COMPUTER LEARNER CORPORA:
ANALYSING INTERLANGUAGE ERRORS
IN SYNCHRONOUS AND ASYNCHRONOUS COMMUNICATION

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This study focuses on the computer-aided analysis of interlanguage errors made by the participants in the telematic simulation IDEELS (Intercultural Dynamics in European Education through on-Line Simulation). The synchronous and asynchronous communication analysed was part of the MiLC Corpus, a multilingual learner corpus of texts written by language learners from different language backgrounds. The main research questions centred on the differences in the amount and types of errors found in both the synchronous and asynchronous modes of communication, and whether different L1 groups committed certain errors more than their counterparts from other mother tongue backgrounds. As we hypothesised, more errors were found in the synchronous mode of communication than in the asynchronous; however, when examining the exact types of errors, some categories were more frequent in the synchronous mode (the formal and grammatical errors, among others), while in the asynchronous, errors of style and lexis occurred more frequently. A analysis of the data revealed that the frequency of error types varied with each different L1 group participating in the simulation, this same analysis also showed that highly relevant associations could be established the participants' L1 and specific error types.

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INTRODUCTION

Computer learner corpora are electronic collections of authentic foreign or second language data which have been gathered according to strict design criteria. The development of computer learner corpora (CLC) in the 1980s marked a new direction in the field of corpus linguistics and its relation to foreign language learning research and pedagogy. One of the first CLC projects was the Danish Project in Foreign Language Pedagogy (Færch, Haastrup, Phillipson, 1984). Then, in the early 1990s, Sylviane Granger at the Université Catholique de Louvain in Belgium (Granger, 1993, 1998) founded and coordinated the creation of the International Corpus of Learner English, a corpus based on a large collection of essays written by French-speaking undergraduates of English Language and Literature. Granger's original project was later expanded to include texts produced by language learners from a variety of different mother tongue (L1) backgrounds, including Bulgarian, Chinese, Czech, Dutch, Finnish, French, German, Hebrew, Italian, Japanese, Polish, Russian, Spanish, and Swedish. Since then, the development of new learner corpora has increased greatly as can be observed on the *Learner Corpora around the World* web page of the Centre for Corpus Linguistics at Louvain, which includes over 100

learner corpora projects centred on spoken and written learner language involving different mother tongue and target language groups, varying from timed argumentative essays, to language for specific purposes texts, or from chat to oral exam interviews, and spontaneous speech.

Learner corpora have been used in the literature to provide evidence concerning what language learners have acquired and not acquired (Granger, 1999), sometimes comparing their output with native speakers (Granger, Meunier, & Tyson, 1994; Virtanen, 1998; Lorenz, 1998), and other times comparing it with other mother tongue groups (de Haan, 2000). Granger (2002) identified two linguistically-based methodological lenses through which corpora are studied: contrastive interlanguage analysis and computer-aided error analysis. The first method deals with studies that compare the output of either two or more non-native speaker groups or two or more native speaker and non-native speaker groups. In the second case, researchers use computer programmes to analyse language output in order to detect the difficulties that learners have. This, in turn, contributes to discoveries about the processes involved in learning, to the identification of instances of crosslinguistic influence, to the development of new materials, and so forth.

The present research encompasses both of these methods in a study which carries out a computer-aided error analysis of the language produced by university students writing on computers in five different European countries. Data were gathered in a series of telematic simulations, and the analysis involved comparing the language errors produced in synchronous and asynchronous communication exchanges.

Errors in Foreign Language Learning Contexts

In educational environments, and in particular in the field of foreign language teaching/learning, errors formed the basis of the teaching methodologies in the three decades from 1950 to 1980, focusing mainly on the product of the language learning and the avoidance of any structures that were deviant in form from the standard target language. One predominant use of errors was in contrastive analysis (Fries, 1945; Lado, 1957), the aim of which was to identify interlingual differences by predicting and describing patterns that were likely to cause difficulty. These errors could then be eliminated through drilling in order to bring about change in the linguistic behaviour of the learner. Later, error analysis, a method that attempted to explain the essentially creative nature of the language acquisition process (Schachter & Celce-Murcia, 1977, p. 442) emerged as an alternative methodology to the previous behaviourist habit-formation theory. This method provided researchers with a way of studying learner language, that is to say, by not concentrating exclusively on what Ellis (1994, p. 48) describes as "fully-formed languages" (L1 and L2). Thus, error analysis became integrated into the field of applied linguistics, above all, thanks to the seminal work of Corder (1967) who understood that errors not only provided teachers and researchers with information concerning how much the learners had learnt and how they were learning, but also how the learners themselves—through making errors—could discover the rules of the target language.

However, error analysis has been criticised for lacking methodological rigour (Ellis, 1994) and for concentrating too much on what was wrong or deviant in the learners' interlanguage, while ignoring their achievements (Enkvist, 1973; Hammarberg, 1974). Moreover, the phenomenon of avoidance (Schachter, 1974), or how learner language develops over time (Ellis, 1994, p. 69) were important aspects that were never addressed. In spite of these important drawbacks, Ellis maintains that error analysis "has made a substantial contribution to second language acquisition research" (1994, p. 70).

Computer Learner Corpora and Error Analysis

There were two main developments in the 1980s and 1990s that linked the field of corpus linguistics to foreign language teaching research and pedagogy. Johns (1986) introduced data-driven learning into language classrooms, using concordances extracted from both general reference corpora and smaller specialised corpora, for pedagogically-oriented tasks. Also, computer learner corpora were developed

(Færch et al., 1984; Granger, 1993, 1998) with the aim of making use of "advances in applied linguistics and computer technology to investigate the interlanguage of advanced learners from various mother tongue backgrounds" (Granger & Meunier, 1994, p. 102). In line with the present study, we concentrate on the second case, (i.e., computer learner corpora), and their applications in the field of language teaching and learning.

The most cited computer learner corpus in the literature is the International Corpus of Learner English (ICLE), (Granger, 1993, 1998). It is based on a large collection of essays (over 2 million words) written by students of English from a variety of different L1 backgrounds. In our research work, we make particular reference to the error-tagged data obtained from the French L1 (Dagneaux, Denness, & Granger, 1998; Granger 1999) and the Spanish L1 components of the ICLE corpus (Neff et al., 2007), as these studies are particularly comparable to ours since the same error tagging method was used.

Computer learner corpora like the ICLE Corpus provide an important source of data for SLA research, which can potentially address some of the shortcomings of error analysis mentioned above. The fact that learner data can now be collected in corpora with strict design criteria, taking into account different variables (ESL or EFL environment, competence levels, task type, years of study, age, etc.) permits the comparison of different groups of learners (Granger & Meunier, 1994). Large amounts of interlanguage data can be studied using software tools designed for counting frequencies of particular forms, or providing syntactic and semantic information, which can increase the degree of empirical validity of many SLA studies (Granger, 1998).

Earlier studies in the field of error analysis centred on the creation of taxonomies for identifying and classifying errors (Dusková, 1969; Burt & Kiparsky, 1974; Corder, 1981; Chun, Day, Chenoweth, & Luppescu, 1982; Dulay, Burt, & Krashen 1982; Green & Hecht 1985; Lennon, 1991), the investigation of error gravity (Hughes & Lascaratou, 1982; Davies, 1985; McCretton & Rider,1993; Rifkin & Roberts, 1995) and the possible causes of IL errors (Richards, 1974; Taylor, 1986; Odlin, 1989; Gass & Selinker, 1992; Ringbom, 1992). More recently, studies in error analysis are using computer tools to investigate learner language especially in the case of the different research groups who contributed to the ICLE corpus. Dagneaux et al. (1998) describe the work carried out with the Université Catholique de Louvain's tagging method on French learners writing in English. They compared error-tagged essays of intermediate and advanced learners separated by a two-year gap at university and found—as expected—that errors were substantially lower with the advanced group, although the progress rate differed, depending on the error category, within the advanced level group. Using the same method, Granger (1999) investigated the use of tenses by advanced learners and found that tenses should be taught at the discourse level and not at the sentence level, as they play an important role in the cohesion of written output. She also suggested introducing a contrastive approach to the teaching of tenses, as errors can result from major differences between the mother tongue and the way tenses are formed in English. In the error-tagged data in the SPICLE corpus, the Spanish component of ICLE, (Neff et al., 2007), the main focus is on grammar and lexical errors. As regards the grammar category, these authors discuss the errors which are most frequent in the corpus: articles, verb tenses, and above all auxiliary verbs (which includes the modal auxiliaries) and suggest possible causes of some of the errors. Regarding lexis, it was found that a high percentage of these errors were in the adjective and adverb category, and many of the deviant forms could be attributed to interference from the mother tongue, Spanish.

Also with a central pedagogical focus, there have recently been a number of studies which analyse errors in order to create specific profiles of learner competence. In the case of the English Profile Project (Hawkins & Buttery, 2009) the aim is to develop Reference Level Descriptions for English linked to the Common European Framework of Reference for Languages (CEFR) levels, which were developed to assess language proficiency as regards the functions that learners can carry out in the process of learning a foreign language. However, it has been noted that these levels are "underspecified with respect to key properties that examiners look for when they assign candidates to a particular proficiency level and score

in a particular L2" (Milanovic, 2009, cited in Hawkins & Buttery, 2010, p. 2). Thus, the English Profile Project proposes to establish a series of criteria (Hawkins & Filipović, 2012) for the CEFR proficiency levels as applied to English and assess the impact of different first languages on these features. In order to do this, researchers have focused on both positive and negative linguistic properties. Using the Cambridge Learner Corpus, negative properties (i.e., errors) have been annotated manually, using a taxonomy of codes with over 70 error types involving the lexical, syntactic, and morphosyntactic properties of English. Along similar lines, using error-tagged learner corpora, the researchers in the European project SLATE (Second Language Acquisition and Testing in Europe) have described the linguistic features of learner performance at each of the six CEFR levels for different target languages with a view to improving the CEFR descriptors for grammatical accuracy, vocabulary control, vocabulary range, orthographic control (spelling and punctuation), and cohesion and coherence (Granger and Thewissen, 2005a; Thewissen, Bestgen, & Granger, 2006).

Lastly, another study which focuses on interlanguage analysis is the TREACLE project (Teaching Resource Extraction from an Annotated Corpus of Learner English) (O'Donnell et al., 2009) based in Spain. This project is developing a methodology for producing grammatical profiles of Spanish university students' written English language. The corpus-based methodology uses an automated syntactical analysis to determine what learners already know, in addition to a computer-aided error analysis using the Universidad Autónoma de Madrid Corpus Tool (O'Donnell, 2008) to find out what learners are not getting right. Together, this details the degree to which learners at each proficiency level have mastered the various grammatical features they need to know for their university degree courses.

Definition and Classification of Errors

There are many different ways of classifying language errors. Dulay, Burt, & Krashen (1982) distinguished two main categories:

- Linguistic categories (morphology, syntax, etc.)
- Surface structure taxonomies (omission, addition, etc.)

Corder (1981) records errors of omission, addition, selection, and ordering on one level, and distinguishes between errors made on the grammar, lexico-semantic, and graphology/phonology levels. Most studies in the literature have analysed interlanguage errors combining the analysis of both linguistic and surface structure taxonomies, either from a grammatical viewpoint, including aspects concerning morphology, syntax, lexis, spelling, and punctuation (Biber, Conrad, & Reppen, 1998; Dagneaux et al., 1998; Dusková, 1969; Granger & Meunier, 1994; Green & Hecht, 1985; Lennon, 1991; Olsen, 1999), or as regards pragmatics, style and discoursal aspects (Chun et al., 1982; Neff et al., 2007, among others), or with regard to factual information (Chun et al, 1982). In our research, we define the concept of error as a form or structure in the learner's production that is identifiable as being deviant, to a greater or lesser extent, in comparison to a native speaker of the target language attempting to say the same in an identical linguistic and communicative context (Lennon, 1991). The tagging system we used was based on the linguistic categories of the errors, but also described the errors with reference to their violation of norms as regards surface structure.

Telematic Simulations

In the last two decades, the advances made in communication technologies and their integration into teaching-learning environments have resulted in enormous changes in the educational system, not only with respect to the accessibility of information, but also in how teaching and learning take place and in the use and delivery of educational resources. Based on Greenblat's conceptual interpretation (Greenblat 1988), a simulation is an operational model of central features, or elements, of a real or proposed system, process, or environment. A telematic simulation is a model that brings together multiple disciplines and professional and academic environments in geographically distant locations via the internet (García-Carbonell & Watts, 1996).

In Europe, Project IDEELS (Intercultural Dynamics in European Education), a large-scale distributed telematic simulation, has proved in several research studies to be of invaluable pedagogical and humanistic interest (Ekker, 2000; Sutherland, Ekker, & Eidsmo, 2006). It has shown to be of use in studies concerning cultural awareness (Ekker & Sutherland, 2009; Sutherland & Ekker, 2010) and language learning (Andreu-Andrés & García-Casas, 2011; Watts, García-Carbonell, & Rising 2011; García-Carbonell, Watts, & Andreu-Andrés, 2012; Angelini, 2012), including the development of the four skills and communicative, pragmatic and interactional competence (García-Carbonell, 1998; MacDonald & Perry, 2009; García-Carbonell & Watts, 2012). Similarly, other positive outcomes have been reported with respect to a wide range of other skills (García-Carbonell, Rising, Montero, & Watts, 2001) involving collaborative teamwork, decision-making, and problem-solving, among others.

Research Questions

Following Granger (1998, p. 12), a contrastive interlanguage analysis was carried out into the language errors in the written production of learners with different L1s from five European universities as they participate in the IDEELS telematic simulation. The present study sets out to respond to the following research questions:

1. Are there more errors in the synchronous or asynchronous mode of communication?

2. Is there a difference in the type of error to be found in each mode of communication due to the conditions under which each is produced?

3. Which types of errors are more frequent in the different L1 groups?

4. Do the different groups make errors that can be associated with their particular L1, in other words, does the L1 seem to influence the type of error predominant in any one group?

MATERIALS AND METHOD

The Learner Corpus

The MiLC corpus (Andreu-Andrés et al., 2010) is a multilingual learner corpus involving the written output (formal and informal letters, summaries, essays, reports, translations, computer-mediated communication) of students learning English, French, and Spanish as a foreign language, and also Catalan, as a first, second, or foreign language. The computer-mediated communication is made up of forum discussions and IDEELS simulations involving synchronous exchanges (on-line conferences held under real-time conditions), and asynchronous exchanges (e-mail type communication). We error coded the online teleconferences and email communication that the participants in the IDEELS simulation produced.

In the synchronous communication, there were 42,059 words (2,906 turns), and in the asynchronous communication there were 42,625 words (250 turns). From these figures it can be seen that there is a substantial difference in the length of turns between these communicative modes. The synchronous postings tended to be short, containing anything from a minimum electronic utterance (Sotillo, 2000) such as an exclamation mark to a longer message containing, say, a team's Opening Statement, whilst the asynchronous messages were, on the whole, much longer with both the language and format showing characteristics of a more formal and syntactically complex genre of writing.

Error Tagging System

The programme used in our research work was the Université Catolique de Louvain's *Error Editor* (Hutchinson, 1996) together with the coding guide, the *Error Tagging Manual Version 1* (Dagneaux, Denness, Granger, & Meunier, 1996). (See Appendix for the complete list of all the tags and the categories of error they represent). The Error Editor does not carry out an automatic analysis of learner

language, but helps simplify the analyst's classification and tagging of the data.

- The first category considers formal errors, involving spelling, derivation, and inflection (F*).
- The second category is devoted to grammatical errors (G*).
- The third category deals with lexico-grammar (X*) errors. It includes those where the morphosyntactic properties of a word have been violated.
- The fourth category groups errors concerning the semantic properties of single words and lexical phrases (L*).
- Three additional categories include: (a) Register (R), (b) Style (S*), (c) Word Redundant (WR), Word Missing (WM), and Word Order (WO).
- We added two categories of our own, one related to punctuation (FPM—punctuation missing, and FPW—punctuation wrong) and the other related to the incidence of code-switching (CS). Although code-switching is widely accepted as being a useful communication strategy for language learners, participants in the simulation were asked to communicate in English at all times, and thus any examples of code-switching are considered errors.

Using the Université Catolique de Louvain's Error Editor, the tag is inserted before the incorrect form or forms, and the suggested correct version is written between dollar signs after the error as in the following examples:

- We think that these two years should be part (FS) iof of secondary education.

- Could you clarify the exact age for starting tertiary (LS) school $education$?

- We are making the Educational System for Eutropolis and not for (GA) 0 the Eutropian Federation

In the above examples, the code FS indicates a spelling error, although this was most likely a typographical error; the code LS indicates a lexical choice error; and the code GA indicates an article error. In this last instance, the article was missing and this is shown by writing a zero.

To ensure uniformity in the application of the tagging system, an intrarater study was carried out by the researcher who coded the corpus. Following this, an intercoder reliability study was carried out by the researcher and a colleague (both native speaker teachers of English) involving the analysis of 10 percent of the corpus. The potential variations in coding due to the effects of rater characteristics were minimized as both raters had similar backgrounds in education (university degreed), and professional experience (more than twenty years of teaching English as a foreign language).

Participants

The participants involved in this research were 126 students at five tertiary education institutions in Europe: (a) University of Bremen, Germany; (b) Nord-Trondelag College, Norway; (c) Universidad Politécnica de Valencia, Spain; (d) University of Riga, Latvia; and (e) University of Nice, France. Their English proficiency level ranged from intermediate to advanced. All students were required to have a minimum level of B1 according to the CEFR levels in order to enrol in the simulations.

Following the simulation rationale, the participants took on specific roles, negotiated, and made an attempt to deal with the problems that a fictitious federation, Eutropia, faced. The students acted as high-level negotiators, activists, consultants, and journalists; discussions during the simulations were conducted on two levels: deliberations within a team and bilateral and multilateral negotiations between or among teams using both synchronous and asynchronous communication. In both cases, the participants were to produce and achieve agreement on collaboratively-written documents that address the problems set forth in the scenario.

RESULTS AND DISCUSSION

Our first research question, concerning the comparison of the amount of errors in both types of communication, is answered in Table 1, which shows that there were more errors per total words produced in the synchronous than the asynchronous mode of communication.

Table 1. *Comparison of Errors in Synchronous and Asynchronous Modes*

Mode of communication	Total words	Total errors	% of total
Synchronous	42,059	2,360	5.6%
Asynchronous	42,625	1,890	4.4%
Totals	84,684	4,250	5.0%

Note. The total errors may consist of one or several words; the percent, then should be viewed as an estimate.

There are several possible reasons for this difference, notably that there were certain constraints placed on the participants when on-line (the speed of the interaction, the fast scrolling down of the other postings, the need to be able to both read and understand the incoming messages, then plan and compose the reply in the shortest interval of time). In this situation, participants probably paid more attention to getting meaning across and less to the formal aspects of their postings.

In terms of our second research question, focusing on the frequency of the types of errors made in both modes of communication, Table 2 shows there were indeed certain categories of error which were more frequent in the synchronous postings. These were formal (F*) and grammatical (G*) errors. although the opposite also occurred: errors of lexis L* and style S* were quantitatively greater in the asynchronous mode than in the synchronous mode.

Table 2. *General Category Errors in Synchronous and Asynchronous Modes*

Code	Error category	Synchronous		Asynchronous	
		Raw	% of total	Raw	% of total
F*	Formal: spelling/ morphology	700	29.7	447	23.7
G*	Grammar	658	27.9	492	26.0
X*	Lexico-grammar	95	4.0	91	4.8
L*	Lexis	423	17.9	464	24.6
W*	Word order/ missing/ extra	250	10.6	187	9.9
R	Register	0	0.0	3	0.1
S*	Style	197	8.3	188	9.9
CS	Code-switching	37	1.6	18	1.0
Total errors		2360	100.0	1890	100.0

The first main category of error that we analysed (F*, formal) deals with the formal aspects of the output. There were 6% more form-related errors in the synchronous mode (29.7% of the total errors in contrast with 23.7% in the asynchronous mode). Using a two-proportion *z* test—a significance test used to determine whether or not two proportions (in this case, percent of errors) are significantly different from each other—the two percentages were found to be significantly different, with $z = 4.38$, $p = .01$. This result contrasts with other studies using the same error tagging method. In both the French L1 and

Spanish L1 component of ICLE, formal errors represented only 9% and 10% respectively of total errors. It must be noted, however, that the French L1 component of ICLE did not include the category of punctuation error in their taxonomy, and the Spanish L1 component of ICLE used a separate tag (Q) for their punctuation errors. Within this Formal (F*) category, FM errors are related to errors of derivation and inflection, whereas the code FS tags errors in spelling. As regards the latter, errors related to formal aspects of the written exchanges such as spelling and typos were fewer in the asynchronous mode than in the on-line communication, as was to be expected. It might be added that in two previous studies carried out by Hughes & Lascaratou (1982) and Polio (1997) involving non-teacher judges of error gravity, this type of error was considered one of the most serious. The significant difference in the percentage of errors in this category may have partly resulted from what has now become a conventionalised norm which is characteristic of on-line communication in general, especially in the case of chat and discussion groups and which tolerates, among other features, non-capitalisation for sentence beginnings and proper names since one or two fewer keystrokes means both a faster reply and subsequent speedier transmission of the message (Ferrara, Brunner, & Whittemore, 1991). However, all the participants in this simulation were asked to maintain certain standards, and were reminded to pay attention to questions of formality in their postings both on- and off-line. It should be stressed, however, that the formal errors of this type did not generally cause communication breakdowns as, for instance, the unclear style category (SU) did; still, a slovenly presentation did not create a good team image, and frequent misspellings in messages made understanding the message more laborious. As a high number of the spelling errors are of a typographical nature (MacDonald, 2012), they cannot therefore be directly attributed to a lack of language competence, but as we stated before, may be due to the time pressure exerted on the participants in the on-line communication. Nevertheless, the asynchronous results are also high in this category, implying that more attention needs to be paid to this type of error.

In terms of the two error types related to punctuation in our corpus (FPM = punctuation marks omitted; FPW = incorrect use of particular punctuation marks), two-proportion z tests revealed that both errors were found significantly more frequently in the asynchronous communication (FPM, $z = -2.62$, $p = .01$; FPW, $z = -2.29$, $p = .02$). The latter case involved either the incorrect placement of commas due to confusion with non-defining relative clauses (the first example below) or in most cases, the insertion of a punctuation mark when one is not required (the second example below):

> I don't have the feeling (FPW), 0 that I know the countries very well.

> I think (FPW), 0 everybody knows (FPW), 0what our goals are

In general, the type of punctuation used in the asynchronous mode coincided with its standard use in written communication in general. On the contrary, in the synchronous mode it was found that punctuation was used partly as a substitution for the lack of non-verbal cues, to express certain emotions such as anger, surprise, doubt, or to mitigate criticism, and to express solidarity, irony, amusement or sadness (MacDonald & Perry, 2009):

> I don't think so!

> OOOOOOOOOOOH DON'T SHOUT YOU ARE NOT ALONE AND CAN YOU TALK NICELY PLEASE :)

Within the grammar (G*) category, errors concerning articles (omission, addition, and misuse) were more frequent in the asynchronous mode, accounting for just over 10% of the total errors.

> We think that getting a patent is the best solution but is it possible to get (GA) a patent for (FS) intelectual $intellectual$ properties of minor importance?

However, a closer look at the distribution of grammatical (G*) errors in Figure 1 shows that article errors account for 28% (*n* = 188) of the errors in the grammar category alone in the synchronous mode, and 40% (*n* = 192, two-proportion *z* test z = -3.73, *p* < .001) of the errors in the grammar category in the asynchronous mode. The former is comparable to the results reported in Dagneaux et al. (1998) and Chuang & Nesi (2006) and O'Donnell (2012), which showed varying percentages averaging 27% determiner errors within the grammar category. More recent research into learner language has also shown that articles pose particular problems for learners at different levels (Master, 2002; García Mayo, 2008), implying that more attention should be given to this grammatical feature in EFL textbooks.
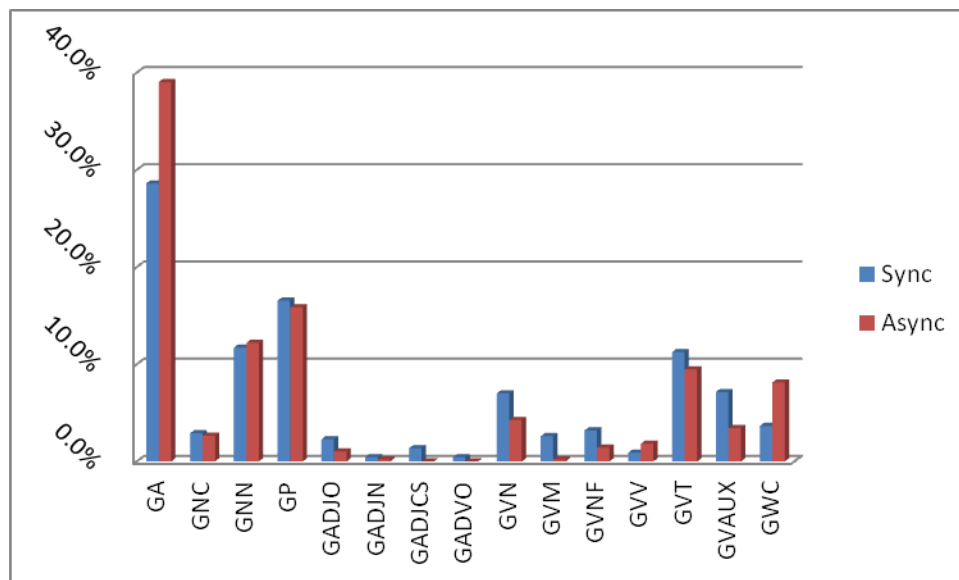

Figure 1. Sub-categories of grammar errors (G*) in synchronous and asynchronous mode. GA = article; GNC = noun case; GNN = noun number; GP = pronoun; GADJO = adjective; GADJN = adjective number; GADJCS = comparative/superlative adjective; GADVO = adverb order; GVN = verb number; GVM = verb morphology; GVNF = non-finite/finite verb forms; GVV = verb voice; GVT = verb tense; GVAUX = auxiliary verbs; GWC = word class.

Within the same category related to grammar errors (Figure 1 above), it can be seen that there are more errors related to the use of verbs (GVN, GVM, GVNF, GVV, GVT, and GVAUX) in the synchronous than in the asynchronous mode. Errors in verb usage total 32% of the grammar errors in the synchronous mode (*n* = 211), but only 20% of the grammar errors in the asynchronous mode (*n* = 103), which is a significant difference according to a two-proportion *z* test: *z* = 4.10, *p* < .001. On the whole, of the verbal forms that were classified as errors, the highest percentage of the total were due to the incorrect use of the tenses (35% of the verb errors in the synchronous mode, *n* = 74, vs. 46% of the verb errors in the asynchronous mode, *n* = 48). Within the tense errors, the most frequent is the use of the present tense when another verbal form should have been used. In the synchronous mode there were more than twice as many of this type of error than in the asynchronous. This may be due to the fact that the time available for the cognitive processing involved in the selection of linguistic elements was restrained because of the medium used and less effort was made to search for the correct form. Others such as Dagneaux et al. (1998), with their French L1 learners of English, and Chuang and Nesi (2006), with their Chinese L1 group, also have found that this was the most frequent error within this category. In terms of verb errors regarding auxiliary and modal verbs, errors were more numerous in the synchronous mode (22% of verb errors in the synchronous mode, *n* = 47, vs. 16% in the asynchronous mode, *n* = 17). The difference between the number of errors of this type in the synchronous compared to the asynchronous modality were not significant, as calculated by a two-proportion *z* test (*z* = 1.12, *p* = .23). With reference to verb

forms, in FL classrooms these grammatical concepts often are practised in decontextualised isolation, without taking into account other features of tenses, such as their important function as cohesive elements in the discourse, and speakers' and writers' views with regard to aspect. McCarthy (1991, p. 62) notes that these functional elements vary considerably from one language to another, and are "traditional stumbling-blocks for learners."

The two-proportion z-test for the lexical error category (L*), revealed that percents of errors were significantly greater in the asynchronous mode (25% of total errors compared with 18% in the synchronous mode) ($z = -5.28$, $p < .001$). This could be explained by examining the context in which both modes of communication are written. The synchronous communications in this experiment were written on a computer or in a multimedia classroom at the participants' college or university, while the asynchronous communications could have been written and sent from any computer, either at the university or college, or even from home. It is thought that with less pressure on the students to produce language as fast as possible in real time, there is a higher probability that they produce more complex language with a greater lexical density than when writing in the synchronous mode. The types of messages sent in the asynchronous mode will additionally be more formal since they deal mainly with the groups' policy statements and their stance in relation to the different points on the simulation agenda. The number of errors in the asynchronous mode (where conditions are similar to those described in the ICLE studies) is the same as the ICLE data (25%), but lower than the SPICLE data, which had an error frequency of this type of 30% (Neff et al., 2007).

In the category of W* errors, concerning word redundancy, word order or word omission, there were slightly—though non-significantly—more in the synchronous mode (synchronous = 11%; asynchronous = 10%, $z = .74$, $p = .45$).

The analysis identifying errors of style (S) shows slight differences between each mode of communication. Firstly, errors relating to style—those which made the discourse appear to be clumsy and non-nativelike—were more frequent in the asynchronous mode, though non-significantly as revealed by a two-proportion z test (10% asynchronous vs. 8% synchronous, $z = -1.80$, $p = .07$). We relate this finding to the length of the asynchronous messages once again, and their relative complexity compared with the synchronous postings. However, cases identified as unclear style (SU), involving what we have termed communication breakdowns, (i.e., the researcher could not understand what the participant meant to say), were slightly more frequent in the synchronous mode (4.19% synchronous vs. 3.7% asynchronous, $z = .81$ $p < .04$). We feel this has also occurred as a result of the medium and the fact that on occasions the interlocutor may not really have had time to plan, write and send a coherent message with the time constraints operating in the online teleconference.

The last category involved code-switching (CS), which was non-significantly higher in the synchronous mode (2% synchronous vs. 1% asynchronous, $z = 1.76$, $p = .07$) as calculated by the two-proportion z test. We also analysed the incidence of error types of each L1 group participating in the simulation in order to answer our third research question, concerning which categories of errors were more frequently found within each L1 group and how performance varied when comparing synchronous and asynchronous communication.

In Table 3 below, it can be seen that each L1 group has a tendency to make more errors of one particular category than others. The Spanish L1 group produces a high rate of grammar errors in both the synchronous and asynchronous modes in comparison to the other errors they make. Within this same group, however, formal errors were frequent in the synchronous mode, but this number was reduced by more than half in the asynchronous messages. The Norwegian L1 group show a high incidence of formal errors in both modes. In the next section, we show the results of the specific analysis carried out on the raw frequency data, which established the incidence of the different categories of errors for each L1 group in relation to the others, and the errors which could be identified as being salient within specific L1 groups.

. *General Error Categories: Percentages Per L1 Group*

| | Spanish | | German | | Latvian | | Norwegian | | French |
	SYNC	ASYNC	SYNC	ASYNC	SYNC	ASYNC	SYNC	ASYNC	ASYNC*
Formal	22.0	10.8	31.1	26.5	28.0	16.8	42.1	38.3	37.7
Grammar	29.0	31.8	27.9	23.8	28.7	39.2	24.1	26.1	5.7
Lexico-	3.5	6.7	4.2	4.5	6.0	2.8	2.9	2.6	5.7
Lexical	22.7	31.8	17.2	23.1	14.0	23.4	12.1	17.4	18.9
Word missing/ redundant/ wrong	12.1	10.4	10.2	10.2	12.0	7.5	8.4	6.1	11.3
Register	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7
Style	9.1	8.4	7.9	10.5	10.0	10.3	7.7	9.6	9.4
Code switching	1.5	0.0	1.4	1.2	1.3	0.0	2.6	0.0	5.7

Note. All figures are percents. *The French group did not have enough synchronous data to warrant study.

Correspondence Analysis

To ascertain whether there were certain errors that could be associated with particular L1s, a correspondence analysis was carried out to investigate the relationship between the different variables and their effect on the type and frequency of errors in the corpus. Correspondence analysis is an exploratory, descriptive technique which is designed to analyze simple two-way and multi-way tables containing some measure of correspondence between the rows and columns. The method visually represents the associations between the different categorical variables, and its primary goal is to transform the table of numerical information into a graphical display—a correspondence map—in which each row and each column is depicted as a point (Greenacre, 1984). The calculations were carried out using SPSS 11.5.

The advantage of correspondence analysis in this particular study is that the method is relational and allows the visualization of a full structure or system of relations. Instead of dealing with one variable and its effect on the variable to be explained, correspondence analysis represents the full array of variables and their interrelations (Harcourt, 2003). The correspondence between the variables and the relative frequencies can be shown on a two- or three-dimensional map, and relationships can be established through the proximity or distance of certain variables, in our case, participants' L1, in relation to the different error types.

The results of the correspondence analysis (Figure 2 below) show the relative incidence of error types according to the L1 of the participants. It was found that the L1 of the group did appear to influence the type of error made, as certain categories were more highly associated with particular L1 groups. In the following section, we discuss each L1 separately with details of the errors that are recurrent and specific to each one of them.

Participants in the Spanish L1 group (red square 1 in Figure 2) have a tendency to make more formal errors (FS) in the synchronous mode than the asynchronous. The grammatical category errors are varied, with two types that are more associated with this group than any other: the use of false friends (LSF), pronoun errors (GP), and auxiliary and modal verb errors (GVAUX). The article (GA) poses particular problems for the Spanish speaking participants in the synchronous mode. The most frequent type of article errors among this L1 group was the definite article used when none was required, which research has related to L1 interference (e.g., García Mayo, 2008).

Another problem concerning the Spanish L1 group is the formation of comparative and superlative adjectives and adjective order (GADJCS). In the lexico-grammatical category (XVCO), this L1 group

shows particular problems with the use of verbs with complementation and dependent prepositions (XVPR). As regards the lexical errors, the corpus gives evidence that both single lexical (LS) and lexical phrase (LP) errors are especially problematic in both the synchronous and asynchronous communication for this group of learners. Neff et al. (2007) found a high incidence of lexical errors in the error-tagged SPICLE corpus, and concluded that lexis is "probably grossly under-taught" (2007, p. 208) to Spanish learners of English. Similarly, a high number of lexical errors are due to incorrect use of prepositions; in some cases, this was attributed to L1 interference (Neff et al., 2007; MacDonald, 2012) since many prepositions may have two forms in English and only one in the learners L1 as in the case of *in* and *on.*

> As we are going to coordinate the technology in Eutropolis we send to you our main ideas (LS) in on this topic:

Sometimes, the translation of the Spanish *de* may have two different forms in English— *of* and *from*— depending on the context.

> we propose to protect the network (LS)of $from$(GA)the 0 external virus attacks and data loss.

Of the connectives, the graphs in Figure 2 show that errors concerning subordinating conjunctions (LCS) were more salient in the synchronous postings, which was opposite to our prediction that there would be a greater presence of connector errors in the asynchronous mode. Indeed, connectors were found to be underused on the whole. We may tentatively conclude from this result that more attention needs to be paid to this aspect of written discourse, as these elements undoubtedly serve an important function in the flow of any text. Indeed, since Canale (1983) first used the term *discourse competence*, the acquisition and use of the connectives has been regarded as one of the constituent abilities that contribute to a learner's overall competence in the target language (Bachman & Palmer, 1996). In recent research work carried out by Chiang (2003), it was found that discourse features (including connectors) in a given test on writing skills were regarded by raters as more indicative of the overall quality of the output than other aspects such as syntax and morphology.
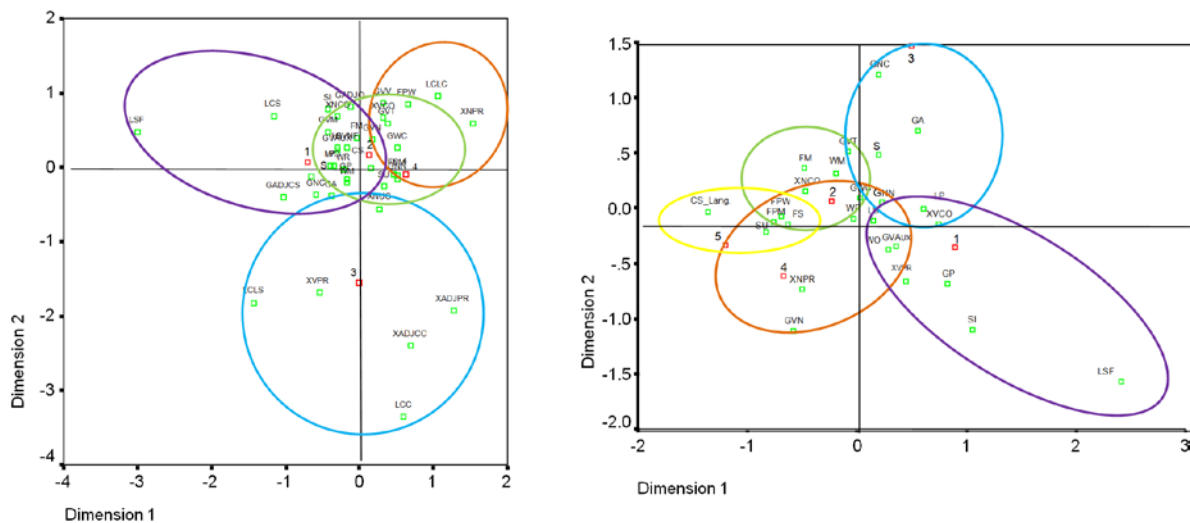

Figure 2. Distribution of errors in the synchronous (left) and asynchronous (right) modes. The numbers next to the red squares refer to the L1 groups; the circles group together the errors associated with the L1 group. Spanish = purple (1); German = green (2); Latvian = blue (3); Norwegian = orange (4); French = yellow (5).

Apart from connectives, errors concerning word order (WO) were also notable in the Spanish L1 group in both modes. As Swan and Smith (1987) note, Spanish has a much freer word order than English; the errors that arise are mainly due to the position of adverbials, the order of elements in complementation, subject-verb order in longer sentences and in interrogative forms, among others. In the synchronous messages, errors concerning style (S) are frequent, although in the asynchronous mode the salient error in this category deals with incomplete sentences (SI). Finally, this group used code-switching (CS) in the synchronous mode, but did not do so in the asynchronous messages.

The German L1 group (red square 2 in Figure 2) commit a large number of formal errors (FS and FM) in their messages in both the synchronous and asynchronous modes, especially in the category relating to derivation and inflection. They also typically use the wrong punctuation (FPW) in their output. As regards the grammar category, there is an overwhelming misuse of the elements of the verb phrase, especially as regards subject-verb concordance (GVN), tense (GVT) and voice (GVV), which all appear associated with the synchronous mode of communication. Word class errors (GWC) are also a frequent category within this L1 group in both the synchronous and asynchronous messages. The erroneous complementation of nouns (XNCO) is salient in the asynchronous mode, whilst the synchronous mode produces more deviant forms involving verb complementation (XVCO). There is a high frequency of single lexical errors associated with this group in both modes, and with lexical phrases in the asynchronous messages. Exclusive to this group is the erroneous use of the complex logical connectors (LCLC) in the synchronous mode. This group also stands out as having a particularly high incidence of errors involving missing words (WM) and words that are redundant (WR) in the on-line conferences and the asynchronous messages. Although in general style errors were more common in the asynchronous mode, the more serious category concerning the breakdown of meaning (SU) was prominent for this group in both modes. Lastly code-switching (CS) was also used by this L1 group in both modes, although the messages were mostly sent as "whispers" to their own L1 group.

The Latvian L1 group (red square 3 in Figure 2) had a relatively infrequent participation in this simulation. Nevertheless, Figure 2 shows that the errors that are most associated with this L1 are highly linked to this specific group in particular. Interestingly, different error categories are present in each mode of communication. Firstly, there are no formal errors associated in particular with this L1 group. On the other hand, the article (GA) and genitive (GNC) within the grammatical category, posed particular problems in the asynchronous mode. Dependent prepositions with verbs (XVPR) and adjectives (XADJPR), and adjective complementation (XADJCO) were errors that were salient with this L1 group in the synchronous postings. Concerning the lexical errors, we noted special difficulty with single logical connectors (LCLS) and coordinating conjunctions (LCC) in the synchronous mode. Missing words (WM) were frequent in both modes, while errors of style (S) were particularly notable in the asynchronous mode.

The Norwegian L1 group (red square 4 in Figure 2) showed notably more errors than other groups as regards spelling (FS) in both the synchronous and asynchronous messages. Olsen (1999) similarly found, with her Norwegian L1 learners of English, that 40% of total errors in her study were due to orthographical mistakes, including spelling and typos. She attributes many of these errors to crosslinguistic influence, although others are probably due to the students' over-generalizing the spelling rules of English. Punctuation errors (FPM and FPW), however, were more frequent in the asynchronous messages. The grammar category of errors (G*) predominated in the synchronous mode, with those related to noun number (GNN) showing a higher incidence in this L1 group. Lack of subject-verb concordance (GVN) was also observed, although this was in the asynchronous mode only. The class of errors involving nouns and their dependent prepositions (XNPR) was also highly associated with this L1. Single lexical errors (LS) were found in both modes as was the use of redundant words (WR). Once more, the category indicating that the meaning of a message has not been understood and which is categorised as unclear style (SU), has an important presence among the errors of this L1 group.

The data obtained for the French L1 group in the on-line teleconferences was not representative, and as a

result, was not included in the analysis of the synchronous part of the corpus. However the asynchronous mode showed that there were several errors particularly associated with this group (red square 5 in Figure 2). Salient in this group were formal errors, dealing with spelling (FS) and derivation and inflection (FM), although these errors were obviously not exclusive to this L1 group. There were, however, no errors in the grammatical or lexico-grammatical categories linked in particular to these learners. Lexical single errors (LS) were found, but the most important group of errors associated with this group were identified as relating to the non-transmission of meaning or unclear style (SU) as it has been classified with the current tagging method. This L1 group also used code-switching (CS) in their asynchronous messages.

CONCLUSIONS

As regards the answers to the research questions formulated in this article's introduction, a preliminary general conclusion can be claimed. As we hypothesised, we found more errors in the synchronous mode of communication than in the asynchronous mode. As synchronous communication involves a different way of processing and producing language, this study shows that learners who are writing online focus on fluency and communication of meaning rather than accuracy. Concerning the macro-phases involved in writing, Hayes and Flower (1980) identified three: planning, writing and revising. In the simulation we describe in our research work, each mode of communication—and each stage involved—shows different amounts of the three different phases just mentioned. Sometimes there is more planning of the writing occurring, which is typical of all the asynchronous messages, whilst at other times there is very little planning or revising of the output, which is apparent in the synchronous or online communication during the teleconferences.

When examining the exact types of errors in these two modes of communication, there are significantly more formal errors (FS) in the synchronous mode than in the asynchronous mode and more errors in the use of lexis in the asynchronous mode. In terms of the formal spelling errors (FS), we understand that the speed of the online interactions makes the participants less concerned of this aspect of their written output. Though spelling does not hinder communication in most cases, it is an important part of writing competence whether dealing with mother tongue or foreign/second language production.

Concerning this finding, we conclude that writers of online interactive communication do not revise their written output very much. Perhaps they find the finished product visually acceptable, not bothering—or not having time in many cases—to read over what they have written or conduct a spell check. This was also observed by Harris (1985) and Daiute (1986). However, we stress the fact that with a word processor, revision is an essential and necessary task, and one which can be performed at any point in the writing process; however, revision for many students simply involves "last-minute tinkering" as Hyland (1991, p. 26) describes.

In terms of the significantly higher number of lexical errors in the asynchronous communication, this is likely due to the nature of the messages themselves. Many of these messages were longer, more complex postings, with a higher information content including detailed policy statements, or reasoned arguments concerning the group's position in relation to the different points on the simulation agenda. In addition, the delayed nature of this mode encourages students to be able to spend more time planning their messages, allowing them to take "language risks" as Sotillo (2000) terms it, and to exploit a wider variety of lexical choices. This, in turn, may lead to more errors being produced in this category.

A further analysis of the raw data shows that the frequency of error types varied within each different L1 group participating in the simulation; when a correspondence analysis was carried out, highly relevant associations could be made concerning the relation between participants' L1 and specific error types. After examining the results, it can be concluded that the L1 of the learners does in fact influence the type of error made. Not only are some errors clearly L1-specific, but Figure 2 shows how several of the L1 groups have a tendency to make similar errors, shown where the error codes are all grouped together in

the middle of the graph. In the synchronous mode, this is especially noticeable with the German, Norwegian, and Spanish L1 groups. To a lesser extent, this also occurs in the asynchronous communication, but this time with the German, Norwegian, and French L1 groups. On the other hand, the Latvian L1 group in both modes tends to make errors that are particular to that group alone, a result which might be partially explained by taking into account that this is the only Baltic language among the different L1s.

Although we are dealing with a small sample in terms of learner corpus research, the present study offers some interesting results which inevitably lead to asking further questions for future research. Is it the case that the similarities and differences in the different L1s of the participants influence the errors made, and to what extent are they due to negative interference from the mother tongue? Also, in which particular areas of the written production is there a greater tendency to make errors and in which linguistic contexts do the errors occur, and how serious are these? Moreover, how can this analysis contribute to the development of specific materials which can concentrate on remedial exercises for these specific errors, such as in the case of the numerous formal errors within the Norwegian L1 group, or the use of false friends and article errors with the Spanish L1 group?

Error-tagged learner corpora can be characterised as describing language learners' developmental processes, including the identification of both overuse and underuse of certain target language forms and structures. They can also highlight predominant errors and provide evidence for arguments about whether an error category may be either L1 specific, developmental, or intralingual and universal. Although the pedagogical applications of the research in the field have not yet been fully exploited to date, a learner corpus can offer information to practising teachers on language in use. This can lead to improvements in syllabus design and materials development. Learners can benefit from the opportunity to become conscious of their errors through the analysis of their own output and that of their peers, heightening in this way their awareness of the differences that exist between their L1 and the target language.

APPENDIX. **Error tags and their meanings (Dagneaux et al., 1996)**

FM	Form—Morphology	LCLS	Lexis—Connectors—Logical—Single
FS	Form—Spelling	LCS	Lexis—Conjunctions—Subordinating
FPW	Form—Punctuation Wrong (code added by authors of present study)	LP	Lexical Phrase
FPM	Form—Punctuation Missing (code added by authors of present study)	LS	Lexical Single
GA	Grammar—Articles	LSF	Lexical Single—False friends
GADJCS	Grammar—Adjectives—Comparative / Superlative	R	Register
GADJN	Grammar—Adjectives—Number	S	Style
GADJO	Grammar—Adjectives—Order	SI	Style—Incomplete
GADVO	Grammar—Adverbs—Order	SU	Style—Unclear
GNC	Grammar—Nouns—Case	WM	Word Missing
GNN	Grammar—Nouns—Number	WO	Word Order
GP	Grammar—Pronouns	WR	Word Redundant

GVAUX	Grammar—Verbs—Auxiliaries	XADJCO	Lexico-Grammar—Adjectives—Complementation
GVM	Grammar—Verbs—Morphology	XADJPR	Lexico-Grammar—Adjectives—Dependent Preposition
GVN	Grammar—Verbs—Number	XCONJCO	Lexico-Grammar—Conjunction—Complementation
GVNF	Grammar—Verbs—Non-Finite / Finite	XNCO	Lexico-Grammar—Noun—Complementation
GVT	Grammar—Verbs—Tense	XNPR	Lexico-Grammar—Noun—Dependent Preposition
GVV	Grammar—Verbs—Voice	XNUC	Lexico-Grammar—Noun—Countable/Uncountable
GWC	Grammar—Word Class	XPRCO	Lexico-Grammar—Preposition—Complementation
LCC	Lexis—Conjunctions—Coordinating	XVCO	Lexico-Grammar—Verb—Complementation
LCLC	Lexis—Connectors—Logical—Complex	XVPR	Lexico-Grammar—Verb—Dependent Preposition

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