

Language Awareness

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/rmla20>

Natural Language Processing (NLP) as an Instrument of Raising the Language Awareness of Learners of English as a Second Language

Marina Dodigovic

Published online: 29 Mar 2010.

To cite this article: Marina Dodigovic (2003) Natural Language Processing (NLP) as an Instrument of Raising the Language Awareness of Learners of English as a Second Language, *Language Awareness*, 12:3-4, 187-203, DOI: [10.1080/09658410308667076](https://doi.org/10.1080/09658410308667076)

To link to this article: <http://dx.doi.org/10.1080/09658410308667076>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

Natural Language Processing (NLP) as an Instrument of Raising the Language Awareness of Learners of English as a Second Language

Marina Dodigovic

*English Language Center, College of Arts and Sciences, Zayed University,
Dubai, UAE*

Based on the statistical regularity of certain error types, an interlanguage grammar could be devised and applied to develop an intelligent computer tool, capable not only of identifying the typical errors in L2 student writing, but also of making adequate corrections. The purpose of the corrections is to make the student aware of the language used and then to sharpen the focus on form. The students, left mostly to their own resources when writing academic assignments in English, which is not their first language, are frequently unsure of the grammaticality of their own sentences. Having an opportunity to have each sentence checked by an expert in both English and their particular interlanguage would not only contribute significantly to the readability of their assignments, but would also facilitate language learning. In a situation where language tutors are available only in the classroom, it becomes clear that any artificially intelligent tool which serves this purpose would be of tremendous benefit. Following the introductory thoughts on L2 learnability, this paper describes the research and development work preceding the piloting of precisely such a tool. It then reflects on various aspects of its initial implementation.

Keywords: computer assisted language learning (CALL), natural language processing (NLP), artificial intelligence (AI), English for academic purposes (EAP), interlanguage (IL), writing

Introduction

This paper discusses the use of Natural Language Processing (NLP) in a specific second language learning situation for the purpose of raising the learners' error awareness and thus potentially improving the learning outcomes. Matthews (1998: 3) successfully and succinctly defined NLP as 'the capacity of the computer to "understand" natural language'. This capacity seemed to be the answer to the learning needs of a number of overseas students studying at a university where English is spoken as a first language. Their particular problem was that they appeared to have reached a plateau in the acquisition of English as a second language (L2) ceasing to make further progress. This problem had become most blatantly obvious in their academic writing, where their non-standard use of grammar and expression would often obscure the meaning.

The NLP approach was deemed capable of providing this group of students with automatic analysis of their typed English sentences, supplying them also with meaningful feedback concerning the grammatical correctness of their

output. However, although the concept of NLP as such was readily available along with the matching technological platform, an appropriate tool based on this technology had yet to be devised. For the reasons discussed below, the most fruitful approach seemed to be a study of typical errors made by this student population. The knowledge of how these students produce target language (TL) could then be 'taught' to the NLP-based tool in addition to the knowledge of standard academic English, as observed in a wide variety of academic publications. Equipped also with appropriate feedback strategies, the tool would consequently have the capacity to firstly separate the correct surface structures from the incorrect ones, and secondly to draw the users' attention to the errors that are most common among the target group. Most NLP devices, otherwise called parsers, either ignore erroneous input or manage to process it, but do not necessarily provide pedagogically motivated correction. Thus, although able to identify most incorrect input as such, the parser described here was additionally expected to be able to provide meaningful feedback to and the correction of a limited set of syntactic errors. Needless to say, the entire effort is based on the belief that L2 is both learnable and teachable, regardless of the learner's age. The theoretical underpinnings for this and other notions utilised in this text are elaborated below.

The focal point of this study is the concept of *interlanguage* or IL, defined by Cook (1993: 17) as a linguistic system developed by an L2 learner which does not conform to either L1 (the first language of the learner) or L2 (the learner's second language) rules. The term 'interlanguage' itself was first introduced by Larry Selinker (1972, cited in Cook, 1993), who subsumed to it both an independent grammar and a psychological process leading to IL creation (Cook, 1993: 19). The research of the psychological processes is not the subject of this paper. The grammar, on the other hand, as captured at a particular stage of IL development, is a viable subject of empirical linguistic research. The criticism that has often been levelled at the observational data research in second language acquisition (SLA) is that it bases its conclusions regarding competence on the mere analysis of performance (Cook, 1993: 49). Competence and performance as used here go back to Chomsky (1965), who defines 'competence' as speaker's knowledge and 'performance' as the use of language in concrete situations. Competence as a mental reality is hardly accessible directly unless it is assessed indirectly through performance. Thus empirical research cannot circumvent analysing language production data, a process that is referred to as Performance Analysis (James, 1998: 18).

According to Larsen-Freeman and Long (1991), a subset of performance analysis is error analysis (EA). EA approaches L2 learning in terms of detailed analysis of the learner's output (Cook, 1993: 20). Corder (1967, cited in Larsen-Freeman & Long, 1991) views errors as evidence of L2 learners testing out their hypotheses about the target language. According to James (1998: 5) the paradigm of EA involves objective description of learners' IL and is therefore a methodology dealing with data (Cook 1993: 22). Data elicitation in this study can be categorised as targeted elicitation (James, 1998: 20) within an observational framework with the focus on the samples of writing of the most at-risk students, those enrolled in a remedial writing course, English for Academic Purposes (EAP) I. The elicited writing samples form a machine-readable corpus, which was analysed for errors and certain standard features of academic writing.

Given the evidence of errors committed by the target population, the purpose

of the parser depicted in this study is either to prevent or undo fossilisation. This is defined by Selinker (1972, cited in Selinker & Lakshmanan, 1993) as 'the long term persistence of plateaus of non-target-like structures in the interlanguage (IL) of non-native speakers'. According to Selinker and Lakshmanan (1993), fossilisation can be partially explained by the multiple effects principle (MEP). In brief, this principle applies when two or more SLA factors work together to prevent the learner from internalising the correct linguistic item, thus causing a long-term retention of incorrect forms.

The task of countering the forces of fossilisation becomes even more daunting when one considers the fact that SLA theory has not always provided support for error correction as a means of explicit L2 instruction (James, 1998). For example, the Universal Grammar (UG) proponents in SLA do not seem to believe that L2 is fully learnable (Cook, 1993: 211). Hope for L2 learners however comes from other SLA sources. A theoretical one is the Teachability Hypothesis (Pienemann, 1989, cited in Cook, 1993), which assumes that an L2 structure can be learnt from instruction when the learner's interlanguage is at a point of development where this structure is naturally acquired. Empirical studies (Pavesi, 1986, Harley, 1993 cited in James 1998: 244) corroborate the value of explicit instruction and error correction. The latter is seen as a means of bringing about defossilisation. In addition, a study by Ehri *et al.* (1988, cited in James, 1998: 242) underlines the value of immediate correction, which prevents errors from becoming fossilised. Thus the parser in this study has immediate error correction as one of its main goals.

The parser, or the cyber coach, referred to in this text has a twofold purpose. One is Consciousness Raising (CR) or explanation and the other is Language Awareness (LA) or explication (James, 1998: 260). According to James (1998), the former means helping learners to notice what they do not know, while the latter means providing explicit insight into something that learners already know implicitly. In this study, CR occurs when the parser encounters one of the typical errors it is familiar with. By offering a choice of reactions, the parser tries to decide whether this is a mistake or a systemic error (Corder, 1967, cited in Larsen-Freeman & Long, 1991). According to Corder (1967, cited in Larsen-Freeman & Long, 1991: 59), a mistake can be self-corrected, whereas an error cannot, thus requiring external correction. In the program described here each instance of either self-correction or feedback-based correction is followed by explication in the form of a parse tree that reveals the details of grammatical structure for that particular sentence. Thus the learner is made aware of what he or she may already know implicitly.

The user interface that enables access to the parser is designed as a dialogue in which the computer-generated questions need to be answered by the user. The questions are designed if not to induce the error itself, at least to induce an attempt at producing the potentially problematic structure. Two studies by Tomasello and Herron (1988, 1989, cited in Ellis, 1997) present some empirical evidence in favour of inducing errors and offering overt feedback. If correction is understood as explicit instruction (James, 1998), this constitutes proof that instructed L2 learning can be effective. Moreover, James (1998) argues that error correction as a curative way of instruction is more effective than preventive instruction based on error avoidance. Considering the integration of all the above practices and principles, the tool described here seems to have considerable potential for supporting L2 learning.

The evidence briefly listed above, as well as a multitude of other empirical studies that for the reasons of space remain unmentioned here, clearly testify to the fact that a second language can be learnt by adults and that pursuing this goal is therefore worth every effort. One of the reasons why this is not always recognised lies in what Cook (1993) calls the 'monolingual prejudice'. The phrase denotes the tacit expectation that L2 learners will attempt to add another L1 to their repertoire, which Cook (1992, cited in Cook 1993) juxtaposes with his own term 'multi-competence'. The latter covers all stages of L2 acquisition. Thus according to Cook (1993), the aim in SLA should not be to produce a person competent in two different languages, but a competence that is radically different, i.e. the multi-competence. This approach avoids the pitfalls of setting unattainable standards for L2 learners and so does the approach taken in this study by recognising that the path to L2 knowledge is strewn with errors.

Artificial Intelligence in Language Learning

The final product of the research and development effort described here is an artificially intelligent tutor of academic English. We might do well to start with an explanation of 'artificially intelligent'. Artificial intelligence (AI) is a branch of science concerned with the study of human intelligence which is also involved in the design of artificially intelligent machines. AI is usually subdivided into the study of expert systems, robotics, computer vision, natural language processing and speech recognition. The latter two are largely concerned with language, with the difference that natural language processing focuses traditionally on written language, whereas speech recognition focuses on speech. Thus artificial intelligence has a lot to do with natural language, it being one of the prime indicators of human intelligence.

Literature on computer assisted language learning (Dodigovic, 1998) and SLA (James, 1998) envisions very promising applications of natural language processing (NLP) in the language learning process. This is based on the fact that NLP programs can basically perform two language-related functions: text analysis or parsing and text synthesis, both crucial to language understanding and production. A computer program with both of these features is capable of conducting a natural dialogue with the user. The extent of its performance naturally depends on its knowledge base, or in other words how many words it 'knows' and how well it 'knows' them, how refined or even robust its grammar is and how well it 'understands' the context.

In any case, a program that would be useful in helping a language student focus on form and understand the nature of his or her errors would also have to specialise in the student's particular interlanguage. Thus, a good intelligent tutor of English, just like a good human tutor, should be able to understand the student's interlanguage and correct it if necessary. Unlike even the most tireless and the most patient human tutor, an artificially intelligent tutor is theoretically available at any time of day or night, any place on earth, and that at no extra cost. Add to this the ability to support varying learning styles and the promise begins to sound very powerful, almost like a genie in a bottle, which actually is the underlying idea of artificial intelligence.

The pilot intelligent tutor described here has its limitations. Thus, to avoid

writing a huge and sophisticated grammar which would attempt to cover all the complexities and ambiguities of English, the parser is limited to a representation of the most common grammatical features of academic English, an explanation of which follows below. The vocabulary is also limited to a topic with which the target student population is notably familiar. However, it has a strength that even more powerful parsers might lack, and that is familiarity with the students' error types. Not only has the parser been trained to analyse the student's erroneous input, but it has also been taught how to correct it. In order to achieve this, both the parser and its developers had to learn the significant stages in the students' interlanguage development. The research process leading to that stage is described below.

Corpus Analysis: The Features of Academic English

As the target student population was involved in studying academic English at university, it seemed logical to focus on the segment of grammar most common to academic English. According to Halliday (1985), written academic discourse is characterised by a relatively high proportion of passive voice and nominalisation resulting in a high level of lexical density. The example in Figure 1 (Butt *et al.* 1997), shows a clear difference between written and spoken language. Words underlined, whether bold type or not, are content words, whereas words in bold type, whether underlined or not, are nouns.

The features in Figure 1 are displayed by professional native-speaker academic writers, tacitly expected of second language student writers as well. The latter will be called English for Academic Purposes (EAP) students in further text. As the above features can easily be tracked down by using a computer, a corpus of EAP students' academic writing was compiled in order to compare its features with those of native-speaker professional academic writing found in Brown (American) and LOB (British) corpora. For the purpose of corpus compilation, two samples of academic writing were collected from 87 predominantly Chinese and Indonesian students over the period of one term. The sample included a small proportion of native speakers of other languages, such as Norwegian, Portuguese, Spanish, Hebrew, Malay, Japanese and Tagalog. All students had scored 550 or higher on the TOEFL test or equivalent. Even though this setting had a strong leaning toward a cross-sectional study, the data were expected to capture various individual stages of interlanguage development, since it was shown by Andersen (1978, cited in Larsen-Freeman & Long, 1991) that individual and group data correlate significantly. The findings have been

Written:

1. Excessive consumption of alcohol is a major cause of motor vehicle accidents.

Spoken:

2. If you drink too much alcohol when you drive your car, you are likely to have an accident.

Figure 1 Samples of written and spoken English

most interesting. The researchers compared the number of content words in the three corpora. The results can be viewed in Table 1.

Table 1 Data on writing styles across the corpora

	<i>LOB</i>	<i>Brown</i>	<i>EAP students</i>
Words	142,977	142,753	14,035
Sentences	5,786	6,889	2,094
Content words	75,505	77,564	7,146
Nouns	69,010	70,692	5,494
Full verbs	6,495	6,872	1,652
Auxiliaries	7,159	6,889	479

Table 1 shows that there is a difference between native-speaker academic writing and EAP student writing. Although the EAP student writing corpus is approximately ten times smaller than the other corpora, certain features can be very well compared. For instance, the EAP corpus has a proportionally far larger number of sentences, which means that the students tend to write short sentences, avoiding compound structures. While the number of content words appears to be similar across the three corpora, the distributions of nouns and full lexical verbs differ. Whereas the British and American corpora comprise a large number of relational verbs (e.g. be, have, will, shall) and considerably fewer full verbs, the EAP corpus demonstrates a lower number of relational verbs, complemented by a high number of full lexical verbs. Consequently, processes largely exist in EAP student writing, that is, full verbs have not been replaced by passives or nouns, which leads to the conclusion that the active voice may be used with much greater frequency than normally found in native-speaker academic writing. All these features render the EAP academic writing strikingly similar to spoken English, which is not surprising considering the oral teaching methods and communicative learning style these students would have been exposed to in their English classes. These findings really reinforce the need for raising the language awareness of the target student population.

Another feature important in academic writing investigated on the EAP corpus was cohesion (Halliday, 1994: 287) or the textual function (Martin *et al.*, 1997), including the linking words and signals. Cohesion fulfils the function of presenting academic discourse as logically coherent (Dodigovic, 2002). Based on a Hallidayan list of cohesive devices, previous research (Field, 1994) into the use of linking words by native speakers of Cantonese has shown that the patterns are not consistent with those found in native-speaker academic writing. The test subjects (Field, 1994), who all came from Hong Kong, seemed to be overusing the conjunctions ‘moreover’, ‘besides’ and ‘nevertheless’. The EAP student corpus, consisting to a large extent of contributions from Hong Kong born students, showed no sign of overuse. Compared to Field’s (1994) study, it seemed to indicate an underuse of linking words. Thus ‘moreover’ did not occur at all, whereas ‘besides’ was used seven and ‘nevertheless’ only four times (Table 2). A possible conclusion is that linking words in English are linguistically quite challenging for the native speakers of Cantonese, whether they have been explicitly taught, as documented by Field (1994), or not, as was the case in this study.

Table 2 Cohesive devices in EAP student writing

<i>Cohesive device</i>	<i>Number of occurrences</i>
actually	10
also	44
although	6
and	465
because	31
besides	7
finally	1
firstly	3
including	4
nevertheless	4
regarding	1
therefore	21

Since academic discourse serves as a vehicle of expressing opinions, expressing critical opinions, what is known as interpersonal function (Martin *et al.*, 1997) in Systemic Functional Linguistics (SFL) was also a subject of this study. Scollon and Scollon (1995) argue that the extent to which opinions are freely expressed is a matter of culture, and that most Asian cultures see the imposition of one's own opinion on someone else as impolite. To test the readiness of the primarily Asian EAP sample to express opinions, a search was done on the so-called opinion indicators. These, according to Halliday (1994), include words such as 'clearly', 'apparently', 'no doubt', etc. The results were then compared with those for native-speaker writing corpora (Table 3).

The results indicate that EAP students were using only eight out of 20 expressions listed in Halliday (1994: 82). Table 3 compares the use of these eight items across the board. Apart from those eight, both British and American scholarly writing corpora showed a wide variety of other opinion indicators, including 'certainly', 'surely', 'perhaps', 'possibly', 'evidently', 'presumably', 'of course', etc., which were not used by EAP students. The table brings into focus the contrastive expression poverty of the EAP population. Thus 'clearly', which seems to be the most widely accepted opinion indicator in the EAP corpus, tends

Table 3 Expressing opinions across the three corpora: number of occurrences

<i>Opinion indicator</i>	<i>EAP</i>	<i>LOB</i>	<i>Brown</i>
apparently	1	15	19
clearly	16	24	31
definitely	1	2	3
no doubt	5	14	6
maybe	1	1	3
obviously	1	15	24
positively	2	0	1
probably	2	44	52

to be overused in comparison with native-speaker data. This of course can be brought back to the general English skills of the EAP population.

In conclusion, EAP writing appears to compromise between the written and spoken style. The spoken style is reflected in the EAP student preference for full or material verbs (Martin *et al.* 1997), rather than for noun groups linked by relational verbs, which are otherwise so typical of written language. Short sentences, lacking clear linking words or definite opinion indicators, are a further feature that brings the EAP student-writer style closer to spoken discourse than to academic writing.

Thus the question of what exactly constitutes academic writing became one of the most important questions for this study. According to Halliday (1994), there is a distinctive feature of written language, something that does not exist in speech, an element which in EAP teaching could be effectively used to raise the students' awareness of the difference between the two. That element is the sentence, so the argument goes (Halliday, 1994), which is a unit beginning with a capital letter and ending in a full stop (or possibly a question or exclamation mark). This is really non-existent in speech, where clauses flow spontaneously from one another, building never-ending complexes, without one-to-one punctuation equivalents. Thus a sentence has the potential of becoming a building block of written academic English, a starting point for research as well as for teaching. Accordingly, the rest of this article is devoted to firstly EAP corpus sentence-level profiling and secondly developing an artificially intelligent learning tool, a cyber coach, based on the profiles.

EAP Corpus: Error Analysis

Earlier in the paper student interlanguages, or rather their erroneous subsets, were identified as a research target for the purpose of developing a cyber coach of written academic English. After a theoretical model described below for the interlanguages of Chinese and Indonesian learners of English as L2 was adopted from literature (Jones, 1999, in Dodigovic, 2002; Yip, 1995), the EAP corpus was analysed for grammatical and semantic errors. The non-native-like features were then categorised, thus generating a bottom-up description of the two systems. The results of the corpus analysis were mainly convergent with the theoretical models. However, as the models themselves could be better understood on the basis of actual data and their descriptions subsequently brought to a common denominator, the differences between the two interlanguages were found to be much less significant than originally anticipated.

The majority of errors overall had something to do with the finite verb (approximately 30% of all errors). While Yip (1995) finds that Chinese learners use pseudo-passives 'these sentences can analyse many ways', ergative construction ('what is happened with these verbs?'), tough movement ('never easy to be learned'), existential construction ('there are sentences cause learnability problems'), Jones (1999, cited in Dodigovic, 2002) reports that Indonesian based interlanguage has the following features: malformed expressions of feelings/reactions/states ('parents must take responsible'), missing copula ('sometimes very easy to make mistake'), finite/nonfinite verb confusion ('I decided to cancelled'). Thus expressed in terms of systemic functional linguistics

(Halliday, 1994), the Chinese learners would mainly seem to misjudge the verb transitivity, whereas the Indonesian learners appear to have difficulties with the mood.

This study shows that in fact both types of errors are equally committed across the board and may be better described as transitivity and mood errors respectively. In Table 4 the errors are classified according to source and type.

Table 4 Error analysis

Part of speech	L1 Indonesian (72% students)	L1 Chinese (20% students)	All students
Verb	27 %	28%	27%
Noun	15%	14%	15%
Determiner	14%	9%	12%
Preposition	10%	10%	9%
Lexis	9%	9%	9%
Other	25%	30%	28%

Significance was not calculated because of a small sample and absence of generality claims. It is quite obvious though that most errors in all groups, including representatives of nationalities other than Chinese and Indonesian, found the verb to be the most difficult part of speech. Tables 5 and 6 give the results of qualitative analysis.

The difficulties seem to arise from a variety of transitivity and mood patterns in English as perceived by systemic functional linguists (Halliday, 1994; Martin *et al.*, 1997). To be more specific, some transitive verbs can form sentences like: ‘this commodity sells well’, whereas others cannot (e.g. *‘Malaria finds everywhere’). Learners may simply overgeneralise from one group to all transitive verbs. Similarly, ergative verbs (e.g. ‘the stone fell’) may have a patient for a subject, which is why in an overgeneralising fashion the students may attempt to build passives

Table 5 Transitivity-related errors

pseudo-passives <i>Malaria can find all over the world.</i>
ergative construction <i>The immune system can be failed.</i>
tough movement <i>More difficult to be realised . . .</i>
existential construction <i>There is a new problem occur.</i>

Table 6 Mood-related errors

malformed expressions of feelings/ reactions/ states <i>The disease had * dominant over human.</i>
missing copula <i>Secondly, communities * affected.</i>
finite/ nonfinite verb confusion <i>It will caused death of both mother and baby.</i>

with these verbs. Apart from the first example in Table 6, which can be interpreted as either the wrong choice of verb (i.e. the finite part of the Mood element in SFL) or a mismatch between the mood (i.e. 'the disease had') and the Residue (i.e. '*dominant over human'), the problems with mood are mainly linked with the distinction between finite and non-finite verbs. Thus the need for a finite auxiliary in addition to a non-finite main verb may not be self-evident to an EAP learner, especially in view of the fact that a large number of sentences appear to need one verb only. The matter is further complicated by the fact that only one verb in a complex tense can be finite, which if not understood can lead to a rather arbitrary choice of verb or verbs to inflect. If a finite verb is not a workable concept in the learners' native languages, as is the case in Chinese and Indonesian (Jones, 1999, cited in Dodigovic, 2002), it would seem rather difficult to predict which of the several verbs in an English sentence should be inflected and why.

The purpose of this study is, however, not so much to offer unambiguous reasons for typical errors, but rather to identify the errors themselves and suggest some ways of making the underlying grammar transparent to the student. Structure explanation seems to help the learning process, especially with adult learners (McLaughlin, 1993), as is the case in an EAP environment. Thus raising both consciousness and awareness, correcting and explaining, are some of the functions of the cyber coach. Its development is described in the next section.

The Intelligent Tutor of Academic English on the Web

The above research has yielded what was required in the first place to construct a successful intelligent tutor, and that is a linguistic description of the students' interlanguages. Thus, in addition to being a sort of native speaker of academic English, the intelligent tutor also became a native speaker of Chinese- and Indonesian-based interlanguages. As a tutor, it was well equipped to respond to two different types of learners: the ones who like to experiment with their own linguistic hypotheses and those who prefer to be given the rules (Dodigovic & Suphawatt, 1999).

Logistically, the program, which is written in PROLOG, relies on two different knowledge banks: one representing a subset of the ideal, correct grammar of English and the other modelling the students' faulty grammar. Both are encapsulated in a user interface, called Dialogue, which is responsible for the communication between the user and the knowledge banks. The purpose of the former knowledge bank is to recognise and acknowledge a student's correct input. The latter identifies and corrects typical errors. Each of the knowledge banks comprises a finite number of augmented phrase-structure rules while both have simultaneous access to the same lexicon, a finite yet appendable list of words accompanied by relevant morpho-syntactic information. These features make the program capable of parsing (1) any correct sentence for which the rules are recognised within the bounds of the given vocabulary, and (2) any erroneous sentence based on the same vocabulary provided it conforms to the six main types of errors depicted above. The modest vocabulary of this very first pilot module is loosely related to the topic of malaria. It might be necessary to point

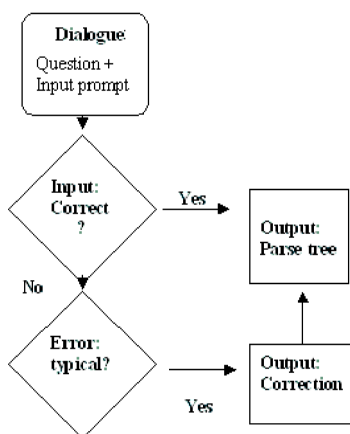


Figure 2

out that the program does not perform simple string matching, so that the given vocabulary can be quite creatively used and recombined. However, sentences using either the vocabulary that is not in the lexicon or the syntactic structures that are not covered by either knowledge bank cannot be successfully parsed, which is how NLP usually operates. Figure 2 shows the language input processing sequence in a highly simplified form.

For a number of reasons, the program was placed on the worldwide web, though with a number of access restrictions. Some might see a contradiction in placing the software on the web, which should render it universally accessible, and then restricting access to it. The universal availability of the web, however, makes it easy for the authorised user to access the software, regardless of the time, place and hardware platform. Yet commercial considerations caution restricting the access to those who have in some manner obtained a right to utilise this tool.

The following text focuses on the user interface of the tutor, the module called Dialogue. Dialogue is a program that converses with the learner using a parser, a device for natural language processing (NLP). The program functions in the following way: the learner is asked questions about an essay topic. The answers expected are in the form of a freely structured sentence at a time. The student enters the sentence into a text box. The parser activated in the background analyses the student input and either accepts it as correct or comments on the type of error made while at request giving a hint as to how to correct the sentence. An example is shown in Figures 3–9.

Figures 3 to 9 demonstrate how Dialogue works. If a grammatically incorrect answer is given, there are two choices. The student can either try again or obtain a suggestion as to how the input could be improved. The correction can either use the vocabulary provided by the student or just any vocabulary with the intention to exemplify the sentence type. The student who likes experimenting with language is free to try yet another variation of the answer. If the answer sentence is correct, a full parse is displayed and the student is praised for the correct input. On the other hand, a rule or a vocabulary item unknown to the system causes the

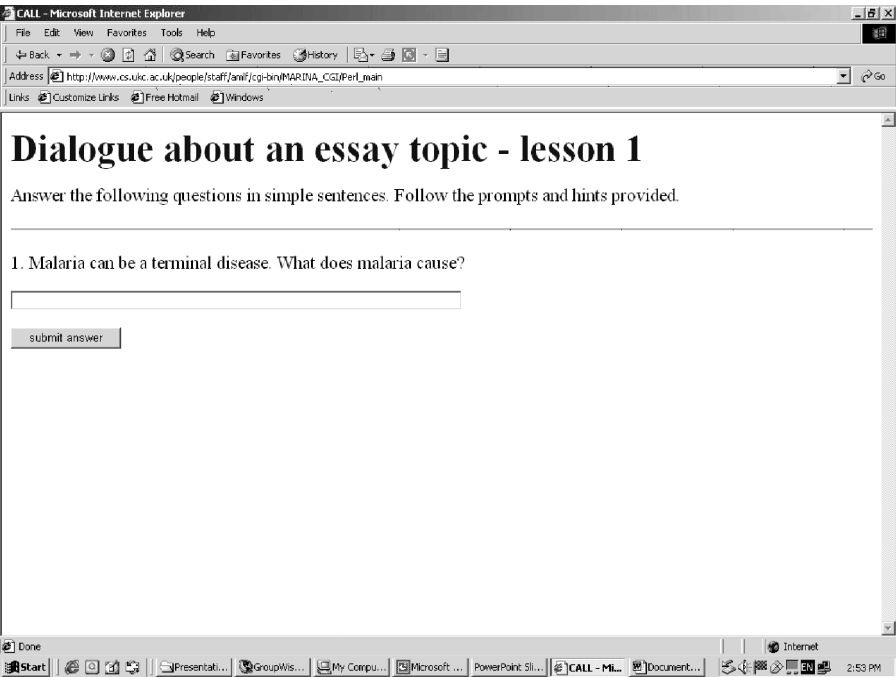


Figure 3 Question prompt

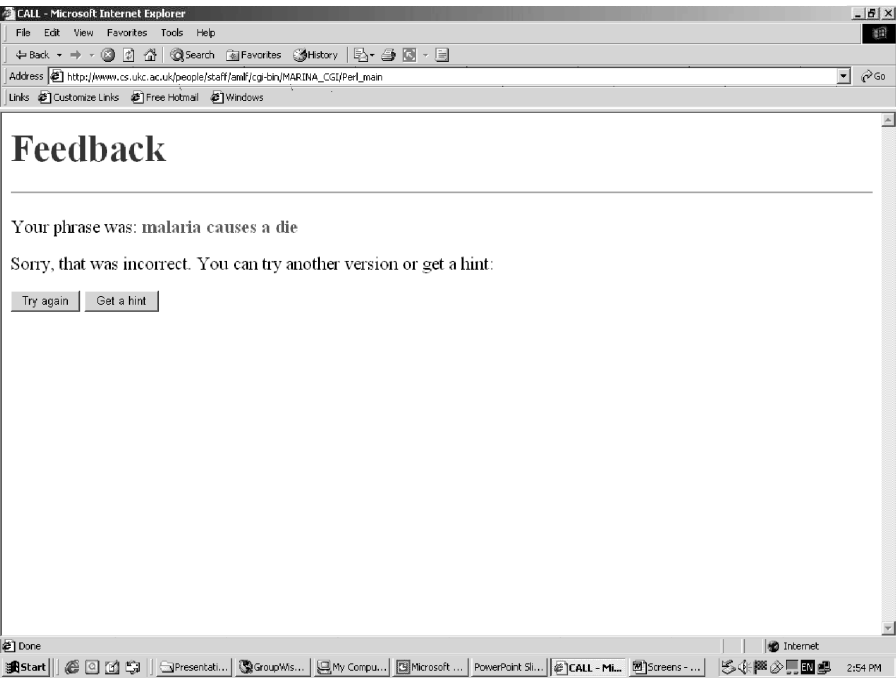


Figure 4 Feedback option ‘Error type recognition’

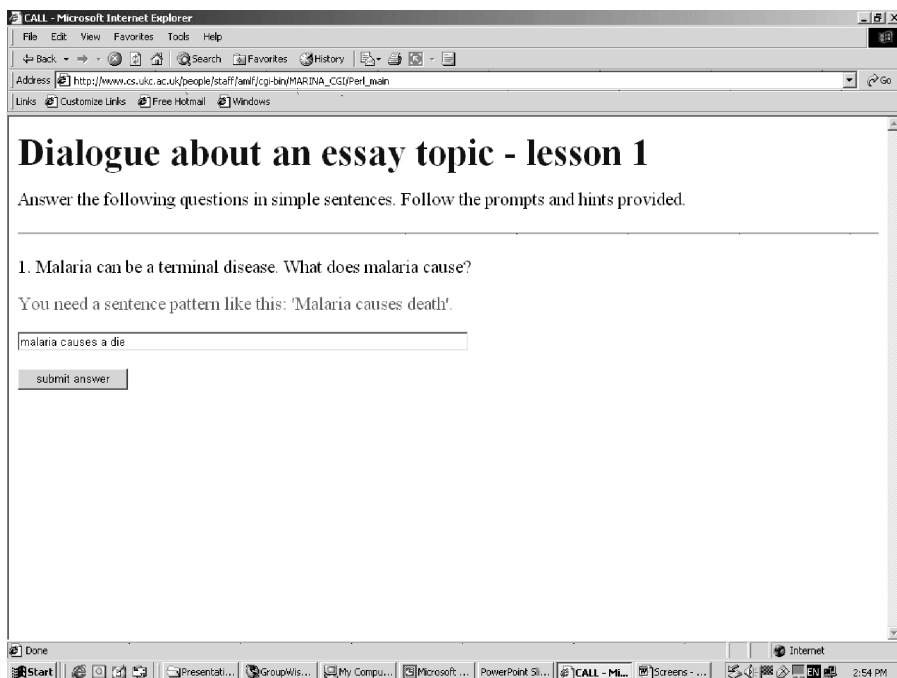


Figure 5 Feedback option 'Get a hint'

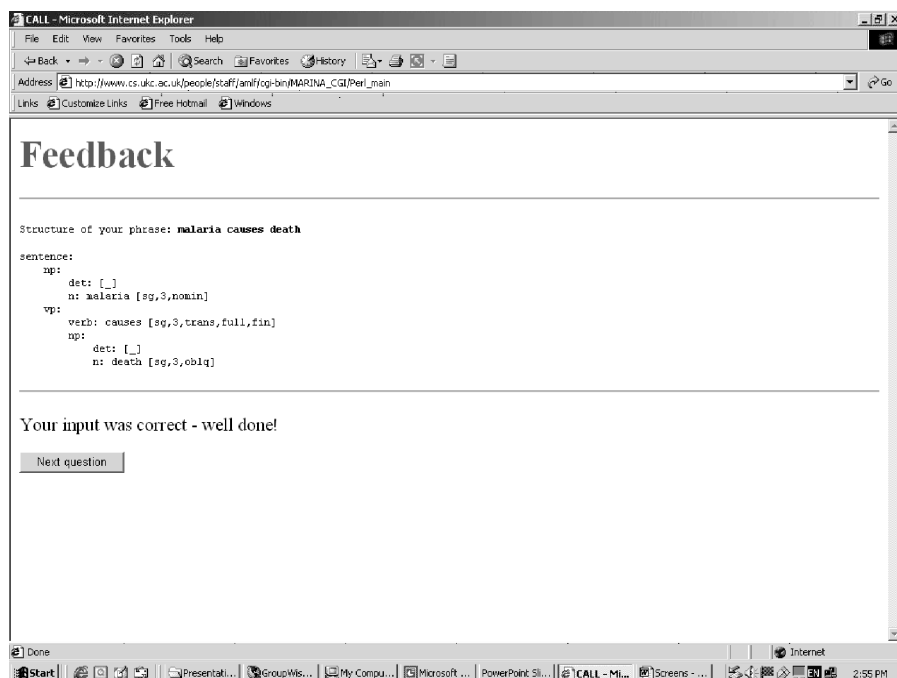


Figure 6 Feedback to a correct answer

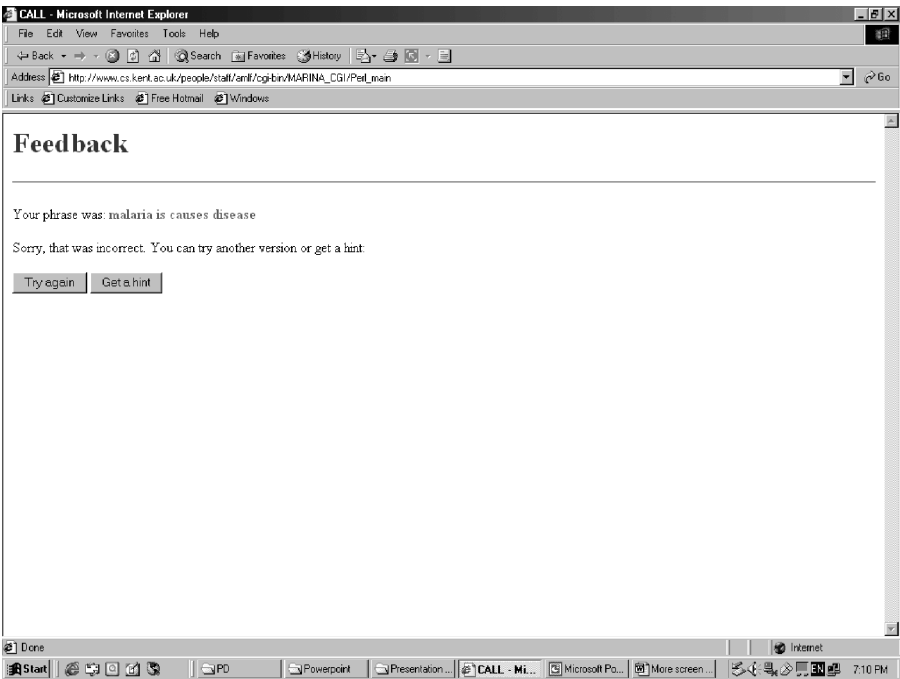


Figure 7 Feedback to an error type which is not recognised: invitation to try again or get a hint

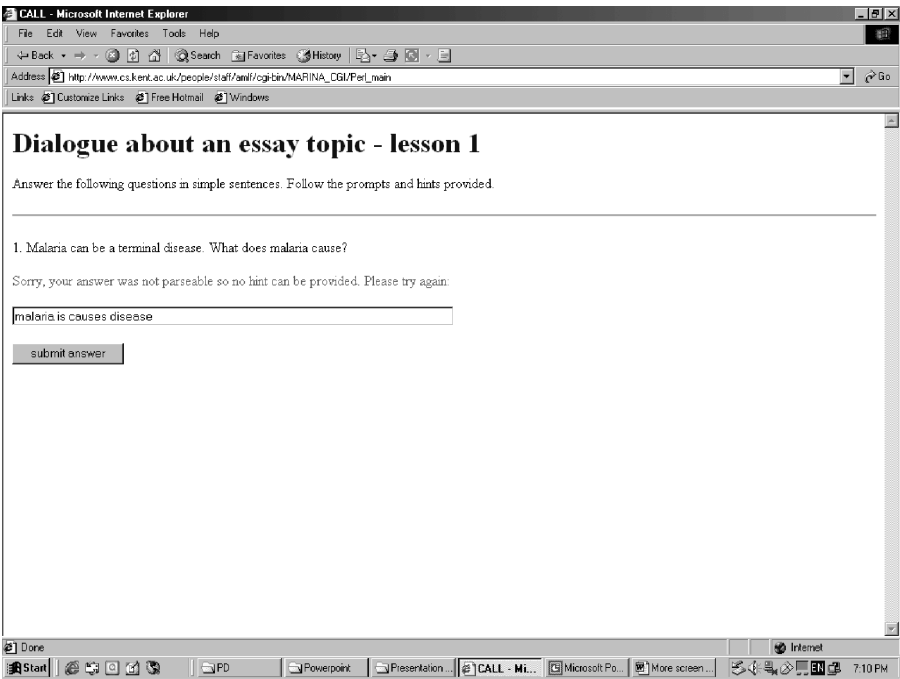


Figure 8 Feedback to an error type which is not recognised: erroneous grammar parse

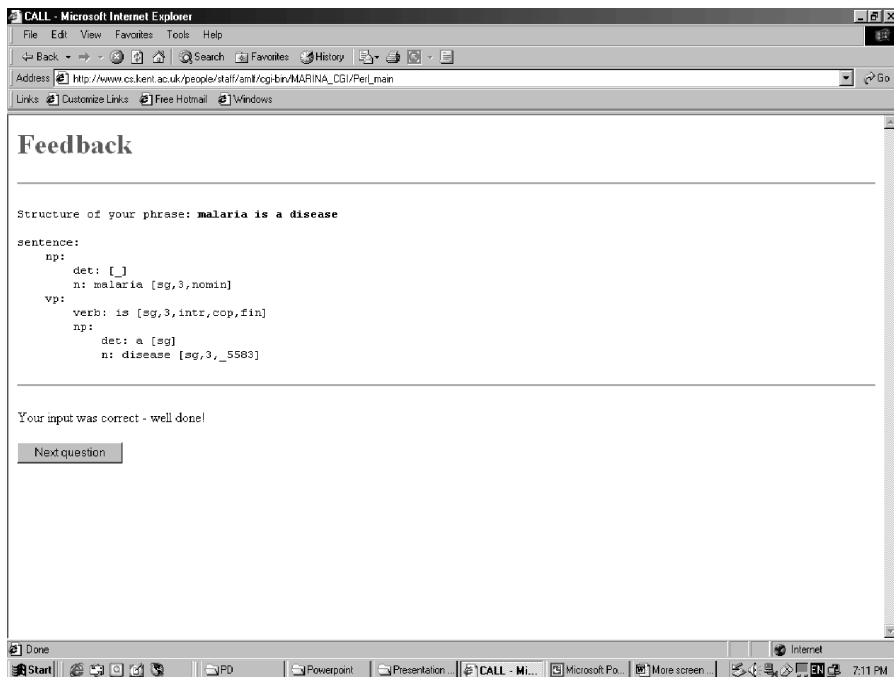


Figure 9 Feedback to input which is not an expected answer to the question, but is parseable

attempted parse to fail. Refining the grammar and appending the lexicon would make this system more flexible. However, in order for this to happen, more data analysis would be necessary, in particular regarding the correct structures most frequently generated by the target population.

The purpose of the intelligent EAP tutor program is to assist the students as one of the writing skills resources, mainly to be used for practising sentence structures, get help with the choice of words and provide feedback on language production. It is also meant to provide an arena for testing individual hypotheses about the target language, thus raising language awareness and helping the students move further towards the target language in a safe environment.

The students who tested the program in its pilot form found it very useful. However, their desire to experiment with language seemed to go far beyond the limitations of the program in terms of topic, vocabulary and grammar range. Some found it frustrating that they could not try out just any language construct that came to mind. Here is the feedback from one student that seems to encapsulate all the relevant points:

It is quite useful as all the topics link with our reading. Some little improvement could be made though . . . It might be too difficult for a computer to judge student's own sentence I think. Actually, I tried several times and could hardly get the right answer.

A reviewer, however, noted the following:

This is a good quality suite of software with a substantial innovative component based on language processing technology. Such software is really needed in both language and literacy learning and one can only hope that more developers will turn to producing this sort of tool.

Thus, the obvious limitations of this pilot program do not seem to pose a serious threat to the role of natural language processing in computer-assisted language learning and raising language awareness. Moreover, they motivate to make further improvements and eventually render the much needed tool available to a broad public in a user-friendly form.

Conclusion

Language learners need to engage in what they are promised will take place in their language classes, and that is language learning. Language learning leading to explicit knowledge (Ellis, 1997) can only happen with the increase of language awareness and consciousness. Computers are ideal devices to help raise the language awareness of students with varying needs and learning habits. When it comes to correcting the fossilised errors of student interlanguage, artificial intelligence computer programs could be unbeatable, considering their constant availability, analytical strength, adaptability to different users and finally their ability to go through the same motions over and over again. This paper has been devoted to one such program.

Our Cyber Coach, as the program is sometimes affectionately called by its developers, has taken several years to research and complete, as it needed to be proficient in both Standard English and the students' interlanguages, based on Chinese and Indonesian as L1 and English as L2. When it was finally first piloted, it proved far less than perfect. Thus it had a truly human quality. Much like a human tutor, or indeed its distant relative, the Star-Trek Voyager's holographic doctor, the program annoyed some users and fascinated others. To be consistent with the human metaphor, it can be said that the Cyber Coach was actually a mere baby, having a lot more to learn and accomplish. Indeed, quite like a human baby, Cyber Coach is capable of acquiring more and more complex 'knowledge' that will eventually bring about maturity.

Cyber Coach is designed as a writing tutor. Initially, it focuses on sentence grammar, which is both the main concern and the basic unit of academic English. It recognises typical errors and corrects them while at the same time allowing the student to experiment with language. Thus it fulfils two important functions: it raises the language awareness of its users and promotes learning. With more research and development work invested into it, Cyber Coach has every chance of becoming an established and useful citizen of the academic world.

Correspondence

Any correspondence should be directed to Marina Dodigovic, English Language Center, College of Arts and Sciences, Zayed University, PO Box 19282, Dubar, UAE (Marina.Dodigovic@zu.ac.ae).

References

- Butt, D., Fahey, R., Spinks, S. and Yallop, C. (1997) *Using Functional Grammar. An Explorer's Guide*. Sydney: NCELTR.
- Chomsky, N. (1965) *Aspects of the Theory of Syntax*. Cambridge, MA: MIT Press.
- Cook, V. (1993) *Linguistics and Second Language Acquisition*. London: Macmillan.
- Dodigovic, M. (1998) Multimedia in natural language processing. In K. Cameron (ed.) *CALL: Theory and Practice* (pp. 57–64). Exeter: Elm Bank.
- Dodigovic, M. (2002) Developing writing skills with a cyber-coach. *CALL Journal* 15 (1), 9–25.
- Dodigovic, M. and Suphawatt, P. (1999) Learning English for academic purposes on the web. In K. Cameron (ed.) *CALL and the Learning Community* (pp. 127–136) Exeter: Elm Bank.
- Ellis, R. (1997) *SLA Research and Language Teaching*. Oxford: Oxford University Press.
- Field, Y. (1994) Cohesive conjunctions in the English writing of Cantonese speaking students from Hong Kong. *Australian Review of Applied Linguistics* 17 (1).
- Halliday, M.A.K. (1985) *Spoken and Written Language*. Burwood: Deakin University.
- Halliday, M.A.K. (1994) *An Introduction to Functional Grammar*. London: Arnold.
- James, C. (1998) *Errors in Language Learning and Use. Exploring Error Analysis*. London: Longman.
- Larsen-Freeman, D. and Long, M.H. (1991) *An Introduction to Second Language Acquisition Research*. London: Longman.
- Martin, J.R., Matthiessen, C.M.I.M. and Painter, C. (1997) *Working with Functional Grammar*. London: Arnold.
- Matthews, C. (1998) *An Introduction to Natural Language Processing through Prolog*. London: Longman.
- McLaughlin, B. (1993) *Theories of Second-language Learning*. London: Arnold.
- Scollon, R. and Scollon, S.W. (1995) *Intercultural Communication: A Discourse Approach*. Oxford: Blackwell.
- Selinker, L. and Lakshmanan, U. (1993) Language transfer and fossilization: The 'Multiple Effects Principle'. In S.H. Gas and L. Selinker (eds) *Language Transfer in Language Learning* (pp. 197–216). Philadelphia: John Benjamins.
- Yip, V. (1995) *Interlanguage and Learnability*. Philadelphia: JB.