using the reverse pyramid format, working in quotations from different sources, and hedging them where appropriate.

In the final stage of the critical thinking module, students were encouraged to take the lead and apply their critical thinking skills creatively. In the students’ final project, they selected a topic from current affairs, and researched the way it was being reported in different media across the world. The critical competencies that students acquired gave them a greater capacity for handling their sources, and the projects that arose in the course of this task showed a considerable degree of creativity both in devising stimulating research questions and in searching for information to answer these questions and triangulate their findings.

Student satisfaction with the course as a whole, and with the critical thinking module in particular, was high, and many students explicitly valued the opportunity to go into more detail when looking at real media texts, and to explore the deeper ideological implications of the differences apparent on the surface.

#### 4. CONCLUDING THOUGHTS

Genre has always been a central concern in ESP courses, because it is not possible for students to become proficient in the language of a particular professional area without gaining an understanding of how professional genres are constructed and how they function in the discourse community. However, across Europe many traditional ESP courses are currently being replaced or supplemented by EMI courses, a phenomenon driven by the need to participate in Erasmus exchanges, and by the general impetus towards “internationalization” arising out of increased competition and the growing importance of rankings (Wächter & Maiworm, 2014). Ironically, one of the side effects of this transition is that students are not receiving as much support with language issues as before. Because language is no longer a primary focus, important issues such as how to understand, interpret, and use different professional genres have receded into the background. In this article, we have shown how genre can be brought back into focus productively when teachers with an ESP background are involved in teaching EMI courses. This does not imply a reduction in the course contents. However, it does mean that EMI courses need to be structured in such a way that there is an explicit focus on language, and most particularly, on genres. Moreover, it also means that the course teacher needs to be competent (and confident enough) to provide support and guidance in all the

language areas involved in the production and interpretation of professional genres – or if this is not the case, that a system of team teaching should be developed so that the content teacher can draw on the support of an ESP teacher to help design, deliver, and evaluate this part of the course.

With this in mind, we have described two very different genre-based modules delivered within EMI contexts, one based on team teaching, the other organized within a “communication skills” course, in two very different professional areas – Engineering and Journalism. Our accounts show how the need to foster critical and creative thinking can be pursued in these very different disciplines, and how the focus on genres facilitates the acquisition of important thinking skills, as well as boosting language competences. We have shown that the pedagogical potential of our approach is broad and promising for the acquisition of disciplinary contents and procedures and the practice of transversal skills. Our genre-based critical thinking modules were designed as ‘prolonged’ language-related episodes (Basturkmen & Shackelford, 2015) in which genre conventions (i.e. discourse features, rhetorical organization, and layout) play a paramount role in any interaction and give an opportunity to rework contents and form collaboratively, critically, and creatively to satisfy the requirements of alternative communicative contexts.

The value of professional genres in EMI resides in the fact that these genres are themselves spaces of convergence for experts from different disciplines, neophytes and experts of a certain discipline, lay and expert audiences, and content and language teachers interested in encouraging communicative competencies. They also build bridges between higher education and the real world, by motivating learners with authentic documents from their fields of expertise and improving their information literacy and communicative abilities. Paraphrasing Carlsson, Edström, and Malmström (2010), we believe that through professional genres students *learn to communicate and communicate to learn*, applying critical thinking and creativity along the way. By understanding genres from the inside in the way we have described, students will become more literate in their disciplines, and ultimately more competent professionals. In accordance with Hyland (2004: 19), another of our beliefs is that creativity flourishes precisely thanks to genre constraints, which allow their users leeway to develop disciplinary and even individual voices. In light of this belief, we would like to assist students in discovering their own voices and those of their professional communities. Thus, we not only suggest that disciplinary literacies are taught in a team-teaching fashion bringing together content and language specialists, but also that (future) members from other professional communities are brought in as lay audiences and feedback providers. The idea would be to ‘do regenring’ by critically figuring out the contexts and communication habits, expertise, and interests of different communities of practice and using linguistic and rhetorical resources creatively to craft engaging or persuasive messages.

In this sense, the two experiences that we have described separately in this article could intertwine: Engineering students could write research paper and patent abstracts, executive summaries for sci-tech contest proposals, science blog entries, and even prepare, as individuals or as spokespersons of universities' and companies' consortia, 'elevator-pitch' presentations, and video-clips for potential sponsors and investors. Journalism students, in turn, might interview engineering graduates playing the role of 'inventors', 'patent examiners', or 'commercial and research sponsors', and disseminate the information so obtained through journalistic genres: press releases, short online articles, editorials, blog entries, and tweets. They would have to adapt the formality and specialization of the scientific/technical or academic sources to the needs and interests of the general public, or of experts with other disciplinary backgrounds.

Rubrics for the evaluation of output and performance in every genre could be negotiated between the two disciplinary groups under the supervision of the content and language teachers, and class discussions might be held to reflect on the chief difficulties experienced in every task. A most revealing activity would be to contrast the genres used by both engineers and journalists (e.g. science blogs), and to compare their respective desirable features, which should be contained in the evaluation rubrics previously negotiated within each learning community and reflect the disciplinary values and social action behind the genre.

Perhaps, as Curry (2014: 62) notes about Engineering, all disciplines should broaden their 'vocal ranges' and make a more frequent and critical use of subjective imagination to better describe their creative elements and counter their traditional 'unemotional objectivity' in the presentation of facts and events and their neglect of non-expert addressees in their discourses. With this study we have intended to show that critical and creative thinking are indispensable tools for learning about genres and discourses and transforming them, within disciplinary conventions, in order to adapt to certain contexts and reach diverse audiences. Both competencies are also necessary to become aware of communication habits in academia and the professions, and may contribute to expanding one's learning community through interaction with students from other disciplines in joint inter- or cross-disciplinary team-teaching projects that mirror the complex flow of information in our globalized world.

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## References

- Ahearn, A. L. (2000). Words fail us: The pragmatic need for rhetoric in engineering communication. *Global Journal of Engineering Education*, 4(1), 57-63.
- Airey, J. (2016). EAP, EMI or CLIL? In P. Shaw, & K. Hyland (Eds.), *The Routledge handbook of English for academic purposes* (pp. 71-83). Abingdon: Routledge.
- Anthony, L. (2007). AntConc 3.2.1w. Retrieved from <http://www.antlab.sci.waseda.ac.jp/software.html>
- Ament, J., & Perez-Vidal, C. (2015). Linguistic outcomes of EMI programmes. *Higher Education: Higher Learning Research Communications*, 5(1), 47-67.
- Arnó-Macià, E., & Mancho-Barés, G. (2015). The role of content and language in content and language integrated learning (CLIL) at university: Challenges and implications for ESP. *English for Specific Purposes*, 37, 63-73.
- Basturkmen, H., & Shackelford, N. (2015). How content lecturers help students with language: An observational study of language-related episodes in interaction in first year accounting classrooms. *English for Specific Purposes*, 37, 87-97.
- Bazerman, C. (1994). Systems of genres and the enhancement of social intentions. In A. Freedman, & P. Medway (Eds.), *Genre and new rhetoric* (pp. 79-101). London: Taylor and Francis.
- Berkenkotter, C., & Huckin, T. H. (1995). *Genre knowledge in disciplinary communication. Cognition/culture/power*. Hillsdale, NJ: Lawrence Erlbaum.
- Bhatia, V. K. (1993). *Analysing genre: Language use in professional settings*. London: Longman.
- Bhatia, V. K. (2004). *Worlds of written discourse: A genre-based view*. London: Continuum.
- Bhatia, V. K. (2016). *Critical genre analysis: Investigating interdiscursive performance in professional practice*. London: Routledge.
- Biber, D. (1988). *Variation across speech and writing*. Cambridge: Cambridge University Press.
- Breeze, R. (2000). Beyond a naïve reading: What we can do with news. *Folio*, 6(1), 29-30.
- Breeze, R. (2015). Media representations of scientific research findings: From 'stilbenoids raise CAMP expression' to 'red wine protects against illness'. In M. Gotti, S. Maci, & M. Sala (Eds.), *Insights into medical communication* (pp. 311-330). Bern: Peter Lang.
- Breeze, R. (2017). Promoting critical cultural awareness in the international university. In R. Breeze, & C. Sancho Guinda (Eds.), *Essential competencies for English-medium university teaching* (pp. 37-49). Cham, Switzerland: Springer.
- Breeze, R., & Olza, I. (2017). *Evaluation in media discourse: European perspectives*. Bern: Peter Lang.
- Breeze, R., & Sancho Guinda, C. (Eds.) (2017). *Essential competencies for English-medium university teaching*. Cham, Switzerland: Springer.
- Brinton, D., Snow, M., & Wesche, M. (1989). *Content-based second language instruction*. Boston: Heinle & Heinle.
- Carlsson, C. J., Edström, K., & Malmström, H. (2010). Engineering and communication integrated learning – Collaboration strategies for skills and subject experts. *Proceedings of the 6th International CDIO conference, École Polytechnique, Montréal, June 15-18, 2010*. Retrieved from [http://www.orbiter.cdio.org/files/document/file/W2C\\_Paper\\_1.pdf](http://www.orbiter.cdio.org/files/document/file/W2C_Paper_1.pdf)
- Clarke, C. (2008). A question of balance: The autism-vaccine controversy in the British and American elite press. *Science Communication*, 30, 77-107.
- Craft, A. (2010). Possibility thinking and wise creativity: Educational futures in England? In R. A. Beghetto, & J. C. Kaufman (Eds.), *Nurturing creativity in the classroom* (pp. 289-312). Cambridge: Cambridge University Press.

- Curry, M. J. (2014). Graphics and invention in academic engineers' writing for publication. In M. J. Curry, & D. I. Hanauer (Eds.), *Language, literacy, and learning in STEM education. Research methods and perspectives from applied linguistics* (pp. 87-106). Amsterdam: John Benjamins.
- De Graaff, E., & Ravesteijn, W. (2000). Engineering education: From competencies to training methods. In J. Michel (Ed.), *The many facets of international education of engineers / Les multiples facettes de la formation internationale des ingenieurs* (p. 4). Rotterdam: A. A. Balkema.
- English, F. (2011). *Student writing and genre: Reconfiguring academic knowledge*. London: Bloomsbury.
- Ennis, R. (1987). A taxonomy of critical thinking dispositions and abilities. In J. Baron, & R. Sternberg (Eds.), *Teaching thinking skills: Theory and practice* (pp. 9-26). New York: W. H. Freeman.
- European Parliament and the Council (2006). *Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning (2006/962/EC)*. Retrieved from <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32006H0962>
- Fredericks, A. D. (2005). *The complete idiot's guide to success as a teacher*. New York: Alpha.
- Gabinete de Comunicación ETSI Aeronáutica y del Espacio (UPM) (2017). *Ingeniería aeroespacial, una profesión "poliédrica"*. [Aerospace engineering, a 'polyhedral' profession]. Retrieved from [https://www.etsiae.upm.es/noticias\\_prensa/masnoticias/Ing\\_aeroespacial\\_profesion\\_poliédrica.pdf](https://www.etsiae.upm.es/noticias_prensa/masnoticias/Ing_aeroespacial_profesion_poliédrica.pdf)
- Giménez, J. (2014). Writing as social practice in engineering. In M. J. Curry, & D. I. Hanauer (Eds.), *Language, literacy, and learning in STEM education: Research methods and perspectives from applied linguistics* (pp. 67-85). Amsterdam: John Benjamins.
- Greere, A., & Räsänen, A. (2008). *Report on the LANQUA subproject on content and language integrated learning – Redefining CLIL: Towards multilingual competence*. Retrieved from [http://www.unifg.it/sites/default/files/allegatiparagrafo/20-01-2014/lanqua\\_subproject\\_on\\_clil.pdf](http://www.unifg.it/sites/default/files/allegatiparagrafo/20-01-2014/lanqua_subproject_on_clil.pdf)
- Guilford, J. P. (1956). The structure of intellect. *Psychological Bulletin*, 53, 267-293.
- Halpern, D. F. (2010). Creativity in college classrooms. In R. A. Beghetto, & J. C. Kaufman (Eds.), *Nurturing creativity in the classroom* (pp. 380-393). Cambridge: Cambridge University Press.
- Hanauer, D. I., & Curry, M. J. (2014). Integrating applied linguistics and literacies with STEM education. Studies, aims, theories, methods and forms. In M. J. Curry, & D. I. Hanauer (Eds.), *Language, literacy, and learning in STEM education: Research methods and perspectives from applied linguistics* (pp. 1-8). Amsterdam: John Benjamins.
- Hood, S. (2004). *Appraising research: Taking a stance in academic writing* (Doctoral dissertation). University of Technology, Sydney.
- Hyland, K. (2004). *Genre and second-language writing*. Ann Arbor, MI: The University of Michigan Press.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Lynch, L. (2013). *Exploring journalism and the media*. Mason: Cengage Learning.
- Lyster, R. (2007). *Learning and teaching languages through content: A counterbalanced approach*. Amsterdam: John Benjamins.

- Mahmud, I., Islam, Y. I., & Rawshon, S. (2013). Engineering creativity by using computer aided Mindmap. *American Journal of Engineering Research (AJER)*, 2(7), 28-32.
- Male, S. A., Bush, M. B., & Chapman, E. S. (2010). Perceptions of competency deficiencies in engineering graduates. *Australasian Journal of Engineering Education*, 16(1), 55-67.
- Martin, J. R. (1993). A contextual theory of language. In B. Cope, & M. Kalantzis (Eds.), *The powers of literacy: A genre approach to teaching writing* (pp. 116-136). Pittsburgh: University of Pittsburgh Press.
- Martin, J. R. (1999). Mentoring semogenesis: 'Genre-based' literacy pedagogy. In F. Christie (Ed.), *Pedagogy and the shaping of consciousness: Linguistic and social processes* (pp. 123-155). London: Cassell.
- Miller, C. R. (1984). Genre as social action. *Quarterly Journal of Speech*, 70, 157-178.
- Moore, T. J. (2011). *Critical thinking and language: The challenge of generic skills and disciplinary discourses*. London: Continuum.
- Moore, T. J. (2017). *On the teaching of critical thinking in English for academic purposes*. In R. Breeze, & C. Sancho Guinda (Eds.), *Essential competencies for English-medium university teaching* (pp. 19-35). Cham, Switzerland: Springer.
- Moore, E., Ploettner, J., & Deal, M. (2015). Exploring professional collaboration at the boundary between content and language teaching from a CHAT approach. *Ibérica*, 30, 85-103.
- Myers, G. (1995). From discovery to invention: The writing and rewriting of two patents. *Social Studies of Science*, 25, 57-105.
- Nesi, H., & Gardner, S. (2012). *Genres across the disciplines. Student writing in higher education*. Cambridge: Cambridge University Press.
- Riemer, M. J. (2007). Communication skills for the 21<sup>st</sup> century engineer. *Global Journal of Engineering Education*, 11(1), 89-100.
- Sales, H. E. (2006). *Professional communication in engineering*. Houndmills, Basingstoke: Palgrave Macmillan.
- Sales, H. E. (2008). Stodgy writing in the technical workplace. In M. Edwardes (Ed.), *Proceedings of the BAAL conference 2007* (pp. 83-86). London: Scitsiugnil Press-British Association for Applied Linguistics.
- Sawyer, R. K. (Ed.) (2011). *Structures and improvisation in creative teaching*. Cambridge: Cambridge University Press.
- Schoonen, R., Snellings, P., Stevenson, M., & van Gelderen, A. (2009). Toward a blueprint of the foreign language writer: The linguistic and cognitive demands of foreign language writing. In R. Manchón (Ed.), *Writing in foreign language contexts* (pp. 77-101). Bristol: Multilingual Matters.
- Stapp, D. C. (1992). Anthropological perspectives on communication needs in engineering projects. *IEEE Xplore. IPCC 92 conference record Santa Fe: Crossing frontiers* (pp. 234-236). doi: 10.1109/IPCC.1992.673026
- Sternberg, R. J. (1988). *The triarchic mind: A theory of human intelligence*. New York: Viking.
- Swales, J. M. (1990). *Genre analysis: English in academic and research settings*. Cambridge: Cambridge University Press.
- Thornbury, S. (2006). *An A-Z of ELT: A dictionary of terms and concepts used in language teaching*. Oxford: Macmillan.
- Wächter, B., & Maiworm, F. (2014). *English-taught programmes in European higher education*. Bonn: Lemmens.

- Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. Cambridge: Cambridge University Press.
- Winsor, D. (1992). What counts as writing? An argument from engineers' practice. *Journal of Advanced Composition*, 12(2), 337-347.
- Zampetakis, L., Tsironis, L., & Moustakis, V. (2007). Creativity development in engineering education: The case of mind mapping. *Journal of Management Development*, 26(4), 370-380.

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## **Appendix 1**

Reflection questions for “Understanding the Inventor’s Mind through Patent Analysis”

| DAY 1  | DAY 2   | DAY 3  | DAY 4  | DAY 5   |
|--|---|--|--|---|
| <ul style="list-style-type: none"> <li>• What do you think a ‘patent assignee’ is?</li> <li>• Why is the research article received before the patent is filed but published later?</li> <li>• How do research article and patent titles differ and why?</li> <li>• Why are patents essentially descriptive and research articles narrative?</li> <li>• What are the key words in the body of text of each document?</li> <li>• What do your e-search findings indicate?</li> </ul> | <ul style="list-style-type: none"> <li>• Where do you find visuals in each document?</li> <li>• Do they complement the verbal text?</li> <li>• If so, do they anticipate, illustrate, or summarize?</li> <li>• Can you design a visual abstract for each document?</li> <li>• Do the two graphical abstracts highlight the same items or aspects? Why (not)?</li> </ul> | <ul style="list-style-type: none"> <li>• How do authors claim the validity of their findings in each genre? What type of language or devices do they use?</li> <li>• How do they criticise previous literature and in what proportion and places in the text?</li> <li>• Why do you think they do it in that way?</li> </ul> | <ul style="list-style-type: none"> <li>• Can you label the parts of this claim?</li> <li>• Can you match each claim with its corresponding description in the body of text of this patent?</li> <li>• How many independent claims can you find in this patent document?</li> <li>• Can you draw a hierarchy tree of the claims in this patent?</li> <li>• Can you write appropriate claims to vindicate the intellectual property of the fictitious object in the photograph?</li> </ul> | <ul style="list-style-type: none"> <li>• What do you think can be patentable?</li> <li>• Do you know of any professor or student who has patented an invention or a discovery?</li> <li>• How can universities patent research?</li> <li>• How have the inventor’s profile and role changed over the years?</li> <li>• Compare these patent documents from different epochs. How has the format of patents evolved? What parts have been eliminated or modified and why?</li> </ul> |

## **Appendix 2**

Reflection questions for “Communication Skills for Journalists”

| STAGE 1   | STAGE 2  | STAGE 3   | STAGE 4  | STAGE 5  |
|---|--|---|--|--|
| <ul style="list-style-type: none"> <li>• How does the same story differ across media in terms of informational content?</li> <li>• What differences in style can you identify?</li> <li>• Can you relate these differences to different kinds of reader?</li> </ul> | <ul style="list-style-type: none"> <li>• Whose voices are in the text?</li> <li>• How are facts reported? Are speeches and testimonies directly quoted, paraphrased, or summarised? What type of reporting action is the most subjective/objective and why?</li> </ul> | <ul style="list-style-type: none"> <li>• How does one same story differ across genres?</li> <li>• What type of audience would be expected in each of the genres?</li> <li>• What is the most distinctive feature of each of the genres presented and what communicative effect does it have?</li> </ul> | <ul style="list-style-type: none"> <li>• Swap your news account with another classmate/team.</li> <li>• Do you find anything superfluous in it?</li> <li>• Is there anything you miss?</li> <li>• Are the sources sufficient and reliable?</li> <li>• Provide feedback, discuss, and get together to create a common improved version</li> </ul> | <ul style="list-style-type: none"> <li>• When examining the reporting of the same story/issue by different sources, did you notice any type of information being omitted? Why do think it was not reported by the source in question?</li> <li>• What source provides the greatest amount of detail and why?</li> <li>• Do you think expectations concerning the media vary in different countries?</li> </ul> |