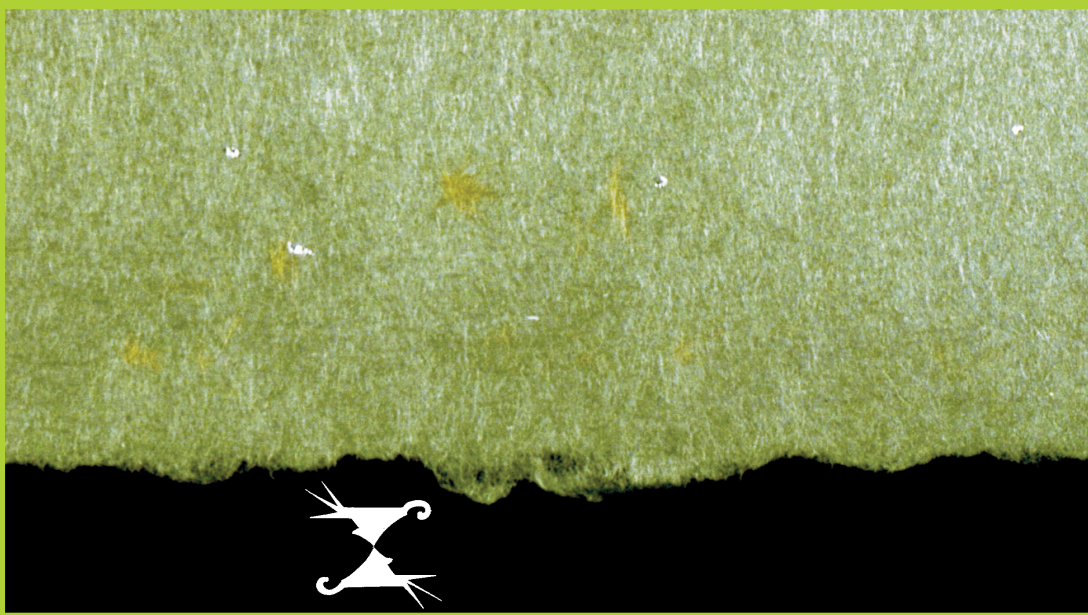
Pete Westbrook

Talk About Mouth Speculums:

Collocational Competence and Spoken Fluency in Non-Native English-Speaking University Lecturers



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COLLOCATIONAL COMPETENCE AND SPOKEN FLUENCY IN NON-NATIVE ENGLISH-SPEAKING UNIVERSITY LECTURERS

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LIST OF ABBREVIATIONS

UCPH	University of Copenhagen
CIP	Centre for Internationalisation and Parallel Language Use
TOEPAS	Test of Oral English Proficiency for Academic Staff
LAS	Department of Large Animal Sciences, University of Copenhagen
IT	Department of Information Technology, University of Copenhagen
Maths	Department of Mathematical Sciences, University of Copenhagen
OCD	Oxford Collocations Dictionary (Second Edition, 2009)

FOREWORD

The motivation behind this study was that, as an English language teacher, I became increasingly aware that English teaching materials, articles, and books dealing with *collocations* seemed to regard them not only as contributing to 'natural-sounding' English, but also as essential for *fluency* in the language. However, there did not seem to be much in the way of empirical research substantiating such a link between collocations and fluency. It was as an attempt to start to close this gap that I embarked on the pilot study described in these pages.

The study is a revised version of a final dissertation I wrote in completion of an MA in Applied Linguistics, which I was awarded in 2015 from the University of Birmingham. I would therefore like to thank my tutor, David Moroney, and my dissertation supervisor, Phyllis Chen, from the University of Birmingham for their invaluable comments and advice on my MA work.

I would also like to thank my colleague, Christian Jensen, for giving me access to his excellent speech analysis files; my brother-in-law, Jeff Readman, for his expert advice on compiling and applying statistics; and my colleague, Nina Rasmussen, for eagle-eyed proof-reading of the final version of the study.

Thanks must also go to my workplace, the Centre for Internationalisation and Parallel Language Use, for giving me the opportunity of publishing this study, and especially to Centre Director Anne Holmen, who agreed to provide the funds to allow me to take the MA in Applied Linguistics, and former Centre Director Birgit Henriksen, who showed the faith in me to employ me at the Centre in the first place.

Finally, I would like to thank my wife, Pia, for her unwavering support and for giving me the time and space to put in the hours.

1. INTRODUCTION

Linguistic research indicates that native speakers, far from selecting one word at a time, tend to produce language by choosing from a stock of thousands of fixed and semi-fixed lexical phrases (Pawley & Syder 1983). As first language (L1) learners, young children assign meaning to chunks of language, for example, *wassat?,* to ask about a particular object. Only later do they start analysing these chunks to extract the individual words, in this case, *what is that.* What is interesting is that, even after unpacking the chunk, the child retains the unanalysed chunk and the analysed individual words, giving him or her access to both forms (Cowie 1988). Sinclair (1987) proposes that these two forms represent two linguistic systems. The first he calls the *idiom principle*, where two or more words operate as a single language item, as in *of course*, and the second is the *open choice principle*, whereby individual words are selected one at a time in a given utterance.

Sinclair's idiom principle acknowledges the *formulaic aspect* of language, an aspect which is considered to be important to language proficiency in general (Pawley & Syder 1983; Nattinger & DeCarrico 1992; Wray 2002). In particular, Pawley & Syder suggest that formulaic language, as well as enabling language to be processed idiomatically, also contributes to the native speaker's ability to produce 'fluent stretches of spontaneous connected discourse' (1983, 191). A number of other studies have provided empirical evidence of this relationship between formulaic language and fluency for both native speakers and non-native speakers (e.g. Towell et al. 1996; Boers et al. 2006; Wood 2010).

The overall concept of formulaic language covers a wide range of different types of word combinations, including idioms (*beat about the bush*), pragmatic formulas (*how are you*), discourse markers (*let me see now*), and lexicalized sentence stems (*this means that…*). Although there seems to be a degree of uncertainty among researchers, collocations (*make a decision*, *major catastrophe*, *afraid of*) are also often

regarded as a subset of formulaic language (Nation 2001; Wood 2010; Henriksen 2013). As such, they are, by association, also assumed to contribute positively to fluency. However, research seems to indicate that even advanced learners experience problems producing native-like collocations (e.g. Nesselhauf 2005; Laufer & Waldman 2011; Henriksen 2013).

This situation leads to the following conundrum: if formulaic language, including collocations, is equated with fluency, yet even advanced learners have problems producing native-like collocations, how can this be reconciled with their status as advanced learners, given that fluency is an important component of overall language proficiency? Despite the studies seeming to support links between formulaic language and fluency, there appears to be a lack of empirical evidence documenting the relationship between collocations and fluency. It is this gap in collocational research that was the motivation behind this study, which, as the data set used was relatively small, should be considered as a hypothesis-gathering pilot study.

The study represents an attempt to answer the following research questions:

1. Is there any correlation between lecturers' overall language proficiency and their spoken fluency?
2. Is there any correlation between lecturers' overall language proficiency and their *collocational competence*?
3. Is there any correlation between lecturers' collocational competence and their spoken fluency?
4. Is there any evidence that collocations function in a similar way to other types of formulaic language in facilitating spoken fluency?

To investigate these questions, I was given access to data from 15 simulated 20-minute mini-lectures given by non-native English-speaking lecturers at the University of Copenhagen (UCPH) during an oral performance test of English academic speaking skills. From these data sources, I

produced measures for the overall performance, collocational competence and fluency of each lecturer. Statistical software was then used to establish whether there were any significant correlations between these different sets of variables. The hypothesis was that if collocations are a subset of formulaic language, some kind of positive correlation would be found.

The study is divided up as follows: Chapter 2 is a literature review and discusses in more detail research related to fluency, formulaic language, collocations, and the relationships between them. This is followed by Chapter 3, which covers the methodology used to collect and analyse the data. Chapter 4 presents the results from the analyses carried out, and Chapter 5 is a discussion of the results. The study finishes with some conclusions in Chapter 6.

2. LITERATURE REVIEW

Chapter 2 starts off by examining the different elements that make up fluency and the various methods used to measure them, before moving on to Section 2.2, which looks at the concept of formulaic language and the various types of linguistic phenomena that the term covers. This is followed by Section 2.3, which focuses on collocations, what defines them, how they might differ from other types of formulaic language, and what collocational competence might entail. The chapter finishes off with a summary.

2.1 Fluency

2.1.1 Defining fluency

The focus of this study is on spoken fluency, which is a difficult concept to pin down. This is partly because the whole process of planning and articulating speech in a comprehensible form is incredibly complex, and partly because the term 'fluency' itself is not always used to refer to the same language phenomena. For example, in a broad sense, fluency is often equated with overall language proficiency, while in a narrower sense, it refers more to the ease and smoothness of speaking.

Researchers who take the broader view of fluency seem to conflate temporal aspects of fluency with appropriateness of form. Segalowitz, for example, examines fluency in terms of 'speed, fluidity and accuracy' (2000, 200). This view, however, seems to run counter to Skehan's (1998) cognitive hypothesis, which states that because of limited processing capacity, there may be a trade-off between linguistic accuracy, fluency, and complexity when carrying out a given language task. This hypothesis theoretically means that a learner, in order to improve fluency, may have to compromise on accuracy. Hence, a learner's utterances may be fluent yet erroneous.

In order to separate fluency in the narrower sense from other aspects of oral proficiency, researchers assign the term

a number of different components, involving both temporal elements like speed of delivery and a degree of freedom from various dysfluency markers, such as repetitions, self-corrections, and filled pauses (Lennon 1990). One aspect of spoken fluency that is regarded as crucially different from other elements of oral proficiency is that it is 'purely a performance phenomenon; there is (presumably) no fluency "store"' (Lennon 1990, 391). In contrast, elements such as the ability to be idiomatic and syntactically complex and to use a wide range of vocabulary can all be assigned to a store of linguistic knowledge.

2.1.2 Research into fluency

Research into fluency falls into two broad categories: research investigating how some intervention (for example, studying abroad for a period of time) affects fluency through measuring fluency variables before and after (Towell et al. 1996), or research comparing fluency variables with independent rater assessments of language proficiency and fluency (Kormos & Dénes 2004; Ginther et al. 2010), or a combination of both (Lennon 1990). Measures used to test fluency are split into two main sets: 'positive' temporal variables basically measuring speed of speaking, and 'negative' hesitation phenomena relating to dysfluency.

Towell et al. (1996, 84) carried out a study into the development of fluency of 12 advanced learners of French. They found that, after a period of living abroad, the learners performed a specific task more fluently than before as measured by speech rate. An increase in the mean length of run was found to be the most important temporal variable contributing to this. They concluded that this was in part attributable to increased use of formulaic language.

The study by Kormos & Dénes (2004) looked at teachers' perceptions of the fluency of 16 Hungarian learners of English. Spoken samples from the learners were split into two distinct levels of proficiency, and temporal fluency measures and linguistic measures were correlated with the teachers' fluency scores. The study found that the best predictors of rater scores were speech rate, mean length of

run, phonation-time ratio, and the number of stressed words produced per minute. However, teachers differed on how much weight they put on accuracy, lexical diversity, and mean length of pauses. Dysfluency measures were not found to influence rater scores.

Ginther et al. (2010) compared 15 temporal variables to overall speaking proficiency in an analysis of spoken samples of 150 respondents on the Oral English Proficiency Test. They found that the variables with the strongest correlations to test scores were speech rate, mean length of run, articulation rate, and the number and length of unfilled pauses.

Lennon (1990) compared eight temporal and four hesitancy measures against 10 native speaker rater scores for global fluency of the spoken performances of four non-native speaker learners before and after a six-month residency in Britain. He found that three variables correlated significantly for fluency improvement across all subjects in the study: speech rate (in words per minute), filled pauses per T-Unit, and percentage of T-Units followed by a pause, a T-Unit being 'one main clause and all its attendant subordinate clauses and non-clausal units' (Lennon 1990, 406).

In line with these studies, in particular Kormos & Dénes (2004), who found that the following three variables provided a relatively robust indication of differences in fluency levels, the temporal fluency measures chosen for this study were:

- Speech rate: measured as the average number of syllables uttered per minute over the total response time.
- Mean length of run: measured as the average number of syllables produced per run, defined as stretches of speech between unfilled pauses of 0.25 seconds and above.
- Phonation-time ratio: measured as the percentage of time spent speaking as a percentage proportion of the time taken to produce the speech sample.

2.2 Formulaic language

2.2.1 Types of formulaic language

One of the problems with researching formulaic language is one of terminology. Wray (2002, 9) lists over 40 different terms used to describe aspects of formulaicity, which sometimes makes it difficult to know precisely what a researcher is referring to: for example, whether a *multi-word unit* (Moon 1997) covers the same linguistic phenomena as a *formulaic sequence* (Wray 2002). In addition, the various types of language phenomena covered by the term are often labelled and defined in different ways. Table 2.1 gives a summary of some of the different kinds of formulaic language identified by researchers.

Researchers	**Category**	**Example***
Pawley & Syder (1983, 205-210)	memorized sequences	*you can't be too careful*
	lexicalized sentence stem	*I'm sorry to keep you waiting*
Nattinger & DeCarrico (1992, 38-47)	clichés	*no doubt about it*
	collocations	*rancid butter*
	polywords	*so to speak*
	institutionalised expressions	*nice meeting you*
	phrasal constraints	*a ___ ago*
	sentence builders	*it's only in X that Y*
Moon (1997, 45-47)	discourse markers	*on the other hand*
	socially pragmatic formulas	*have a nice day*
	standardized similes	*as quick as lightning*
	proverbs	*a stitch in time…*
	phrasal verbs	*make out*
Henriksen (2013, 2)	idioms	*spill the beans*
	figurative expressions	*frozen to the spot*

Table 2.1: Summary of categories of formulaic language by researcher

* Examples are those provided in the cited sources.

Two of the main differences between these categories of formulaic language are the degrees of fixedness and contiguousness of the expressions.

To illustrate the first aspect, Pawley & Syder's example in Table 2.1, *I'm sorry to keep you waiting,* allows for some flexibility through the substitution of variables. These include inflections (e.g. *Mr X is* instead of *I'm*) and expansions (e.g. adding *all this time* at the end) (Pawley & Syder 1983, 210). Other expressions, however, are more rigidly fixed, for example, *as quick as lightning* or *you can't be too careful.*

The second aspect, contiguousness, relates to how far the words that make up the sequence allow substitutable items to be included within their structure. This is shown, for example, by considering Nattinger & DeCarrico's (1992) *a ___ ago* phrasal constraint. This requires a word or phrase inserted in the middle to complete it: *a while ago, a few days ago,* and so on. In contrast, a polyword such as *so to speak* allows no such insertions.

Despite these differences, what these sequences all seem to have in common is the concept of prefabrication. Thus, a useful working definition of formulaic language is 'a sequence, continuous or discontinuous, of words or other elements which is, or appears to be, prefabricated: that is, stored and retrieved whole from memory' (Wray 2002, 9).

2.2.2 Formulaic language and fluency

Research over the last 30 years or so has led to increasing recognition that formulaic language is central to how language is produced for both native speakers and non-native speakers (Pawley & Syder 1983; Sinclair 1987; Nattinger & DeCarrico 1992; Wood 2010). Native speakers seem to be able to utter relatively long uninterrupted strings of discourse, longer than would be expected given the limited processing capacity of short-term memory, estimated at only about seven or eight words at a time (Wood 2010). This is achieved by utilizing formulaic language held in memory as a single unit, thereby allowing the speaker to retrieve strings of words quickly and efficiently, rather than focusing on the selection of individual items. It is this phenomenon that is

recognised as fluency. Pawley & Syder (1983) estimate that the lexicon of a native speaker of English includes several hundred thousand formulaic sequences, which may just make up, to use Lennon's words from Section 2.1.1, a speaker's fluency 'store' (Lennon 1990, 391).

Therefore, from a theoretical perspective, there is good reason to suppose that use of formulaic language is crucial to fluency. Although this relationship has not been investigated empirically in great depth, three studies seem to support the theory. Firstly, Towell et al. (1996), in their study described in Section 2.1.2, concluded that increases in informants' fluency, as measured by mean length of run, were partly due to their increased utilization of lexical phrases.

Secondly, Boers et al. (2006) split 32 second language (L2) speakers majoring in English into two groups. The experimental group was made explicitly aware of standardized formulaic sequences, while the control group was taught using the traditional lexis-grammar dichotomy. The study showed that the oral proficiency of the experimental group, as assessed by two judges, was higher than that of the control group. A count of formulaic sequences used by the two groups also correlated well with the oral proficiency ratings, suggesting that helping learners build up a store of formulaic sequences can contribute to improving their oral proficiency.

Finally, Wood (2010) carried out a longitudinal study of 11 adult English L2 learners studying abroad for six months. Regular speech samples were collected and analysed using temporal variables associated with fluency. Discourse analysis was carried out to uncover use of formulaic language, and this was correlated with the fluency variables. The study found a relationship between speech fluency development and the use of formulaic language in L2 speakers.

2.3 Collocations

2.3.1 Defining and identifying collocations

Collocations are frequently recurring two-to-three word combinations, such as *make a decision*, *bitter disappointment*, and *talk about*, which co-occur 'with a mutual expectancy greater than chance' (Nattinger & DeCarrico 1992, 36). They are referential and tend to be conventionalised combinations, displaying a certain degree of predictability for native speakers.

Two main approaches have been adopted by researchers to identify collocations in a given text or corpus: the *frequency-based approach* and the *phraseological approach.* The frequency-based approach is associated with computer-based searches of large language corpora. These searches involve identifying words that occur within a short span, usually four words, either side of a headword, or 'node'. If the node occurs together with another word or words within this span 'at a frequency greater than chance would predict, then the result is a collocation' (Nattinger & DeCarrico 1992, 20). Thus, collocations are not necessarily contiguous, although they can be. They can also be realised in different lexical combinations. The collocation *strong argument*, for example, can be realised as: *it is a strong argument, he argued strongly for, the argument is a strong one,* and so on.

Frequency criteria alone, however, will not necessarily yield collocations. The phraseological approach employs a more intuitive syntactic and semantic analysis of word combinations and is helpful in defining collocations more precisely. A useful starting point is Cowie's (1988; 2001) categorisation of word combinations as shown in Figure 2.1.

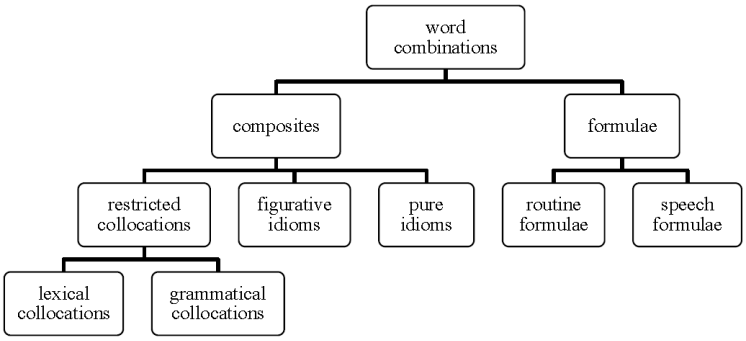

Figure 2.1: Classification of word combinations (after Cowie 1988; 2001)

Cowie (1988; 2001) classifies word combinations into what he terms *formulae* and *composites*. Formulae function as autonomous utterances at the sentence level and cover socially pragmatic phrases such as *How are you doing, you know what I mean*, and *mind the step*. Composites, on the other hand, are semantic combinations which function within a sentence and have a referential function. Cowie subdivides composites into *pure idioms*, *figurative idioms*, and *restricted collocations*. Collocations are the subject of this study and can be further split into *lexical collocations,* i.e., combinations made up of verbs, nouns, adjectives, and adverbs, e.g., *make a claim* or *ulterior motive*, and *grammatical collocations*, which include a preposition as in *talk about* or *in advance*.

Howarth (1998), basing his work on Cowie, conceived these different composite forms as being placed somewhere along a continuum as shown in Table 2.2.

Type of composite	Free combinations	Restricted collocations	Figurative idioms	Pure idioms
Lexical composites (e.g. verb + noun)	*blow a trumpet*	*blow a fuse*	*blow your own trumpet*	*blow the gaff*
Grammatical composites (e.g. preposition + noun)	*under the table*	*under attack*	*under the microscope*	*under the weather*

Table 2.2: Collocational continuum showing examples of collocations ranging from free combinations to fixed idioms (from Howarth 1998, 28)

The continuum ranges from freely substitutable and transparent word combinations at one end through restricted collocations, which are semi-transparent and have a limited number of (restricted) collocates, to idioms at the other end. Idioms are considered non-transparent, in that the meaning is difficult to work out just from the individual elements and more or less completely restricted, i.e., fixed in form. This concept of restrictedness is especially important for identifying collocations. The verb *see* can be combined with virtually any noun (*see a river, see a house, see a cat,* etc.); there are no constraints on which nouns it can combine with. *See a river* would therefore not be considered a collocation. On the other hand, a verb like *perform,* as in *perform a task*, can only be used with a relatively small number of nouns and would be considered having restricted senses. *Perform a task* would be considered a collocation.

2.3.2 Collocations and formulaic language

There seems to be some uncertainty about whether collocations can actually be considered formulaic language, and therefore how far Wray's (2002) definition of formulaic language given in Section 2.2.1 covers the term. Some researchers explicitly categorize collocations as a subset of

formulaic language (Nation 2001; Henriksen 2013). Others more implicitly refer to collocations under a general discussion of formulaic language (Moon 1997; Wood 2010; Laufer & Waldman 2011).

However, Wray (2002, 52) casts doubt on the question by pointing out that as collocational meaning is merely due to the tendency of lexical items to 'prefer' certain word partners over others, this may not be fixed enough for collocations to function similarly to other formulaic language. Since there is so much potential for variation, such pairings could easily be constructed via Sinclair's open-choice principle. As a result, Wray asserts that:

> It is far from being the case that all commentators see collocational associations as 'formulaic' in any useful sense at all. Whereas other types of formulaic sequence are entirely or partly fixed, so there is a central internal stability, collocation is much more fluid (Wray 2002, 51).

The question seems to boil down to how far collocations are word combinations which are stored in long-term memory as if they were 'single lexical units', as other types of formulaic language are hypothesized to do. This seems intuitively to apply to more fixed types of formulaic language such as idioms, *beat about the bush,* or pragmatic formulae, *Have a nice day.* But is the same true for more flexible combinations like collocations?

The hypothesis for this study is that if collocations are to be considered a subset of formulaic language, and formulaic language is seen to promote fluency, the expectation would be that there might be some kind of relationship between collocations and fluency. This is the reasoning behind the investigation carried out in this study.

2.3.3 Research into learners' collocational competence

Researchers seem to use a variety of terms for referring to collocations and to errors that learners make when producing collocations. Following Nesselhauf (2005), Laufer & Waldman

(2011), and Henriksen (2013), this study uses the term *deviant collocations* to refer to word combinations which contain some kind of error.

Research into collocational competence, the ability to produce or recognise native-like collocations, seems to show two conflicting sets of findings. Firstly, there are the studies that have found a positive correlation between collocational competence and overall language proficiency. For example, Groom (2009) looked at grammatical collocations in a written corpus of Swedish learners and found a positive correlation between L2 immersion (a period spent in an L2-speaking country) and collocational accuracy. The implication is that improvements in general proficiency, assuming learners improve overall from time spent in an L2 environment, are accompanied by enhanced collocational competence.

Keshavarz & Salimi (2007) tested both the collocational competence and overall proficiency of 100 English major university students in Iran. Their findings suggest that learners' collocational competence and language proficiency level were closely and positively correlated.

Nizonkiza (2011), using a collocations dictionary to design a collocational competence test administered to English majors at the University of Burundi, found that mastery of collocations predicted lexical competence, which in turn seemed to be a reliable predictor of language proficiency.

However, there is also a body of research that seems to suggest that learners' collocational competence sometimes lags behind their general language proficiency. Bahns & Eldaw (1993) showed that, for advanced German speakers of English, collocations present a major problem in the production of correct English. Investigating verb-noun collocations in a translation task and a cloze test, they found that the number of collocational errors was twice as high as the number of errors involving single lexical items in the translation tasks they assigned.

Nesselhauf (2005) reports on the collocational use of verb-noun combinations in academic writing by non-native

English-speaking students. She concludes that even advanced learners have considerable difficulties in producing certain native-like collocations. Findings showed that particularly challenging for learners were the semi-transparent collocations and collocations formed with a different constituent part compared to the L1 equivalent. An example of this is the erroneous collocation *make homework*, rather than the conventional *do homework*, probably influenced by the learner's L1 (German) equivalent *Hausaufgaben machen* (Nesselhauf 2005, 191).

Laufer & Waldman (2011) compared native English speakers and different levels of Hebrew-speaking non-native learners of English with regard to the frequency and correctness of their respective use of collocations. They found that learners at all levels of proficiency produced far fewer collocations than the native speakers. In addition, while increases were registered at the most advanced learner level, deviant collocations, especially those arising from interlanguage differences, continued to persist.

Finally, De Cock (2000), one of the few researchers to conduct research into spoken L2 collocational use, concluded that learners have a tendency to overuse, underuse, and misuse native-like collocations and often produce deviant collocations.

Pawley & Syder (1983) contend that a speaker's store of familiar collocations will enable them to make idiomatic, native-like selections and to process language fluently. Lennon goes so far as to claim that:

> The greatest barriers both to purely temporal fluency and to higher-order fluency at advanced levels of English as a foreign language would appear to be lexical in nature; conversely, felicitous [i.e. native-like] lexical collocations contribute positively to fluent performance (Lennon 2000, 40).

However, in the studies cited above, collocational competence seems to be operationalised as the ability to

apply correct, frequent, and varied collocations, i.e. conform to native speaker norms. It seems logical that this would enable the learner to produce more native-like utterances, what Pawley & Syder call 'native-like selection' (1983). For example, saying *I did my homework* rather than the erroneous *I made my homework* is more accurate and sounds more native-like. What is less clear is how this might promote fluency. Furthermore, if even advanced learners appear to produce the numbers of deviant collocations that the research suggests they do, how might this affect their fluency?

2.4 Summary

The term fluency is used both in a broad sense to refer to the ability to produce language easily, smoothly, and accurately, and in a narrow sense referring to the more temporal aspects of speech. The research into temporal fluency shows that there are several elements involved in the process. However, three temporal measures appear to be particularly robust at predicting spoken fluency: speech rate, mean length of run, and phonation-time ratio.

Research into formulaic language, defined as prefabricated strings of words stored and produced as single units, seems to have established a positive relationship between formulaic language and fluency. Collocations, two-to-three word combinations such as *bitterly cold* and *fond of*, are often considered a subset of formulaic language and would therefore in theory be expected to behave in a similar way. However, if collocational competence is the ability to produce native-like collocations, how might learners' deviant collocations impact on their fluency? There seems to be a lack of empirical evidence into collocational competence and fluency to shed light on these questions. It is this research gap that was the motivation for this study.

3. METHODOLOGY

The aim of this study is to find out whether there is any kind of correlation between use of collocations and fluency. The methodology therefore sets up various measures for overall language proficiency, collocational competence, and spoken fluency, and applies statistical tools to test for any correlations between them. The chapter covers the origin of the data source (Section 3.1), and the procedure followed for calculating collocational competence and fluency measures (Section 3.2). Section 3.3 describes the initial statistical analyses applied. This is followed by the additional procedures designed to test potentially important aspects of the data set not included in the original methodology design (Section 3.4). The chapter finishes with a summary.

3.1 Origin of the data

The data used for this study originated from an oral proficiency test for lecturers at UCPH, where I work. I was given access to a number of data sources to enable me to undertake this study. This section gives a description of the test and then goes on to explain procedures that were followed to produce the data, prior to my work on it.

3.1.1 The TOEPAS certification test

Over the last 20 years or so, increasing internationalisation at UCPH has led to more and more graduate-level study programmes being run through the medium of English. As a result, in the autumn of 2009, the university management introduced an oral English certification test for lecturers: the Test of English Proficiency for Academic Staff (TOEPAS). Since then, nearly 400 non-native English-speaking lecturers from the university have taken the test. TOEPAS was intended to test whether lecturers, who were already employed at UCPH, had the necessary English language proficiency to teach on elite English-medium instruction courses at the university.

The TOEPAS test takes place at UCPH's Centre for Internationalisation and Parallel Language Use (CIP). During each certification session, three lecturers from the same discipline each deliver a 20-minute mini-lecture from their own field of research to their two colleagues. They, in turn, act as 'graduate students' and are encouraged to ask questions, both during the lecture and in a question-and-answer session afterwards, in order to simulate a degree of classroom interaction.

The three mini-lectures given per session are assessed by two examiners from the CIP team of eight examiners. These examiners are described by CIP as 'researchers and research assistants specialised in second language acquisition with an emphasis on academic English' (CIP 2014a). Directly following the examination session, the two examiners independently rate the test takers' performances, by awarding each lecturer a global score from 5 (highest score) down to 1, where a score of 5, 4 or 3 is certified to teach English-medium courses, and a score of 2 or 1 is uncertified. This global score is the score the lecturers themselves receive from CIP as their certification result. Appendix A contains a description of the global score bands

Table 3.1 gives an overview of the results for all 394 certifications from August 2009 to August 2014. As can be seen, there is an overwhelming number of 3s and 4s (92.1%), with only a relatively small number of lecturers achieving the top score of 5, and even fewer (2.8%) failing to be certified (a score of 2). No lecturer has yet been given a score of 1. This table serves to illustrate that the lecturers taking the certification test are relatively advanced non-native speakers of English.

Global Score	English Proficiency Level	No. of Lecturers (394 total)	% of Total Lecturers	Certification Awarded
5	equivalent to a native speaker	20	5.1	yes
4	excellent	182	46.2	yes
3	good	181	45.9	yes
2	less than sufficient	11	2.8	no
1	limited	0	0	n/a

Table 3.1: TOEPAS overall certification scores and results, 2009-2014

As well as a global score, the examiners also score five analytic criteria, namely: fluency, pronunciation, vocabulary, grammar, and interaction, the descriptors for which are shown in Appendix B. These analytic criteria, which are used only for the internal purposes of ensuring inter-rater reliability and providing additional data for research, are also scored on a scale from 5 to 1, but may be qualified by a plus or minus. Thus, a lecturer may score 3+ for fluency, 4- for vocabulary, and so on. On occasions, there is disagreement between the examiners as to the exact internal score for a particular analytic criterion; this disagreement is also recorded internally. A lecturer may therefore be given a fluency score of 3 by one examiner and 3+ by the other. The internal fluency score was used as part of the data for this study (described in Section 3.2.3).

Each lecturer's mini-lecture for the certification procedure is recorded in stereo directly onto a Mac computer, using a Panasonic mini digital video recorder. One channel is connected to a personal wireless microphone worn by the lecturer giving the mini-lecture. The other channel is connected to an overhead microphone positioned just above the other two lecturers, in order to pick up any comments and

questions they might have. The recording results in digital video and audio files.

3.1.2 Access to data sources

In October 2011, CIP provided funds to have 15 of the certification mini-lectures transcribed for research purposes. This resulted in a number of data sources, which, as an employee at CIP, I was given access to. These data sources made it possible for me to embark on this study and included the following material:

- overall totals for the 394 certifications that have been held so far (Table 3.1 in Section 3.1.1).
- a transcription of each of the 15 mini-lectures, together with the accompanying audio and video files;
- text file versions of the 15 transcriptions.
- copies of the certification reports for each of the 15 lecturers, which gave me access to the examiners' global scores and fluency scores.
- two files of speech analysis data, which a colleague of mine had extracted in 2012 from the 15 mini-lectures for his own research. The procedure he used to produce the files is explained in Section 3.1.4. I have called these files Speech Analysis File 1 and Speech Analysis File 2, as they gave me the raw material to be able to calculate the temporal measures for fluency, explained in Section 3.2.4.

3.1.3 Data selection

Out of the 96 certifications that had been carried out by October 2011, the 15 mini-lectures to be transcribed were randomly selected by computer, albeit meeting a number of predetermined criteria:

- Only certifications after 1 January 2010 were to be used. The reason for this was that the assessment procedure had not been fully standardised prior to this date.
- For ease of transcription, rather than each lecturer

coming from a different certification session, the 15 lecturers had to be distributed over just five sessions, with three lecturers in each session (as described in Section 3.1.1).

- As the lecturers should represent a spread in global ratings, the procedure needed to produce a stratified sample to satisfy the following conditions:
    - 3 lecturers with a score of 5
    - 3 lecturers with a score of 2
    - at least 4 lecturers with a score of 3
    - at least 4 lecturers with a score of 4

The 15 lecturers that had been selected by this method were used as the informants in this study. They came from three university departments: Large Animal Sciences (LAS), Information Technology (IT) and Mathematical Sciences (Maths). For the purposes of this study, I have given each lecturer an identification number from 01 to 15 together with a prefix L, I or M according to which department they came from. Appendix C shows their identification number, university department, global scores, and the internal fluency scores from each of the two examiners. The final distribution of global scores was three 5s, five 4s, four 3s, and three 2s. The lecturers had all signed consent forms at the time of certification, allowing the anonymous use of their recordings for research purposes.

The audio files for each of the 15 mini-lectures selected were orthographically transcribed manually using the *Transcriber* program, which also aligned the audio file with the transcription file. These were then converted into *TextGrid* files in the speech analysis program *Praat*. In order to produce a text file, the orthographically transcribed speech of each lecturer was extracted from the *Praat TextGrid* file and saved in a separate plain text file. This file I called the Collocations Text File, and it was used to identify collocations (Section 3.2.2).

3.1.4 Extraction of the speech analysis files

In order to produce the two speech analysis files that I was later given access to, my colleague extracted and numbered runs from the *Praat* files using a simple script program. A phonetics transcription was added using the program *PhoTransEdit*. This included syllable boundaries making it possible to produce a count of the number of syllables uttered by a speaker. The resultant two files listed consecutively all 15 mini-lectures including question-and-answer sessions. Speech Analysis File 1 contained data about all speech runs between unfilled pauses of 0.15 seconds or more (as my colleague had originally set the pause cut-off time to 0.15 seconds for his own research purposes) and showed timed filled and unfilled pauses, and incomplete words. Speech Analysis File 2 showed all speech runs with the respective number of syllables for each run. I used these two files to calculate the three temporal fluency measures (Section 3.2.3).

3.2 Data processing for this study

From the data I was given access to, I needed to extract the specific information used in this study. This section tracks my own procedures for doing this. It should be noted that although the data originally consisted of a mini-lecture followed by a question-and-answer session, my data set was restricted to the mini-lecture itself, roughly 20 minutes for each lecturer.

3.2.1 Verification of collocations

A number of researchers, including Nesselhauf (2005), Laufer & Waldman (2011), and Nizonkiza (2011), have used monolingual dictionaries to verify word combinations found in their data. According to Nesselhauf, such dictionaries constitute 'the best existing sources recording the combinability of lexical items' (2005, 54). In the interests of applying a standardized and objective yardstick to the data under investigation, this was also the method I adopted for verifying collocations.

While collocations can, like single word items, be divided up into general, academic, and domain-specific collocations, the study focused initially only on general collocations. Although the data came from a number of different academic disciplines, the rationale behind looking only at general collocations was twofold. Firstly, the method I chose to verify collocations was a collocations dictionary, which only includes general collocations, or at the most pre-technical collocations (such as *amniotic fluid*). There was no readily available robust method of verifying domain-specific collocations. Secondly, I considered it feasible to compare lecturers based on only general collocations as I assumed at that point that the proportion of general collocations across the lecturers and the disciplines would be fairly consistent.

The dictionary chosen was the *Oxford Collocations Dictionary for Students of English* (OCD), second edition (2009). The advantage of using a collocations dictionary over other types of (learner) dictionaries is that this type of dictionary, being dedicated to listing collocations, constitutes a more comprehensive and direct source of collocations than a more traditional dictionary. The OCD draws on corpus data from the two-billion-word Oxford English Corpus, deals with a reasonably formal register (Barfield & Gyllstad 2009), and is aimed at upper-intermediate learners and above. It was chosen over other collocations dictionaries as, with over 9,000 headwords, it was the most comprehensive. By comparison, the *Macmillan Collocations Dictionary* (2010) has 4,500 headwords and the *LTP Dictionary of Selected Collocations* (2002) only 3,200.

The OCD is based on the lexical frequency/co-occurrence view of collocation, but it explicitly only includes collocations which roughly correspond to the restricted collocations on Howarth's (1998) continuum, described in Section 2.3.1. The dictionary includes fairly weak collocations (*see a movie*) through to strong and more restricted collocations (*see reason*). However, it excludes completely free combinations such as *see a river* as well as completely fixed idioms like *not see the wood for the trees* (McIntosh et al

2009:v). The OCD was therefore considered an appropriate tool for verifying collocations for this study.

3.2.2 Identification of collocations and deviant collocations

Collocations were identified manually by going through the Collocation Text Files for each lecturer and underlining any word combinations which potentially constituted either lexical collocations (e.g., *draw a graph, subtle difference,* etc.) or grammatical collocations (e.g., *in fact, talk about,* etc.), as described in Section 2.3.2 above. The manual approach allowed me to capture collocates further away from the node word than four each side, as in the following example: *the time schedule for when to deliver and what to deliver it needed to be adjusted* (lecturer I08). The verb *adjust* is listed in the OCD as a collocate for *schedule,* but in the data it was positioned 13 words away.

Once a particular combination had been underlined, it was checked to see if it was listed in the OCD. A number of decisions were made to determine whether a word combination was in fact a verifiable collocation according to the OCD. They were as follows:

1. A word combination was counted as a collocation if it was listed in the OCD.
2. Phrasal verbs (*look for, find out, look up*) were not included in themselves, if these were listed in OCD as single items.
3. Combinations listed as phrases in the OCD were also ignored as these constituted more fixed idiomatic phrases, which did not fall under the definition of collocations that this study is following.
4. If a collocation where one of the component parts was an adjective, and the adjective occurred in a collocations file with the comparative form of the adjective, then that was included as a collocation. For example, the OCD lists *good result* as a collocation. One of the lecturers says *better result*, which was included in his list of verified collocations.

5. Nested collocations, i.e., two (or more) collocational pairings on the same headword, were counted as two separate collocations. For example, *use a different method* was counted as two collocations (*use a method* and *different method*).

If a word combination was counted as a collocation, it was added to the list for that lecturer. In this way, a list was compiled of all the lexical and grammatical collocations produced by each lecturer in their mini-lecture. These were then sequenced alphabetically in order to group repeat uses of particular collocations, thereby enabling the calculation of collocation types and collocation tokens for both lexical and grammatical collocations. This in turn yielded the total number of collocation types and tokens used by each lecturer. Appendix D, E, and F list all the collocations found for each lecturer in the LAS, IT, and Maths departments respectively.

If a word combination was not verified as a collocation, there were two possibilities: either the word combination was deemed to be acceptable, although not verifiably a collocation, in which case it was simply ignored, or it was deemed potentially deviant in some way. Potentially deviant collocations (e.g., *do a procedure, violent pain, extremely many*) were logged against the lecturer that produced them. Following Nesselhauf's (2005, 50-51) procedure for deciding acceptability of word combinations, I collated all potentially deviant collocations into one list and sent the list out to five raters. These raters were either native English speakers and/or trained TOEPAS certification examiners. They were instructed to indicate acceptability of the word combinations on a three-point scale: acceptable, unacceptable, or not sure. If three of the five raters judged a combination as unacceptable, it was listed as a deviant collocation against the lecturer who had produced it. The full list of potentially deviant collocations and the raters' assessments is listed in Appendix G. Appendix H contains the final list of all deviant collocations by lecturer.

3.2.3 Calculating collocational competence

As explained in Section 3.2.1, three variables indicating collocational use were produced for each lecturer: number of collocation types (different collocations used), collocation tokens (all collocations produced including repetitions), and deviant collocations. However, the 15 mini-lectures were all slightly different in length. Therefore, in order to produce comparable measures, collocational competence was defined as the number of verifiable collocation types (as listed in the OCD), collocation tokens (frequency of use), and deviant collocations per thousand words spoken. The number of words was calculated by copying the Collocations Text File over to a word file, removing all laughter (transcribed in the file as 'ha'), filled pauses (transcribed as 'uh'), incomprehensible utterances (transcribed as 'xxx'), and incomplete words (transcribed as part of a word with a dash, for example, *ea-* represents an incomplete *each*). The remaining word count in Word was then noted for each lecturer as number of words spoken.

In addition, the type/token ratio was calculated for each lecturer by dividing the number of collocation types by the number of collocation tokens. This was done to test for possible patterns of collocational 'overuse'. If every collocation only occurs once, this figure will be 1, and therefore the nearer to 1 the type/token ration is, the more varied the collocational use is considered to be. On the other hand, a low type/token ratio indicates that the same collocations are used several times through the mini-lecture.

3.2.4 Measuring fluency

The temporal fluency measures chosen for this study were calculated as follows:

- Speech rate: number of syllables uttered per minute. This gives an indication of how fast speech is produced overall.
- Mean length of run: the average number of syllables produced in utterances between pauses of 0.25

seconds and above. This gives an indication of how long a speaker can 'keep going' before each pause.

- Phonation-time ratio: percentage of time spent speaking words as a percentage of the time taken to produce the speech sample. Overall, the higher the ratio figure, the more time a speaker spends on actually speaking rather than producing filled or unfilled pauses or incomplete words.

In order to identify and calculate these measures, each lecturer was analysed manually in turn, applying the following procedures to Speech Analysis Files 1 and 2 (from Section 3.1.3):

1. As the other two lecturers, who were acting as graduate students, were supposed to ask questions during the mini-lecture itself, there were a number of runs not actually spoken by the lecturer giving the mini-lecture. Therefore, these two lecturers' run and pause times were deleted from Speech Analysis File 1, and their spoken runs deleted from Speech Analysis File 2.
2. I needed to calculate runs using as my boundary unfilled pauses of 0.25 seconds or more (based on the research into temporal fluency variables in Section 2.1.2). However, many of the runs listed in Speech Analysis File 2 were separated only by filled pauses, incomplete words, and/or pauses of less than 0.25 seconds, as my colleague had originally set the pause cut-off time to 0.15 seconds. Therefore, runs separated in this way were combined.
3. Speech Analysis File 2 listed syllables per run, and so the total number of syllables used by the lecturer could be established. This figure divided by the total number of spoken runs, as calculated in step 2, yielded the mean length of run.
4. The times for spoken runs were then separated from the non-speech times for the lecturer and totalled. This yielded the total speaking time and total non-

> speaking time, from which both speech rate (in syllables per minute) and phonation-time ratio (as a percentage) could be calculated. It should be noted that, matching up with the number of words included in each mini-lecture sample (as explained in 3.2.3 above), 'speaking time' does not include laughter, filled pauses, incomprehensible utterances, or incomplete words. Non-speaking time includes these features plus unfilled pauses.

As outlined in Section 3.1.3 above, all the lecturers in the data set had received internal scores on five analytic criteria, including fluency, from each of the two CIP examiners. Each of the examiners' fluency scores were converted into an integer between 0 and 14 from each examiner based on the conversion chart shown in Appendix I, and then added together to provide a single value, which could be used in the statistical analyses. A lecturer could therefore score between 0 (if awarded 0 by both examiners) up to a top score of 28 (if the lecturer was awarded 5 by each examiner) for fluency. So, for example, lecturer L01 was awarded a 4- for fluency from one examiner and a 3+ from the other examiner, giving him an overall fluency index of 19 (10+9). The individual examiner's fluency scores and the corresponding fluency index for each lecturer can be found in the table in Appendix C.

It is worth noting at this point that the analytic criterion which would be expected to correlate most closely with collocational competence is vocabulary. This is because particularly low frequency and consistently appropriate collocations, as well as deviant collocations, would presumably be noted by the examiners under this criterion. Although it might have been interesting to examine other analytic criteria, I only used the internal scores for fluency and ignored the other four analytic criteria, since this study focused on investigating the relationship between collocational competence and fluency.

3.3 Initial statistical analyses across lecturers

The data collected for each lecturer were collated in a table and statistical analyses carried out using IBM's *SPSS* statistics package. To perform a meaningful parametric test, such as Pearson's r test, generally requires at least 30 informants; however, the data in this study consisted of only 15 lecturers. Furthermore, the data proved to follow a non-normal distribution, as shown in the histogram in Figure 3.1, which plots the frequency distribution of the 15 lecturers according to their fluency index (Fl. Index on Figure 3.1).

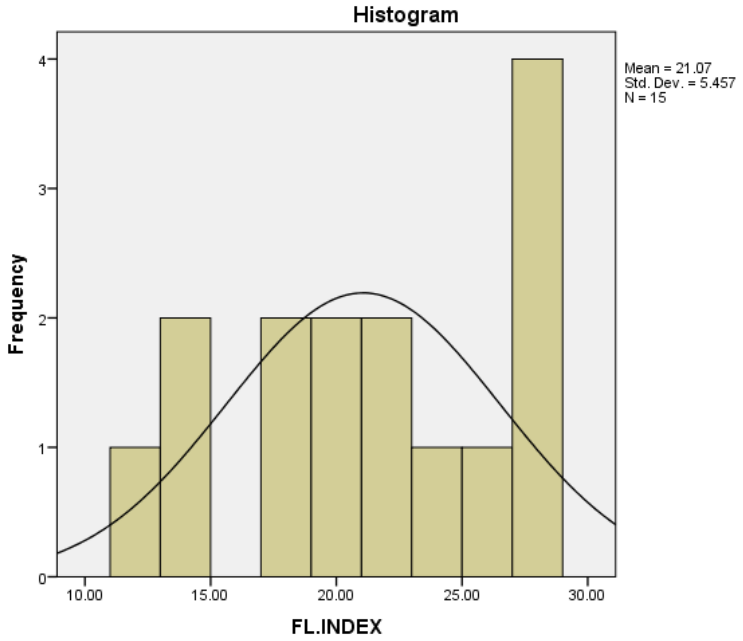

Figure 3.1: Histogram showing non-normal distribution of fluency index scores

The non-normal distribution was mainly due to the overrepresentation of participants with fluency indices of 28, so a non-parametric test was considered more appropriate. Therefore, following the study by Kormos & Dénes (2004), I applied the Spearman rank-order test to investigate

correlations between temporal fluency variables, linguistic variables, and examiner-based variables.

The initial step in the analysis phase was to compare the collocational competence measures, i.e., collocation types per thousand words, collocation tokens per thousand words, type/token ratio, and deviant collocations per thousand words, with overall proficiency, operationalised as the global certification score. These figures were collated and grouped according to global score and set out in a table. Then a Spearman rank-order correlation test was run against the five variables in order to find out whether there were any significant correlations between any of them. The deviant collocations per thousand words scores were given a minus sign as they constituted a negative variable. For example, -0.49 deviant collocations per thousand words would be considered 'better' than -2.72 deviant collocations per thousand words, and would therefore be expected to correlate with correspondingly higher language proficiency scores. The Spearman test produced a correlation grid across the five variables.

The procedure described above was repeated but this time for the three temporal fluency variables: speech rate, mean length of run, and phonation-time ratio, plus the examiners' global scores and internal fluency scores, expressed as fluency index.

The third step involved the Spearman rank correlation test being run against the four collocational competence variables together with the four fluency variables. This again produced a correlation grid.

3.4 Additional analyses across departments

The analyses described in this section were not part of the original planned methodology. They were added to investigate how far initial results were influenced by domain-specific language use across the three departments represented by the 15 lecturers. Therefore, for the following analyses, the lecturers were grouped according to the

department they came from: six from LAS, three from IT, and six from Maths.

3.4.1 Spearman analyses of the LAS and Maths departments

In order to investigate whether correlation patterns per department might be any different to the initial results, the Spearman rank correlation test was again run against the global score, collocational competence variables, and fluency variables, first across the six lecturers from the LAS department and then across the six lecturers from the Maths department. Although such a small sample from each of these two departments is admittedly not sufficient to provide any solid research findings, it was considered worthwhile for the purposes of identifying patterns and generating hypotheses for further study. On the other hand, as there were only three lecturers making up the IT department, they were not included in this part of the analysis.

3.4.2 AntConc analyses

As a supplement to the Spearman test, the software program *AntConc 3.4.3* (Anthony 2014) was chosen to find out if there were any potential domain-specific collocations across the texts for each of the three departments. Among other things, *AntConc* allows the user to list words in the text in order of frequency, shows frequent word partnerships present in the texts, and can display concordance lines for a particular word, with the additional option of sorting the lines according to the co-text to the left or right of the node word. Thus, the program enables the identification of clusters of word partnerships which form potential (domain-specific) collocations.

The texts from the three different fields, Maths, LAS, and IT, were analysed in turn using the following procedure. First, I went through the word list produced by *AntConc*, in order of frequency, for each of the three sets of texts and selected the first (i.e., the most frequent) ten lexical items (i.e., nouns, verbs, adjectives, and adverbs, thereby ignoring function words like *the, only, one,* etc.) which could potentially be used to form domain-specific word partnerships. Using

AntConc's concordance program, I then extracted any words that formed partners with these ten items, occurred at least twice, and were not listed in the OCD. For example, *equation* was one of the initial top ten words for the Maths texts. One of the word partnerships found with *equation* was *differential equation*, which occurred 15 times. However, as this particular collocation is listed in the OCD, it was not included in the list of domain-specific word partnerships. On the other hand, *closed graph theorem*, occurring 13 times, was included as a domain-specific collocation as it is not listed in the OCD.

3.4.3 Deviant collocations

Deviant collocations were added up, and the average numbers of deviant collocations per thousand words produced per lecturer for each department were calculated. To ensure compatibility across the departments, which had slightly different overall global mean scores, these figures were adjusted using the IT mean score of 4 as a base line. Thus, the LAS department had a global mean score of 3.17 (79.25% of the IT mean score), and the Maths department had a global mean score of 3.67 (91.75% of the IT score). The LAS and Maths average deviant collocations per thousand words scores were therefore adjusted by multiplying them by 0.7925 and 0.9175, respectively, in order to allow comparability with the IT department score.

In addition, a calculation was made of the overall proportion of deviant collocation tokens as a percentage of total collocation tokens across all lecturers.

3.5 Summary

The data for this study came from 15 lecturers employed at three different university departments who each took an oral proficiency test at UCPH. A number of data sources from these tests were made available to me, including sound files, transcriptions, test scores, and speech analysis files. From these sources, I was able to extract the eight measures shown in Table 3.2.

Type of measure	Measure	Definition
Measures from the oral proficiency test examiners' scores	Global score	Between 5 and 2, 5 being the highest, and 2 being a fail.
	Fluency index	The two examiners' internal scores for fluency, converted to a single figure between 0 and 28.
Temporal fluency measures	Speech rate	Number of syllables uttered per minute of lecturing time.
	Mean length of run	Average number of syllables uttered in each run of speech between silent pauses of 0.25 seconds or longer.
	Phonation-time ratio	The amount of time spent actually speaking as a percentage of total time to produce the speech sample, i.e., the lecturing time.
Collocational competence measures	General collocation types per thousand words	Number of different collocations produced, as verified in the Oxford Collocations Dictionary (2009), expressed per thousand words spoken during the mini-lecture.
	General collocation tokens per thousand words	Total number of collocations produced, as verified in the Oxford Collocations Dictionary (2009), expressed per thousand words spoken during the mini-lecture.
	Type/token ratio	Total number of collocation types produced divided by the total number of collocation tokens produced.
	Deviant collocations per thousand words	Total number of deviant collocations produced, as judged by a panel of five raters, expressed per thousand words spoken during the mini-lecture.

Table 3.2: Measures used to calculate language proficiency, collocational competence, and fluency

Correlations among these different measures were examined using the Spearman rank correlation test. This was done initially across all 15 lecturers. This was followed up by additional analyses testing for correlations among the same variables across the three departments. A concordance program, *AntConc,* was used to identify potential domain-specific collocations across departments. The results of these analyses and statistical tests are shown in Chapter 4.

4. RESULTS

The first section of this chapter, Section 4.1, looks at the results of the initial set of analyses across all 15 lecturers: how fluency correlates with overall language proficiency (Section 4.1.1); how collocational competence correlates with overall language proficiency (Section 4.1.2); and whether there are any statistical correlations between collocational competence and fluency (Section 4.1.3). Section 4.2 shows the results from the additional set of analyses carried out across the three departments: LAS, IT, and Maths. The chapter finishes with a summary of the results.

4.1 Initial analyses across all lecturers

4.1.1 Fluency and overall language proficiency

Appendix J shows the results for the four fluency measures (fluency index plus the three temporal variables) across the 15 lecturers, who are grouped according to global score. The average scores per variable have also been calculated and are given in the last row of the table.

The highest correlation seemed to be between fluency index and global score in that all score 4s and 5s had a fluency index above the mean score of 21, and all the 3s and 2s fluency index values were below the mean. This is not unexpected as both these two numbers originated from the same source: the certification examiners. However, the picture did not look so clear-cut when the three temporal fluency measures were compared with global score, so Spearman rank tests were applied to the data to identify any correlations between the measures. These are shown in Table 4.1.

Variables	Fluency Index	Speech rate	Mean length of run	Phonation-time ratio
Global score:				
Correlation Coefficient	.907**	.625*	.425	.379
Sig. (2-tailed)	.000	.013	.114	.163
Fluency Index:				
Correlation Coefficient	1.000	.688**	.464	.458
Sig. (2-tailed)		.005	.082	.086
Speech rate:				
Correlation Coefficient		1.000	.932**	.875**
Sig. (2-tailed)			.000	.000
Mean length of run:				
Correlation Coefficient			1.000	.889**
Sig. (2-tailed)				.000

Table 4.1: Spearman rank correlations between global certification scores and fluency variables (N=15)
**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

The grey shaded areas indicate significant correlations, either at the 0.01 or 0.05 level. These show that two fluency measures correlate significantly with global score: fluency index, with a correlation coefficient of 0.907 (significant at the 0.01 level), and speech rate, with a slightly lower correlation coefficient of 0.625 (significant at the 0.05 level). Speech rate is the only variable to correlate significantly with all the other four variables: at the 0.01 level for fluency index, mean length of run, and phonation-time ratio, although only at the 0.05 level for global score. The three temporal fluency measures all correlate significantly with each other at the 0.01 level.

4.1.2 Collocational competence and overall language proficiency

Appendix K shows the figures for the collocation types per thousand words, collocation tokens per thousand words, collocational type/token ratio, and deviant collocations per thousand words for each lecturer, again grouped according to global score.

With a mean value of 30.7, the number of collocation types per thousand words ranged from 46.5 for lecturer I07,

who scored a global 4 on the certification, down to 13.2 for lecturer M10, who was in fact awarded a global score of 5. The next lowest value was gained by lecturer M11, who scored a global 4, indicating that there may not be a clear relationship between collocational competence and overall proficiency.

A similar pattern emerged for the collocation tokens per thousand words used. There was, in fact, a close relationship between the two measures. As shown in Table 4.2, the Spearman rank correlation test between collocation types per thousand words and collocation tokens per thousand words yields a coefficient of 0.954, which is significant at the 0.01 level (shaded in grey). Apart from this correlation, however, Table 4.2 shows no significant correlation between global score and any of the four collocational measures.

Variables	Collocation types per 1000 words	Collocation tokens per 1000 words	Collocation type/token ratio	Deviant collocations per 1000 words
Global score:				
Correlation Coefficient	.183	.248	-.002	.488
Significance (2-tailed)	.514	.373	.995	.065
Collocation types per 1000 words:				
Correlation Coefficient	1.000	.954**	.368	-.215
Significance (2-tailed)		.000	.177	.441
Collocation tokens per 1000 words:				
Correlation Coefficient		1.000	.361	-.072
Significance (2-tailed)			.187	.800
Collocation type/token ratio:				
Correlation Coefficient			1.000	-.366
Significance (2-tailed)				.180

Table 4.2: Spearman rank correlations between global certification scores and collocational competence variables (N=15)
**Correlation is significant at the 0.01 level (2-tailed)

The pattern for deviant collocations per thousand words is equally unclear. While the three lecturers with a global score of 5 all have deviant collocations per thousand words scores of below 0.5, so does lecturer M13, who actually failed the certification. Furthermore, the likelihood of having no deviant

collocations per thousand words at all seems to be equal whether a lecturer has a global score of 3, 4, or 5. These results are reflected in Table 4.2, which shows that there are no significant correlations between deviant collocations per thousand words and either global score or any of the other three collocational variables.

4.1.3 Collocational competence and fluency

Table 4.3 shows the results of the Spearman rank-order test as applied to three collocational competence variables and the four fluency variables. Note that as collocational type/token ratio seemed to be unrelated to global score (correlation coefficient of -0.002 in Table 4.2), it was not included as a variable in the remainder of the analyses.

Variables	Speech rate	Mean length of run	Phonation-time ratio	Coll. types per 1000 words	Coll. tokens per 1000 words	Deviant colls. per 1000 words
Fluency Index:						
Corr. Coefficient	.688**	.464	.458	.061	.043	.429
Sig. (2-tailed)	.005	.082	.086	.829	.879	.111
Speech rate:						
Corr. Coefficient	1.000	.932**	.875**	-.161	-.204	.237
Sig. (2-tailed		.000	.000	.567	.467	.396
Mean length of run:						
Corr. Coefficient		1.000	.889**	-.168	-.232	.054
Sig. (2-tailed			.000	.550	.405	.849
Phonation-time ratio:						
Corr. Coefficient			1.000	-.021	-.079	-.014
Sig. (2-tailed)				.940	.781	.960
Coll. types per 1000 words:						
Corr. Coefficient				1.000	.954**	-.215
Sig. (2-tailed)					.000	.441
Coll. tokens per 1000 words:						
Corr. Coefficient					1.000	-.072
Sig. (2-tailed)						.800

Table 4.3: Spearman rank correlations between fluency variables and collocational competence variables (N=15)
**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Here, again, there were no significant correlations across any of the two sets of variables. On this basis, there appeared to

be very little evidence that collocational competence plays any role in either certification examiners' perception of fluency or in determining temporal fluency.

From the initial results across all lecturers, therefore, there seemed to be no significant relationship either between global certification score and collocational competence, or between fluency and collocational competence. The results from the additional analyses across departments are given in the next section.

4.2 Additional analyses across departments

This section looks at the results from the four additional analyses carried out to identify collocational use in the lecturers across the three departments. As described in Section 3.4, these analyses consisted of three stages: comparing Spearman rank correlation tests from the LAS and Maths departments respectively, identifying potential domain-specific collocations from the lecturers per department, and analysing deviant collocations.

4.2.1 Comparing the LAS and Maths department lecturers

Table 4.4 shows the Spearman rank combined correlations for global score, fluency index, the three temporal fluency variables (speech rate, mean length of run, and phonation-time ratio), and the three collocational competence variables (collocation types per thousand words, collocation tokens per thousand words, and deviant collocations per thousand words) for the six lecturers from the LAS department.

LARGE ANIMAL SCIENCE Variables	Fluency index	Speech rate	Mean length of run	Phonation-time ratio	Coll. types per 1000 words	Coll. tokens per 1000 words	Deviant colls. per 1000 words
Global score:							
Corr Coefficient	.985**	.324	.059	.059	.971**	.971**	.324
Sig. (2-tailed)	.000	.531	.912	.912	.001	.001	.531
Fluency index:							
Corr Coefficient	1.000	.406	.174	.174	.986**	.928**	.232
Sig. (2-tailed)		.425	.742	.742	.000	.008	.658
Speech rate:							
Corr Coefficient			.943**	.943**	.314	.143	-.371
Sig. (2-tailed)		1.000	.005	.005	.544	.787	.468
Mean length run:							
Corr Coefficient			1.000	1.000**	.086	-.143	-.600
Sig. (2-tailed)				.000	.872	.787	.208
Phon-time ratio:							
Corr Coefficient				1.000	.086	-.143	-.600
Sig. (2-tailed)					.872	.787	.208
Coll. types per 1000 words:							
Corr Coefficient					1.000	.943**	.314
Sig. (2-tailed)						.005	.544

Table 4.4: Spearman rank correlations between the global score, fluency variables, and collocational competence variables: LAS lecturers (N=6)
**Correlation is significant at the 0.01 level (2-tailed)

Here, there were mutually significant correlations (at the 0.01 level, shaded in dark grey) across the four variables: collocation types per thousand words, collocation tokens per thousand words, global score, and fluency index. However, there were no significant correlations between deviant collocations per thousand words and either global score or fluency index. At the same time, the table shows that while all three temporal fluency variables correlated significantly with each other (also at the 0.01 level, shaded in light grey), there seemed to be no relationship between these two sets of variables. None of the individual variables from the one set correlated significantly with any of the variables making up the other set.

Table 4.5 shows the same eight variables tested for the six Maths lecturers. The picture here was rather different from the equivalent table for the LAS lecturers. With the exception of the correlation between global score and phonation-time ratio (correlational coefficient 0.759), all the

four fluency variables and the global scores were mutually significantly correlated, at least to the 0.05 level. On the other hand, there was no significant correlation at all between the three collocational competence variables and the five fluency/global score variables.

MATHS Variables	Fluency index	Speech rate	Mean length of run	Phonation -time ratio	Coll. types per 1000 words	Coll. tokens per 1000 words	Deviant colls. per 1000 words
Global score:							
Corr. Coefficient	.832*	.880*	.941**	.759	-.273	-.395	-.400
Sig. (2-tailed)	.040	.021	.005	.080	.600	.439	.431
Fluency Index:							
Corr. Coefficient	1.000	.986**	.928**	.928**	-.522	-.696	-.191
Sig. (2-tailed)		.000	.008	.008	.288	.125	.717
Speech rate:							
Corr. Coefficient		1.000	.943**	.886*	-.543	-.714	-.261
Sig. (2-tailed)			.005	.019	.266	.111	.618
Mean length of run:							
Corr. Coefficient			1.000	.829*	-.486	-.600	-.174
Sig. (2-tailed)				.042	.329	.208	.742
Phonation-time ratio:							
Corr. Coefficient				1.000	-.429	-.543	-.058
Sig. (2-tailed)					.397	.266	.913
Coll. types per 1000 words:							
Corr. Coefficient					1.000	.943**	-.493
Sig. (2-tailed)						.005	.321
Coll. tokens per 1000 words:							
Corr. Coefficient							-.232
Sig. (2-tailed)						1.000	.658

Table 4.5: Spearman rank correlations for global score, fluency variables, and collocational competence variables: Maths lecturers (N=6)
*Correlation is significant at the 0.05 level (2-tailed)
**Correlation is significant at the 0.01 level (2-tailed)

4.2.2 Domain-specific collocations

The results of the *AntConc* analysis are shown in Appendix L. It should be borne in mind that these figures are derived only from the first ten most frequent content words in the word list, and do not include possible domain-specific collocations, which only occurred once in the data. Nevertheless, they do

reveal some notable differences between the lexical items extracted from *AntConc* and their partners in the data, i.e., what are being considered as potential domain-specific collocations across the three departments.

The number of domain-specific word partnership types from the Maths texts (29) is twice the number collected from the IT or LAS texts (14 and 15, respectively). This difference is even more pronounced in the figures for the word partnership tokens. For Maths, a total of 238 word partnership tokens are used from the ten most frequent content words compared to only 68 each for the IT and LAS texts. This would appear to be a significant number of word partnerships when compared with the equivalent figures relating to general collocations found for the various texts.

To test how these new figures might affect the results, the domain-specific word partnerships were added to the original number of collocations found by group. Table 4.6 shows the average number of collocation types per thousand words from the original data set (i.e., collocations verified in the OCD) per department. To these figures were added the respective number of domain-specific collocation types per thousand words, found through *AntConc*, to give new totals of collocation types and tokens per thousand words spoken across the three groups.

Department	Original number of collocation types per 1000 words	Additional domain-specific word partnership types per 1000 words	Total collocation/ word partnership types per 1000 words	Percentage increase after adding the domain-specific types per 1000 words
Large Animal Sciences (N=6)	35.5	1.0	36.5	2.8
Information Technology (N=3)	37.1	1.4	38.5	3.8
Mathematical Sciences (N=6)	22.3	2.0	24.3	**9.0**

Table 4.6: Original number of collocation types per thousand words plus additional potential domain-specific collocation types by department

The same procedure was then carried out for the collocation tokens per thousand words plus the respective number of domain-specific word partnership tokens per thousand words for each department. The results are shown in Table 4.7.

Department	Original number of collocation tokens per 1000 words	Additional domain-specific word partnership tokens per 1000 words	Total collocation/ word partnership tokens per 1000 words	Percentage increase after adding the domain-specific tokens per 1000 words
Large Animal Sciences (N=6)	45.2	4.1	49.3	9.1
Information Technology (N=3)	49.9	6.6	56.5	13.2
Mathematical Sciences (N=6)	31.7	16.3	48.0	**51.4**

Table 4.7: Original number of collocation tokens per thousand words plus additional potential domain-specific collocation tokens by department

This rough comparison shows that, for the six Maths lecturers, domain-specific word partnership tokens accounted for an additional 16.3 potential collocation tokens per thousand words spoken, equivalent to an extra 51.4%. For the IT lecturers, the corresponding figures were 6.6 additional collocation tokens per thousand words, representing a further 13.2% of the collocation tokens, and for LAS, 4.1 additional collocation tokens per thousand words, representing a 9.1% increase. This may explain why the Maths lecturers, as a group, produced fewer general collocations than did the IT and LAS lecturers; a larger proportion of the collocations used by the Maths department were in fact domain-specific. The majority of these would not be picked up by consulting a general collocations dictionary like the OCD.

4.2.3 Deviant collocations

Table 4.8 shows the deviant collocations produced and averaged per department, and reveals considerable

differences across the departments. Taking the comparable adjusted figures (far right column), the lowest figure is for the Maths department (0.38 deviant collocations per thousand words). IT has a 50% higher figure (0.58), and then there is a jump up to the figure for the LAS department, which has an adjusted mean number of deviant collocations per thousand words of 2.16, over five times that of the Maths lecturers.

Department	Mean global score	Total number of deviant collocation tokens	Total number of words spoken	Average deviant collocation (tokens) per thousand words	Average deviant collocations (tokens) per thousand words, adjusted figure
LAS (N=6)	3.17	42	15,362	2.73	**2.16**
IT (N=3)	4.00	6	10,296	0.58	**0.58**
Maths (N=6)	3.67	6	14,608	0.41	**0.38**
Totals	**3.65**	**54**	**40,266**	**1.24**	**1.04**

Table 4.8: Deviant collocation tokens and averages per thousand words, by department

The total number of deviant collocation tokens was 54 (from 49 types as five deviant collocations were repeated). There were 1,675 collocation tokens in all, so the percentage of deviant collocations to verified native-like collocations was 3.1%.

4.3 Summary

Initial results indicated a relationship between overall language performance and two of the fluency variables: fluency index and speech rate. In addition, the three temporal fluency variables were all mutually significantly correlated. However, there were no significant correlations between any of the collocational competence variables and overall language proficiency, or between collocational competence and fluency.

Results from the additional analyses across departments revealed some differences in the collocational use by lecturers across the three departments. For the lecturers from the LAS department, a significant correlation was found between collocational competence and both overall language proficiency and fluency, but only as measured by fluency index. There was no correlation between collocational competence and temporal fluency.

For the Maths lecturers, there were mutually significant correlations among global score, fluency index and all three temporal fluency measures (except between global score and phonation-time ratio). However, no relationship was found between any collocational competence and either overall language proficiency or fluency at all.

The *AntConc* analysis resulted in the following percentage increases in collocation tokens per thousand words after adding the top ten most frequent domain-specific headwords and their collocates for each department:

- LAS – 9.1%
- IT – 13.2%
- Maths – 51.4%

The percentage of deviant collocation tokens (totalling 54) compared to number of collocation tokens (totalling 1,675) was found to be 3.1%. The figures for deviant collocations per thousand words per department were:

- LAS – 2.16
- IT – 0.58
- Maths – 0.38

The following chapter, Chapter 5, discusses these results further.

5. DISCUSSION

This chapter discusses the results found in Chapter 4 and how far they answer the research questions posed in Chapter 1, which were the following:

1. Is there any correlation between lecturers' overall language proficiency and their spoken fluency?
2. Is there any correlation between lecturers' overall language proficiency and their collocational competence?
3. Is there any correlation between lecturers' collocational competence and their spoken fluency?
4. Is there any evidence that collocations function in a similar way to other types of formulaic language in facilitating spoken fluency?

Section 5.1 looks at the role of domain-specific collocations, the examiners' perceptions of fluency, the role of deviant collocations, collocations compared to other types of formulaic language, and the importance of genre. The chapter also consider limitations of the research carried out (Section 5.2) and puts forward some suggestions for further research (Section 5.3), before finishing with a summary.

5.1 Interpretations of the results

5.1.1 Domain-specific collocations

Ananiadou & McNaught (1995), in a paper on the relationship between fields of terminology and translation, conclude that technical 'sublanguages' contain very high incidences of collocational use, perhaps even more so than general language, and that: 'collocations are highly distinctive in characterizing the language of the field' (1995, 51). In this study, the *AntConc* analysis, described in Section 4.5, seemed to uncover evidence of these sublanguages through variations in domain-specific collocational use across the three departments. These differences manifested themselves in two ways: first, the density of domain-specific collocations,

and second, how technical those domain-specific collocations tended to be.

To take the first point: the ratio of domain-specific collocations to general collocations appears to be a lot higher for Maths than for the other two departments. In this sense, Maths as a sublanguage appears more technical and specialized than the LAS sublanguage. IT seems to lie somewhere between the two.

The second major difference was the degree of technicality of the (potential) domain-specific collocations, from very highly technical (Maths) through IT to LAS (the least technical). To illustrate this, one of the most frequent collocations in the LAS lectures was *broiler chickens*, which may be considered a domain-specific collocation as this was the topic of the mini-lecture in which it occurred. But it is also listed in the OCD, indicating that it is only a weak domain-specific collocation and likely to be known by people outside the field. Other examples of LAS domain-specific word partnerships are listed in Appendix L and include terms such as: *colic episode, hoarding birds,* and *mouth speculum*. Even if the exact meanings of these terms are not understood by the layman, what they refer to is at least partially comprehensible. Compare these with some examples from the Maths domain: *Banach space, tensor algebra, Cartesian product*. These terms are impenetrable to the layman. Again, IT terms seem to lie midway between these two extremes; some are difficult to understand, like *Church-Rosser property,* while others are more accessible, e.g., *Java code.*

These two aspects of technicality are reflected in research into single-item technical vocabulary. Chung & Nation (2004) found that different academic disciplines not only had varying coverage of technical language, but that some disciplines, e.g., anatomy, may have a high density of words which are peculiar to that particular discipline, and which are virtually never found outside that domain.

As a result, it may be hypothesized that if all domain-specific collocations as well as general collocations across all lecturers were taken into consideration, this might have

resulted in closer correlations between collocational competence and fluency (research question 3).

5.1.2 Examiners' perceptions of fluency

The initial results across all lecturers (Section 4.1) seem to indicate that for research question 1, the answer is partly yes: there does seem to be some kind of relationship between overall language proficiency and fluency, but only as far as fluency index and speech rate are concerned. It is not so surprising that the data showed a significant correlation between global score and fluency index because both scores originated from the two certification examiners. However, it does confirm that the examiners regarded fluency as an important component in determining overall language proficiency. That speech rate was the only temporal fluency measure to significantly correlate with fluency index and global score is in line with the fluency studies cited in Section 2.1.2, all of which found speech rate to be the most reliable predictor of rater scores.

The additional Spearman analyses across the LAS and Maths departments (Section 4.2), however, yielded two rather different patterns of fluency. These findings suggest that the test examiners may have perceived fluency somewhat differently according to which academic field they were assessing. In the analysis of the LAS lecturers, fluency index correlated significantly with their collocational competence but not with any temporal fluency variables. This implies that it was the more lexical cues, collocations, which assumed importance in determining the test examiners' perception of fluency. What is unexpected is that there were no significant correlations between fluency index and any of the temporal fluency variables, not even speech rate. Meaning seemed to override the need to focus on temporal measures.

Conversely, as discussed in Section 5.1.1, the Maths lecturers used very technical language, indicated by the high incidence of domain-specific collocations. The examiners were linguistic specialists rather than either Maths or LAS specialists, so they may conceivably have had more difficulty understanding the full content of the Maths lectures.

Consequently, they may have had to draw on other than lexical criteria and meaning to make their assessments. The significant correlations between the examiners' fluency index and the temporal fluency measures for the Maths lecturers seem to reflect a perception of fluency as a purely temporal phenomenon.

This issue centres on the discussion in Section 2.1.1 concerning the elements that make up fluency, and the difference between the narrow, temporal meaning and the broader meaning of fluency in terms of 'speed, fluidity and accuracy' (Segalowitz 2000, 200). When listening to the LAS lecturers, the examiners seemed to incorporate accuracy, as represented by producing native-like collocations (collocational competence) into their fluency assessments. This matches with Lennon's assertion that 'felicitous [i.e. native-like] lexical collocations contribute positively to fluent performance' (2000, 40). However, the lack of significant correlations between fluency index and temporal fluency measures seems to indicate that the examiners did not find speed and fluidity so important. In contrast, when assessing the Maths lecturers, the examiners seemed to view fluency in the narrower sense, showing a similar pattern to that in the study by Kormos & Dénes (2004), which found a positive relationship between the same three temporal variables and rater fluency scores. It would appear that there may be a kind of hierarchy of factors which influence how raters assess the fluency of different speakers in different situations.

The certification descriptors for the fluency criteria, shown in Appendix B, focus on speech being produced at an appropriate rate, smoothly, coherently, and effortlessly, and without unnatural language-related pauses or hesitations. This description seems to be closer to the narrow view of fluency, and yet when assessing the LAS lecturers, examiners apparently focused on lexical cues rather than temporal ones. This seems to support Lennon's claim that 'for the listener it is likely that fluency cannot be fully divorced from other elements of oral proficiency' (1990, 395).

5.1.3 Deviant collocations

The lack of any kind of significant correlation between deviant collocations per thousand words and any of the other variables, examiner-based or temporal, may possibly be due to: a) the small data sample, and b) the low percentage of deviant collocations to collocation tokens, 3.1%, compared to other studies. Nesselhauf found that out of 2,082 verb-noun combinations produced by the informants, 304 of them, or 14.6%, were deviant (2005, 66). Laufer & Waldman (2011), also investigating verb-noun collocations, calculated that 31.9% of combinations produced were deviant for their advanced group of learners. The figures seem to lend support to the notion that the general proficiency level of the lecturers was relatively high, as mentioned in Section 3.1.1.

Despite no correlations being found for deviant collocations, two interesting individual cases deserve closer inspection. These were investigated with reference to the results in Appendix J (fluency measure scores per lecturer) and Appendix K (collocational competence measure scores per lecturer). Firstly, lecturer L04 was only awarded a global score of 3 and a fluency index of 19. In addition, she produced the highest number of deviant collocations of all lecturers: 18, twice as many as the next highest figure and equivalent to 5.79 deviant collocations per thousand words. At the same time, she also showed evidence of overusing certain word combinations, as did De Cock's learners (2000). For example, lecturer L04 uses *have a possibility* six times during her mini-lecture, five of them within a 200-word stretch in the middle. What is surprising, though, is that lecturer L04 recorded both the highest mean length of run (17.8 syllables a minute) and the highest phonation-time ratio (79.9%) of all the lecturers. Furthermore, at 202.4 syllables a minute, her speech rate was the fourth highest. From a temporal point of view, this is relatively fluent. The implication here is that lecturer L04 sacrificed accuracy for fluency, in line with Skehan's (1998) cognitive hypothesis mentioned in Section 2.1.1. That lecturer L04 did not achieve higher scores with the examiners is likely

to be due to several factors, but one of them may be the use of so many deviant collocations.

Secondly, in contrast to lecturer L04, lecturer L06, who failed the certification, also gained the lowest fluency index score, 12, and the lowest scores for speech rate, mean length of run, and phonation-time ratio across all lecturers. Surprisingly though, he only had three deviant collocations, equivalent to 1.27 deviant collocations per thousand words. This was the second lowest deviant collocations per thousand word score of all the LAS lecturers, second only in fact to lecturer L03, who had top scores from the examiners and produced no deviant collocations at all. Again, there were certainly other reasons for his low scores, but juxtaposed with the data from lecturer L04, it may very well be that lecturer L06 was possibly over-cautious in his delivery, thereby sacrificing fluency for accuracy.

5.1.4 Collocations versus formulaic language

As discussed in Section 2.3.2, there is some uncertainty as to how far collocations are a subset of formulaic language. Even if they are, it is unclear as to whether they function in a similar way to other types of formulaic language in being prefabricated and thereby contributing to enhanced spoken fluency. If collocations did function in this way, it might be expected that some correlation between collocational competence and temporal fluency would be apparent from the study data. However, no such correlation emerged at all. As discussed in Section 5.1.1, this could be accounted for by the absence of a robust measure for domain-specific collocations; except that this also seems to be the case with the six LAS lecturers. This group produced a higher density of general collocations in their lectures, which in theory would lead to a more complete picture of their collocational competence, as there were fewer domain-specific collocations to take account of. If any correlation between collocational competence and temporal fluency was present in the data, it would be expected to be from these six lecturers. However, that was not the case.

The answer to research question 4 is, therefore, that there is no evidence in the data set that collocations function in a similar way to other types of formulaic language in facilitating spoken fluency. There are a number of possible explanations for this. It may be that collocations, unlike other kinds of formulaic language, are not prefabricated and stored in a way that has much of an impact on speakers' temporal fluency.

Another possibility is that all formulaic language aids fluency, but that different types of formulaic language have greater or lesser effect on fluency according to where on the fixedness/contiguousness continuum they lie. Collocations, placed at the flexible end of the continuum, might only have a minimal effect on fluency; too little, perhaps, to be gauged by the investigation in this study. This minimal effect may also partly be due to collocations tending to consist of much shorter word combinations than more fixed formulae. While lexical phrases can be several words long, e.g., *Do you think I was born yesterday?* (Pawley & Syder 1983, 213), collocations are typically only two or three words long (*strong argument*, *perform an operation*). Thus, the combination of less fixedness and fewer component words may lead to collocations having a reduced effect on aiding short-term memory.

Finally, the fact that there were relatively few general collocations found across the data (an average of 40.9 collocations per thousand words, as shown in the table in Appendix K) may also have contributed to the minimal effect collocations had on fluency. An inclusion of counts for both academic and domain-specific collocations, which would give a broader picture of the informants' collocational competence, may have yielded different results.

5.1.5 Effect of genre on research results

The results from this study may deviate from other research studies because the data comes from a particular genre of language use, i.e., that of an academic lecture. Most of the data sources for research into collocational competence seem to be written (e.g., Bahns & Eldaw 1993; Nesselhauf 2005; Laufer & Waldman 2011). Even for studies into spoken language, the genres are different. Pawley & Syder (1983)

base their assertions about how formulaic language contributes to native-like selection and fluency on everyday conversation. De Cock (2000) uses informal interviews with her informants.

While the TOEPAS certification tests did include more spontaneous speech in relation to questions asked, this was minor compared to the formal lecture section. Most of the data came from mini-lectures, which were prepared and could even have been rehearsed. This possibility may have manifested itself in the lecturers having artificially increased fluency compared with data from spontaneous speech.

5.2 Limitations of the research

One limitation was the relatively small sample (15) of lecturers. As a result, deviations from expected results could be put down to random outliers in the sample. Lecturers M10 and M11, for example, registered the lowest collocational competence scores of the whole sample, while being awarded the highest scores in both fluency and global score from the certification examiners. This made it harder to draw meaningful conclusions from statistical analyses and renders any findings about collocations and fluency less generalizable to a larger population. The scope of generalizability may even have been further narrowed by the specialised nature of the lectures.

A possible limitation linked to the small sample may have been that the data was restricted to lecturers from only three departments. Given that some of the most interesting results came from differences across departments, it might have been more beneficial to have, not only more lecturers, but also more departments represented.

Finally, the data was extracted from mini-lectures given by specialist lecturers in an academic context. As such, the lectures were prepared and practised beforehand; in some cases, no doubt, they had even been presented in a real classroom situation. This may have affected the measurement of fluency, in that lecturers were likely to be relatively more fluent in the certification situation than they

would be in a situation requiring more spontaneous speech. In addition, the lecturers have been shown to be relatively advanced adult learners of English. This brings into question how representative they were of a more general population of language learners, even advanced learners. It is possible that these particular lecturers represent too rarefied a sample to extrapolate findings on the effects of collocational competence on perceptions of fluency to a more general context.

5.3 Suggestions for further research

Despite the relatively small sample size, the study does give an indication of the direction that further, more comprehensive research might take. The certification data has almost 400 recorded mini-lectures by lecturers at UCPH across a range of different disciplines, and from this databank, it would be possible to select a considerably larger sample for analysis than this study was able to use. This would enable further research into the relationship between fluency and collocations, although the methodology applied in this study would have to be supplemented with some method of identifying not only general but also domain-specific collocations. Such research would, as the discussion above suggests, benefit from analysing lecturers across academic disciplines, and should also cover fields such as humanities and social sciences, whose sublanguages are likely to vary considerably from those investigated in this study. To verify that word combinations actually do constitute domain-specific collocations would involve further investigation, for example, by using a technical dictionary from the particular field, as Chung and Nation (2004) suggest for technical vocabulary in general, or by obtaining verification from experts in the field.

In order to establish what differences there might be between the relative impact of collocations as opposed to more fixed types of formulaic language (e.g., lexical phrases, discourse marker, pragmatic phrases, etc.) on fluency, one possibility might be to use the certification data to test the

relative frequency of both types of formulaic language and compare these to the same fluency measures used in this study.

It would be useful to apply a similar methodology as this study has employed but on a different and more general data source, for example, where informants describe pictures or give a talk on an unprepared topic. Ideally, a monologic sample of speech should be used, where informants have the opportunity of speaking uninterrupted for a period of time. This would make it easier to transcribe and analyse for fluency variables as well as avoid the problem of informants potentially 'picking up' collocations from their interlocutors, as may be the case if, for example, a conversational situation were employed.

Finally, it would be interesting to compare collocational use across genres. Using the same informants for both tasks, a study could be designed that compared collocational use in a prepared mini-lecture with collocations produced in a more spontaneous genre, such as an unprepared talk or a question-and-answer session.

5.4 Summary

This chapter offered the following interpretations from the results:

- The inclusion of domain-specific collocations into the calculations might conceivably have resulted in closer correlations between collocational competence and fluency. Both the proportion of domain-specific collocations and their respective level of technicality varied considerably across the three departments.

- The correlation between fluency index and global score was unsurprising as both originated from the test examiners. The correlation between speech rate and fluency index was seen to be in line with previous research. Differences in correlations across the variables for the LAS and Maths departments seemed

to show evidence that examiners' perceptions of fluency were influenced by lexical cues when assessing less technical disciplines, but by more temporal fluency measures when assessing fields with more technical domain-specific collocations.

- The relatively low number of deviant collocations across the data sample was regarded as an indication of the generally high proficiency level of the lecturers. Data from two individual lecturers provided evidence of trade-offs between accuracy and fluency.

- There was little evidence that collocations functioned in a similar way to other types of formulaic language in promoting temporal fluency. This may be due to the relative flexibility and shorter length of collocations, or a combination of the two.

The main limitations were the small sample of 15 lecturers, the fact that only three university departments were represented in the data, and the prepared mini-lecture genre, which may have artificially enhanced levels of fluency.

Suggestions for further research included using the same data source but with more informants representing a greater number of departments from more diverse academic fields. Such research would also need to take in to account both general collocations and domain-specific collocations. Other possible research areas included examining the differences between collocations and more fixed expressions on the same data set; applying the same methodology on a more general and spontaneous data set; and comparing collocational use across different genres.

6. CONCLUSIONS

Research seems to indicate that formulaic language, i.e., prefabricated strings of words stored in memory as single units, makes a considerable contribution to language proficiency, in particular fluency. However, some uncertainty seems to exist as to how far collocations, often regarded as a subset of formulaic language, function in the same way. In addition, there seems to be a lack of empirical evidence about the relationship between collocations and fluency. This study aimed to address this gap in collocational research by investigating the following research questions:

1. Is there any correlation between lecturers' overall language proficiency and their spoken fluency?
2. Is there any correlation between lecturers' overall language proficiency and their collocational competence?
3. Is there any correlation between lecturers' collocational competence and their spoken fluency?
4. Is there any evidence that collocations function in a similar way to other types of formulaic language in facilitating spoken fluency?

The data came from 15 mini-lectures, each lasting approximately 20 minutes, recorded for an oral proficiency test at the University of Copenhagen. The 15 lecturers in the data sample came from three different university departments: Department of Large Animal Sciences (LAS), Department of Information Technology (IT), and Department of Mathematical Sciences (Maths). From data provided to me by the university, I was then able to use the test examiners' global and fluency scores and to calculate the temporal fluency measures speech rate, mean length of run, and phonation-time ratio for each of the lecturers. In addition, I calculated both collocational types and tokens per thousand words spoken, as well as type/token ratio and deviant collocations per thousand words spoken by each lecturer.

Appendix J shows the four fluency measure scores per lecturer against global score, and Appendix K shows the four collocational competence measure scores against global score. Spearman rank-order correlation tests were run against these measures across all lecturers. The discovery of significant numbers of potential domain-specific collocations in the data prompted an additional set of Spearman tests to be run across the LAS and Maths departments. Using the text concordancing software *AntConc*, an analysis was then carried out to establish a rough estimate for the density and technicality of potential domain-specific collocations for each department, and to ascertain how these factors might affect the overall collocational competence measures. Finally, deviant collocations for each lecturer were totalled and collated by department.

Initial results across all lecturers indicated a relationship between overall language performance and two of the fluency variables: fluency index and speech rate. In addition, the three temporal fluency variables were all mutually significantly correlated. However, there were no significant correlations between any of the collocational competence variables and overall language proficiency, or between collocational competence and fluency.

Results from the additional analyses across the LAS and Maths departments revealed considerable differences between the two. The data from the six LAS lecturers showed a significant correlation between collocational competence and fluency index, but no correlation between collocational competence and temporal fluency. From the Maths lecturers' data, significant correlations were found between fluency index and all three temporal fluency measures, but there was no correlation between collocational competence and fluency at all.

The *AntConc* analysis resulted in the following percentage increases in collocation tokens per thousand words after adding the top ten most frequent domain-specific headwords and their collocates for each department: LAS 9.1%; IT 13.2%; and Maths 51.4%.

The percentage of deviant collocation tokens (totalling 54) compared to number of collocation tokens (totalling 1,675) was found to be 3.1%. The figures for deviant collocations per thousand words per department were: LAS 2.16; IT 0.58; and Maths 0.38.

The additional analyses carried out on the data indicated that sublanguages used across the three academic departments varied in both the density and technicality of domain-specific collocations used. The Maths mini-lectures contained a high ratio of domain-specific collocations to general collocations, and the domain-specific collocations used tended to be rather arcane and difficult to comprehend for the layman. The LAS mini-lectures featured much lower ratios of domain-specific collocations to general collocations, and the domain-specific collocations used were considerably more accessible in meaning. The discourse used by the IT lecturers seemed to lie somewhere in the middle. If all domain-specific collocations as well as general collocations were taken into consideration, this might have resulted in closer correlations between collocational competence and fluency for the whole data set.

The marked variations in department sublanguages were seen as affecting how the test examiners perceived and assessed fluency. When assessing the LAS lecturers, whose discourse was relatively comprehensible, the examiners seemed to have been influenced by lexical cues, i.e., collocational competence, and not by temporal fluency at all. On the other hand, the examiners may have had some difficulty following the content of the Maths mini-lectures, due to the greater proportion of highly technical domain-specific collocations. This appeared to be reflected in the examiners' reliance on temporal fluency measures to make their assessments. Surprisingly, given that the content of the Maths lectures was probably less comprehensible than that of the LAS lectures, the assessment for the Maths lecturers seemed to be more compliant with the oral proficiency test descriptors for fluency.

The relatively low number of deviant collocations across the data sample compared to other research studies was regarded as an indication of the generally high proficiency level of the lecturers. In addition, the deviant collocation data provided two interesting case studies in showing that a high level of deviant collocations can be associated with higher levels of temporal fluency, and vice versa, providing possible evidence of accuracy/fluency trade-offs.

There was little evidence that collocations functioned in a similar way to other types of formulaic language in promoting temporal fluency. This may be due to the relative flexibility and shorter length of collocations, or a combination of the two.

The main limitation was the small sample of 15 lecturers, combined with the fact that only three university departments were represented. Furthermore, the genre from which the data originated, a prepared and perhaps practiced mini-lecture, could possibly have led to somewhat enhanced fluency compared to a more spontaneous genre.

Suggestions for further research included using the same data source but with more informants representing a greater number of departments from more diverse academic fields. Domain-specific collocations, as well as general collocations, would also have to be taken into account. Another research area could be to examine the differences between collocations and more fixed expressions in the same data set. Conversely, the same methodology could be used on a more general and spontaneous data set. Finally, it would be very interesting to compare collocational use across genres: for example, how a prepared mini-lecture compares to a more spontaneous genre such as an unprepared talk or explanation.

It seems clear from this study that collocations exist not only as a general concept for 'typical language use', but that every genre, discipline, and indeed situation may potentially have its own set of collocations. Moreover, significant differences between purely temporal fluency and the subjective perception of fluency by examiners appear to

render separating temporal fluency from a broader definition of fluency, including accuracy, a difficult task. These factors seem to affect how collocational competence and fluency are defined and measured, and how examiners perceive and assess fluency in a test situation. Clarification of these issues requires further investigation with a larger sample and a robust method for identifying domain-specific collocations.

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RESUMÉ

Motivationen bag dette speciale fandt jeg, da jeg som engelsk sprogunderviser blev opmærksom på, hvordan engelsk sprogundervisningsmateriale, artikler og bøger behandler emnet kollokationer. Det lader til, at kollokationer ikke blot anses for at bidrage til et mere "naturligt klingende" engelsk, men også opfattes som afgørende for at kunne udvikle et flydende sprog. På trods af den store mængde forskning inden for fraseologisk sprogbrug og *fluency* mangler vi empirisk baseret belæg for, hvordan kollokationer, der ofte anses for at være et delelement af fraseologisk sprogbrug, muligvis påvirker fluency. Det var med det formål at afdække dette hul i kollokationsforskningen, at jeg indledte denne pilotundersøgelse, som beskæftiger sig med følgende spørgsmål:

1. Er der en sammenhæng mellem underviseres overordnede sproglige færdigheder og deres mundtlige fluency?
2. Er der en sammenhæng mellem underviseres overordnede sproglige færdigheder og deres kollokationskompetence?
3. Er der en sammenhæng mellem underviseres kollokationskompetence og deres mundtlige fluency?
4. Findes der belæg for, at kollokationer fungerer på samme måde som andre former for fraseologisk sprogbrug, der kan fremme den mundtlige fluency?

Specialets empiriske materiale består af en række mini-forelæsninger af 15-20 minutters varighed, som blev optaget i perioden mellem 2009 og 2011 i forbindelse med en færdighedstest i mundtligt engelsk for undervisere med engelsk som fremmedsprog ved Københavns Universitet. De 15 undervisere var tilknyttet 3 forskellige institutter: Institut

for Produktionsdyr og Heste (IPH), Informationsteknologi (IT) og Institut for Matematiske Fag (MATH). Ud fra dette materiale, samt andre kilder stillet til rådighed af Københavns Universitet, har jeg haft mulighed for at bruge eksaminatorenes overordnede karakterer samt fluency karakterer, og har udregnet *temporal fluency measures, speech rate, mean length of run* og *phonation-time ratio* for hver underviser. Derudover udregnede jeg forskellige variabler relateret til at måle kollokationskompetence. Skønt kollokationer, ligesom enkelte ord, kan opdeles i generelle, akademiske og domænespecifikke kollokationer, fokuserede jeg begyndelsesvis på generelle kollokationer, idet jeg udregnede antal af generelle kollokationstyper per tusinde udtalte ord, *type/token ratio*, samt afvigende kollokationer per tusinde ord udtalt af hver underviser.

Spearmans rangordnende korrelationsanalyse blev benyttet i analysen af empirien fra alle 15 undervisere, og de første resultater viste en sammenhæng mellem den overordnede sprogpræstation og to af fluency variablerne: *fluency index* og speech rate, men de viste ikke tegn på nogen sammenhæng mellem kollokationskompetence-variablerne og den overordnede sprogfærdighed, eller mellem kollokationskompetence og fluency.

Fundet af hyppige forekomster af potentielle domænespecifikke kollokationer i materialet gav anledning til at foretage endnu en række Spearman-analyser på tværs af både IPH og MATH-instituttet. Ved hjælp af tekst-konkordanssoftwaret *AntConc* blev en analyse udført for at kunne anslå frekvensen af potentielle domænespecifikke kollokationer på hvert institut og for at kunne konstatere, hvordan disse faktorer muligvis har indflydelse på de overordnede kollokationskompetencevariabler. Til slut blev hver undervisers afvigende kollokationer optalt og sammenlignet med tallene fra instituttet.

Resultaterne fra de yderligere analyser på tværs af henholdsvis IPH og MATH afslørede interessante forskelle imellem disse. Materialet fra de 6 IPH-undervisere viste en sammenhæng mellem kollokationskompetence og fluency

index, men ingen sammenhæng mellem kollokations-kompetence og temporal fluency. Materialet fra de 6 MATH-undervisere viste signifikant sammenhæng mellem fluency index og alle tre temporal fluency measures, men slet ingen sammenhæng mellem kollokationskompetence og fluency-variablerne.

AntConc-analysen resulterede i de følgende procentforøgelser i kollokationsudtryk per tusinde ord efter at have tilføjet de ti mest hyppige domænespecifikke opslagsord og deres kollokationer for hvert institut: IPH 9,1%, IT 13,2%, og MATH 51,4%.

Disse yderligere analyser knyttet til institutterne viste, at mulige korrelationer blev skjult af variationer i antallet af generelle kollokationer i forhold til domænespecifikke kollokationer på tværs af de 3 faglige discipliner.

APPENDIX A – TOEPAS GLOBAL SCORE DESCRIPTORS

The overall certification result is based on a combined assessment of the lecturer's fluency, pronunciation, vocabulary, grammar and interaction skills in English for university teaching

5: The lecturer has demonstrated English language proficiency for university teaching equivalent to that of a highly articulate, well-educated native speaker of English. The lecturer has been certified to teach English-medium courses. No training is required.

4: The lecturer has demonstrated excellent English language proficiency for university teaching. The lecturer has been certified to teach English-medium courses. No training is required.

3: The lecturer has demonstrated good English language proficiency for university teaching. The lecturer has been certified to teach English-medium courses. No training is required, but training may be beneficial in one or more of the assessed areas.

2: The lecturer has demonstrated less than sufficient English language proficiency for university teaching. The lecturer has not been certified to teach English-medium courses. Training is required.

1: The lecturer has demonstrated limited English language proficiency for university teaching. The lecturer has not been certified to teach English-medium courses. Significant training is required.

(CIP 2014b)

APPENDIX B – TOEPAS internal analytic criteria level descriptors (fluency, pronunciation, vocabulary, grammar, and interaction)

	5	4
Fluency	Equivalent to a highly articulate, well-educated native speaker	Speech is produced smoothly, coherently and effortlessly Can produce extended speech, using a wide range of discourse markers and connectors, without unnatural language-related pauses/hesitations Speech rate is appropriate
Pronunciation		Although L1 accent may be perceptible, this causes virtually no strain to the listener and does not impede effective communication Produces almost all phonological contrasts with good accuracy Places stress correctly, and uses intonation to convey a range of pragmatic meanings
Vocabulary		Broad range of general, academic and domain-specific vocabulary for effective communication Good command of formulaic language Consistently correct and appropriate use of vocabulary Can vary vocabulary to convey nuances of meaning
Grammar		Consistently displays a high degree of grammatical accuracy in both simple and complex structures
Interaction		Responds appropriately and effectively to questions/comments without language-related hesitation Fully capable of interactively negotiating meaning through comprehension checks, clarification requests or confirmation checks Fully capable of dealing with unclear questions or misunderstandings when necessary

	3
Fluency	Speech is produced smoothly, coherently and almost effortlessly Can produce extended speech, using a variety of discourse markers and connectors, although some unnatural, language-related pauses may occur Speech rate is generally appropriate
Pronunciation	While pronunciation is marked by L1 features, this only occasionally causes strain to the listener or compromises intelligibility Produces most phonological contrasts with fairly good accuracy Generally places stress correctly and uses intonation to convey basic pragmatic meaning
Vocabulary	Sufficient range of general, academic and domain-specific vocabulary for effective communication Few significant vocabulary errors occur Lexical gaps are successfully overcome with circumlocution
Grammar	Generally displays sufficient grammatical accuracy in both simple and complex structures Grammatical errors do occur but do not lead to misunderstanding
Interaction	Usually responds appropriately and effectively to questions/comments although some language-related hesitation may occur Good ability to interactively negotiate meaning through comprehension checks, clarification requests or confirmation checks Good ability to deal with unclear questions or misunderstandings when necessary

	2
Fluency	Can generally produce extended speech. However, only uses a limited number of discourse markers and connectors. Speech is marked by unnatural language-related pauses which may lead to a loss of coherence Speech rate may be inappropriate
Pronunciation	Pronunciation is strongly marked by L1 features Although pronunciation is generally intelligible, imprecise pronunciation of certain sounds, stress errors, and failure to uphold phonological contrasts causes strain to the listener Very limited or inappropriate use of intonation to indicate pragmatic meaning
Vocabulary	Less than sufficient range of general, academic and/or domain-specific vocabulary for effective communication Lexical inaccuracy or incorrect word choice may cause some confusion Lexical gaps result in noticeably less precision
Grammar	Displays less than sufficient grammatical accuracy and/or range of structures Grammatical errors can be distracting and may lead to misunderstanding
Interaction	Sometimes responds appropriately and effectively to questions/comments. Due to language-related hesitation response time may be slow Less than sufficient ability to interactively negotiate meaning through comprehension checks, clarification requests or confirmation checks Less than sufficient ability to deal with unclear questions or misunderstandings when necessary

	1
Fluency	Speech is disrupted and fragmented due to excessive pauses, hesitations or false starts, especially in longer stretches of free production Rarely uses discourse markers or connectors
Pronunciation	Pronunciation impedes effective communication Pronunciation is marked by features that may be understandable only to those familiar with the speaker's L1
Vocabulary	Limited range of general, academic and/or domain-specific vocabulary Frequent lexical errors impede effective communication
Grammar	Displays limited accuracy and range of grammatical structures Frequent errors cause misunderstanding or incomprehensibility
Interaction	Does not respond appropriately and effectively to questions and comments Limited ability to interactively negotiate meaning through comprehension checks, clarification requests or confirmation checks Limited ability to deal with unclear questions or misunderstandings when necessary

APPENDIX C – Table showing the 15 lecturers' global scores, internal fluency scores (raw and converted to a single fluency index figure), and university department, grouped by global score.

Lecturer ID number	University of Copenhagen Department	Global score	Internal fluency scores		
			Examiner 1	Examiner 2	Fluency index
L03	Large Animal Sciences	5	5	5	28
M10	Mathematical Sciences	5	5	5	28
I09	Information Technology	5	5	4	25
M11	Mathematical Sciences	4	5	5	28
M12	Mathematical Sciences	4	4+	5	26
L02	Large Animal Sciences	4	4+	4	23
I07	Information Technology	4	4	4	22
M15	Mathematical Sciences	4	4	4	22
L01	Large Animal Sciences	3	4-	3+	19
L04	Large Animal Sciences	3	3+	4-	19
I08	Information Technology	3	3+	3+	18
M14	Mathematical Sciences	3	3	3	16
M13	Mathematical Sciences	2	3	3+	17
L05	Large Animal Sciences	2	3-	3-	14
L06	Large Animal Sciences	2	2+	2+	12

APPENDIX D – List of all collocations found in the OCD for the lecturers from the Department of Large Animal Sciences by lecturer, in alphabetical order

LECTURER L01	LECTURER L02	LECTURER L03
alternative approaches	aware of	a little bit
animal behaviour	broken bone	a lot better
argues for	care of	almost non-existent
as a reward	caused some accidents	answer your question
ask a question	clearest signs	as a result
attach a value	constant pressure	at one point
bad at	control over	at that point
better at	do damage	at the moment
better result	domestic animals	avoid problems
body mass	emergency department	avoiding obstacles
by definition	exposed to	bearing weight
chemical processes	extended periods	big news
choose between	extremely unnatural	breed of
correct answers	film clips	brief overview
debate about	find signs	broiler chickens
demand for	finding indications	carried out the survey
differences between	full (speed) gallop	cause pain
different species	give a talk	cause pneumonia
different ways	give talks	causes of
difficult task	give the signal	causes pain
do a study	good example	causing infections
dotted line	good for	change strategy
emphasis on	good thing	changes the behaviour
example of	have an assignment	colour vision
find an example	have the proof	competing with
first part	having an accident	constant voltage
good for	heated discussion	cut it short
good thing	horse (back) rider	cut-off point
have an assignment	horseback riding	die of

for example	in a hospital	differ from
forget about	in the world	ease the transition
general public	key problem	eat food
get a reward	little bit	electrical currents
get frustrated	little girls	equal amount
get it right	looks like	eye infections
give rewards	lost control	finish off
good at	main areas	focus on
graduate students	main problem	for example
guess right	main theme	giving this lecture
have notions	main topic	good question
high ability	making sure	group discussion
high value	negative reinforcement	grow quickly
highly efficient	on (its) back	hang upside down
huge demand	on the television	have any experience
looks like	pieces of equipment	have knowledge
lost control	pressure on	have problems
human infants	put pressure	have vision
infer from	puts its feets	improve the welfare
inferred from	quarter of	in a house
interest from	quite famous	in a minute
interfere with	quite recent	in comparison
large area	quite small	in the air
lead you to	recent study	in the direction
little bit	reduce that risk	in the house
make errors	reduce the severity	in total
makes it difficult	respond to	interesting project
measure the size	rides the horse	level of consciousness
pressure on	riding schools	lifting its feet
mental processes	safety equipment	looked at
move into the area	serious accidents	low key
much better	short video	lower percentage
noisy environment	small girls	main causes

number of	smaller proportion	main concern
observed directly	special circumstance	main focus
Old Man	step backwards	main problem
over time	tail swishing	marked reduction
personal opinion	take care	media attention
prefer to	take the pictures	new breed
presented to	taken to hospital	new legislation
problems of	talk about	number of
question of	talk on	on a scale
quiet room	this summer	over the years
quite difficult	time period	past years
rather worse	took the pictures	per year
reach a level	train horses	prior knowledge
reach a plateau	treat their diseases	problems beginning
right number	tugging lightly	problems caused
scientific study	tugging on	problems of
scientific study	tugging the reins	produce chickens
simple task	used for	produce eggs
take care	very big	production system
social network	very fast	quite low
solve a problem	very important	quite unfortunate
species of bird	very restrained	random number
support for	video clip	reach maturity
talking about	wagging its tail	really good
think of	wear a helmet	reduce problems
types of	wear boots	reduced dramatically
various parts	working on	related to
very bad		result in
very difficult		ritual slaughter
treat their diseases		scoring system
tugging lightly		selective breeding
very good		sexual maturity
very much faster		shifted towards

very much slower		sit down
very much smarter		six point scale
very nice		slaughter pigs
very noisy		survey carried out
very quiet		talk about
very simple		throughout the period
very small		transition between
visual stimuli		twenty-four-hour period
well adapted		used for
wild animals		very brief
working with		very crucial
yield a result		very elegant
		very good
		very noticeable
		very remote
		very short
		video clips
		wood shavings
		worked on

LECTURER L04	LECTURER L05	LECTURER L06
abdominal pain	at home	action on
abdominal surgery	at the zoo	amniotic fluid
advanced course	aware of	at the moment
answer to	be aware	aware of
at my office	broken teeth	be aware
at the hospital	careful examination	blood from
aware of	common problem	blood sugar
be aware	CT scan	care of
books about	cut with the knife	damage to the brain
cardiovascular system	did some x-ray	during the night
care of	do an examination	during the pregnancy

caused this colic	do surgery	during the weeks
chapters to read	domesticated animals	front leg
clinical examination	eating the food	general overview
correlation between	exotic animals	general practice
curling the lips	first time	give them a lecture
decreased intensity	for (six) weeks	had colic
do (a lot of) introduction	for weeks	had pain
do work	gentle movements	have a look
doing research	good source	have an assignment
doing this examination	had a baby	have the opportunity
extremely small	had symptoms	hear about
focus on	have a look	hind legs
general rule	have duties	in a box
get a feeling	have food	in the area
giving a lectures	having problem	in the blood
going into shock	have teeth	in the corner
good feeling	in a box	interested in
great interest	in the box	into the box
have a look	in captivity	last 2 or 3 weeks
have colic	in the world	listen to
have control	in the zoo	long time
having interest	in zoo	low content
having pain	in captivity	low level
hear a sound	in the forest	lungs are working
identify (what is) the problem	intermittent diarrhoea	make an examination
important thing	last thing	next time
in practice	left side	normal reaction
in a situation	light source	on the floor
in addition	looks (most) funny	quite still

in chapter	loose teeth	reacting against
in intensity	lower part	signs of
in mind	make comments	silky coat
in the clinic	on the left	standing still
in the corner	on the table	successful operation
in the evening	pretty sure	superficial examination
in the field	problems with	take action
in the world	put her on antibiotics	take care
increased intensity	right side	take long
increased risk	right side	take time
interest in	sharp knife	this time
interesting subject	sharp teeth	tie her up
large diameter	surgery on	umbilical cord
large openings	third time	vaccination programme
last time	took x-ray	very aggressive
laying down	use time	very bad
lecture on	very (most) famous	very easy
lying down	very bad	very expensive
main subject	very careful	very fast
main things	very common	very late
make an examination	very creamy	very low
make sure	very exceptional	very painful
make your decision	very gentle	very quick
modern times	very ill	very slow
next time	very important	very soft
next year	very interested	very steep
night duties	very nice	very weak
on the ground	very sharp	wandering around
on the internet	very shy	with success
on the subject	very strange	

pawing the ground	very sure
professional life	very thick
read books	weight loss
rectal examination	welcome to
reduced rate	well developed
serious is the condition	whole world
small diameter	work we did
small intestine	x-ray department
specific diagnosis	
spend your time	
stomach is full	
stressful situation	
subject of	
symptoms developed	
take care	
take the pulse	
take the temperature	
talk about	
talking to	
thorough examination	
university hospital	
use time	
variation among	
very expensive	
very great	
very important	
very large	
very nice	
very quick	
very small	

very stressful
vital sign
water supply
weak pulse
welcome to

APPENDIX E – List of all collocations found in the OCD for the lecturers from the Department of Information Technology by lecturer, in alphabetical order

LECTURER I07	LECTURER I08	LECTURER I09
address one topic	adjusted schedule	address a question
addresses the question	ask questions	agree on
body of the text	at some point	amount of time
break the rules	basic problem	apply a rule
broad categories	be clear	apply to
business communication	be distinct	ask a question
business letter	be equal	at a conference
business school	better understanding	at a level
call a meeting	big company	at some point
change the way	big player	be the crux
changes happening	bigger project	better ways
close together	bugs in	brief sketch
colloquial language	business intelligence	briefly explain
common sense	car industry	call by
communication between	communication skills	care about
copies of	compare with	close to
copy of	computer program	common term
define formally	design element	commonly occurring
design a system	design flaws	computer science
designed for	development tools	correspond exactly
differ from	distinct from	correspond to
differences between	do some checks	criterion for
digital medium	do wrong	dependent on
discussion about	enhancing understanding	devise a plan
dispersed geographically	essay about	devise a system
dreamed of	excited about	discuss the problem

early days	experience a problem	do a thing
experts in	fairly decent	do calculations
facilitate communication	find bugs	do exercises
familiar with	fix some errors	do work
film and / media studies	for instance	dotted lines
focus on	get a deal	equal to
for instance	get enthusiastic	every kind
formal letter	get excited	extremely large
formal meeting	get information	fairly cool
freely choose	give you a demo	fairly easy
front page	give you a taste	fairly old
fuss about	gotten big	fairly simple
get drunk	graphs showing	find our way
getting confused	had a meeting	finite number
give a presentation	have a rule	first row
give an assignment	have an opinion	first step
give an example	heart stops	first thing
go to sleep	heart surgeon	focus on
gotten used to	important points	for instance
group work	in comparison (to/with)	for reasons
groups of	in this file	for simplicity
had the job	in this part	fundamental question
handwritten letter	informed decisions	funny thing
have aims	interact with	give a proof
have trouble	interested in	give an example
hold the meeting	label as	give an indication
important concept	last week	give the answer
in a relationship	make a note	good question
in an e-book	make a statement	graduate program
in connection with	make decisions	grow large

in fact	make improvement	have a problem
in groups	make instruments	have a proof
in that case	make life better	have rules
in that way	marketing department	high level
in the analysis	medical instruments	in (different) ways
in the beginning	meeting with	in a direction
in the organization	morally wrong	in a program
interested in	moving towards	in all cases
interesting thing	need information	in fact
intimate knowledge	need more time	in practice
introduce concepts	new release	in the century
invent ways	next week	in the sense
involved in	obey rules	in the universe
is that clear	opinion about	in the valley
know the difference	oral exam	infinite number
know the rules	over time	interest in
large corporations	part of	interesting question
large organizations	past experience	kind of
little child	present as	larger number
make a search	pretty good	last time
make it easier	problem area	last year
make observations	product manager	last year
meet a need	project manager	lead back
music genre	put time (into)	level of
need for	quality of	main criterion
new ways	question about	mathematic and computation course
newspaper site	questions regarding	new way
newspaper websites	really excited	next time
nineteenth century	really good	number of

notable differences	really urgent	obvious reasons
notion of	recognize as	occur in
over time	reliable information	old student
perform actions	responsible for	on your chest
physical differences	rule for	plan for
popular press	rules about	pretty straightforward
process of	set of	problem of
provide some suggestions	set of tools	programming languages
question of	silly thing	programming course
quite formal	size has grown	pure science
quite intuitive	small company	rather technical
reading a text	source code	rather weak
recognize as	start with	reason for
recommendations for	statement about	run a program
related to	strict rules	run into
remarkably stable	talk about	school yard
retrieve documents	talk to	several ways
right way	taste of	shorter time
scientific paper	think about	simple rules
send out an invitation	understood about	simple things
short answer	very hard	sketch of
sit comfortably	web browser	small reductions
social aspect	work as	spend your time
social phenomena	work part-time	start with
speak a language	worked with	stay in
specific context	write an essay	substitute for
sports section	write code	take a course
start by		take an interest
study of		take another direction
subject matter		take steps

suggestions for		take time
sunny day		talk about
take minutes		technical terms
talk about		tell the truth
telephone communication		terms mean
telephone conversation		think about
twentieth century		this morning
use routinely		top left
used for		twentieth century
useful for		use examples
very broad		use strategies
very common		use this rule
very different		very hard
very easy		very low
very formal		very similar
very good		wait a minute
very practical		way to
very uncomfortable		whole truth
well defined		worry about
work assignment		write a program
write a letter		
written communication		

APPENDIX F – List of all collocations found in the OCD for the lecturers from the Department of Mathematical Sciences by lecturer, in alphabetical order

LECTURER M10	LECTURER M11	LECTURER M12
ask about	a little bit	along the way
at the end	a little harder	at that point
be okay	a little odd	basic concept
begin with	absolutely sure	be surprised
by definition	at every point	cite papers
change colour	at the point	class of
divide into	ball rolling	completely independent
draw a diagram	basic formulas	complex numbers
draw a graph	care about	concrete examples
establish continuity	common mistake	considered a factor
find (counter)examples	different method	correspondence between
have equality	different way	deduce from
important for	differential equation	equal numbers
in fact	does (the same) thing	equal to
in the future	down the hill	example of
in this case	fairly trivial	for example
in trouble	get a result	for this purpose
know the answer	go quickly	from the left
on the test	had this formula	from the right
point at	hand in homework	give an example
point of	have the formula	good sense
say about	high school	got inspiration
subtle difference	horizontal line	have (no) idea

talk about	in school	have a system
very important	in the family	have time
very useful	in this case	heard about
work with	left-hand side	homework assignment
	lose points	idea about
	make sure	important thing
	on the side	in a way
	positive number	in effect
	product of	in fact
	quite complicated	in his youth
	quite important	in the discussion
	right-hand side	in this case
	rolling down	in this way
	slightly (more) complicated	independent of
	smooth curves	interesting examples
	solves the problem	interesting question
	special cases	introduction to
	standard formula	know about
	strange coincidence	know for sure
	take a path	know the answer
	take care	know very well
	think of	little bit
	twist around	make sense
	use a method	obtain this result
	use the rule	positive numbers
	very bad	product of

	very important	provide a proof
	very simple	quite surprising
		quite useful
		rather deep
		rather simple
		rational numbers
		real mess
		remind you of
		sequence of
		sequence of numbers
		set of
		simple fact
		small thing
		sum of
		talk about
		tell about
		thinking about
		use theory
		useful way
		very different
		very good
		very interesting
		very useful
		very young
		was young
		write down

LECTURER M13	LECTURER M14	LECTURER M15
at the moment	ask a question	ask a question
basic point	at the point	ask about
basic question	be clear	ask for
be technical	be different	ask questions
begin with	classical mechanics	at a level
behaves like	classical model	attached to
category of	completely different	background in
class of	complex number	basic question
difference between	connection with	basic structure
different ways	correspond to	be right
each time	develop a theory	beyond the scope of
each time	difference from	by definition
example of	do things	care about
fairly obvious	emphasis on	certain number
few words	explain to	consider a question
for example	for instance	decide the question
give a lecture	formal definition	discuss a topic
glued together	fundamental question	easy exercise
good example	give a definition	equal to
groups of	give an answer	equivalent to
have a notion	have a function	first thing
have properties	hear about	for instance
have time	in detail	general interest
in a minute	in the system	general purpose

in fact	in the version	give an assignment
in this case	in this language	give an impression
introduction to	kind of	given the fact
kind of	little bit	group of
make life easier	make a difference	have a background
notion of	make a drawing	have this fact
of this type	make a measurement	important fact
other end	make a model	important property
part of	make precise	in addition
put parentheses	make sense	addition to
question of	Newtonian mechanics	in detail
quite different	nice thing	in fact
relations between	physical phenomenon	in most cases
say about	physical world	in that case
say words	play a role	in this range
slightly weaker	put emphasis	in this sense
start by	quantum mechanics	kind of
start with	relate to	know about
think about	simply defined	lead to
unanswered question	take time	little bit
very different	talk about	logically impossible
wait a minute	think of	make sense
with respect to	very early	mathematical point of view
write down	very fruitful	named after
	very fundamental	next step
	work on	next week

		notion of
		notion of
		number of
		obvious question
		occurs in
		provide a solution
		questions about
		rational numbers
		real life
		real solutions
		reduce the number
		remember correctly
		resolved by
		say about
		set of
		simple equation
		simple statement
		solutions to
		specific question
		statements about
		take a course
		take the step
		talk about
		tell about
		this time
		understand intuitively

		very big
		very interesting
		well defined
		write a word

APPENDIX G – List of potentially deviant collocations and assessments as judged by the five raters, in alphabetical order

a/A=acceptable, u/U=unacceptable, ?=not sure
(x2)=number of occurrences if the word partnership occurred more than once

Word partnership	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Final assess-ment
afterbirth has arrived	a	u	u	a	a	**A**
attention to	a	a	a	a	a	**A**
baby foal	u	u	a	?	?	**?**
big brains (x5)	a	a	a	?	a	**A**
big proportion (x3)	a	u	a	u	u	**U**
caught animals	u	a	u	?	u	**U**
come with a sound	u	u	u	u	u	**U**
conserve teeth	a	a	a	a	u	**A**
cutting research	a	?	u	u	u	**U**
damage a foal	a	a	a	a	a	**A**
damage your hand	a	a	a	?	a	**A**
debate intensively	u	a	u	?	a	**?**
demand of	u	u	u	u	u	**U**
do a diagnostic	a	u	u	?	a	**?**
do a palpation (x2)	u	a	a	u	u	**U**
do a procedure	a	u	a	u	u	**U**
do a sedation	u	u	u	u	a	**U**
do a stomach tubing	a	a	?	u	a	**A**
do an extraction	a	a	a	a	a	**A**
do an extraction (x2)	a	a	a	a	a	**A**
do animals	u	u	u	?	a	**U**
do auscultation	a	a	?	?	?	**?**
do colic	u	a	u	u	u	**U**
do dentistry	a	a	a	a	a	**A**
do medicine	a	u	a	?	a	**A**
do reasoning	a	u	u	?	a	**?**
do treatment	u	u	u	a	a	**U**
extremely many	u	u	u	u	u	**U**
former picture	a	a	a	u	u	**A**
full speed gallop	u	a	u	a	a	**A**
get a sound	a	a	a	a	a	**A**
get antibodies	a	a	a	a	a	**A**
get indications	a	a	u	a	a	**A**

get relations	u	u	u	u	u	**U**
give a possibility	u	u	u	u	u	**U**
give problems	a	u	a	a	a	**A**
give salience	u	u	u	u	u	**U**
grow chickens	a	a	a	u	u	**A**
handle an environment	a	a	a	?	a	**A**
handle medical(ly)	u	u	u	?	?	**U**
handle surgical(ly)	u	u	u	?	?	**U**
have a foaling	u	u	?	?	?	**?**
have a possibility (x6)	a	a	a	a	a	**A**
have a prognosis	a	a	u	a	a	**A**
have salience	u	a	u	u	u	**U**
high listed animal	u	a	?	u	u	**U**
high salience (x2)	u	a	u	u	u	**U**
high sound	u	u	u	u	a	**U**
how long time	u	u	u	u	u	**U**
in a course	u	a	a	u	u	**U**
in a course (x7)	a	a	u	a	a	**A**
in proper time	u	a	u	a	a	**A**
incredible strong	u	u	u	u	u	**U**
judge an attitude	a	a	?	a	a	**A**
killing procedure	a	a	?	a	a	**A**
large expenses	a	a	u	a	a	**A**
large variation	a	a	a	?	a	**A**
make a bug	u	u	u	u	u	**U**
make a coalition	u	u	u	u	u	**U**
make a defect go away	a	u	a	u	u	**U**
make a layout	?	a	a	?	?	**A**
make an auscultation	u	?	?	?	?	**?**
make an infusion	u	a	a	a	a	**A**
make plasma	a	?	?	?	?	**?**
make (this kind of) reasoning	u	u	?	u	u	**U**
make something survive	a	u	a	u	u	**U**
medicate control	u	u	u	u	u	**U**
mild problem	a	a	a	?	u	**A**
model something after something	a	u	a	?	a	**A**
nice rule	a	a	?	?	a	**A**
nice test	a	a	a	?	a	**A**
on a hospital	u	u	u	u	u	**U**

on a pressure	u	?	u	u	u	**U**
on-hand handling	?	u	u	?	u	**U**
pain control	a	?	a	a	a	**A**
perform a book	u	u	u	u	a	**U**
perform a lecture	u	u	u	u	u	**U**
poor prognosis	a	a	a	a	a	**A**
prove results	u	u	a	u	u	**U**
prove something barehandedly	u	u	u	u	u	**U**
put in anaesthesia	u	a	u	u	u	**U**
put something equal	u	u	?	?	u	**U**
quick interference	u/a	a	u	u	u	**U**
react fast	a	a	a	a	a	**A**
red numbers	a	a	?	u	u	**?**
reduce problems	a	a	a	a	a	**A**
refer someone for (a hospital) x2	u	u	u	u	u	**U**
release pressure	a	a	a	a	a	**A**
severe weight loss	a	a	a	a	a	**A**
small essay	a	u	a	u	u	**U**
small sound	a	u	u	u	u	**U**
solve a question	u	u	u	u	u	**U**
surgical colic	a	a	a	?	?	**A**
take a gallop	u	u	u	a	a	**U**
take a test	a	a	?	a	a	**A**
take in medicine	u	u	u	u	u	**U**
take long time	u	u	u	u	u	**U**
take out sound	a	u	a	a	a	**A**
tell your name	u	u	u	u	u	**U**
through the phone	u	u	u	u	u	**U**
trauma medicine	a	a	a	u	?	**A**
urgent injury	a	u	a	?	a	**A**
use money	u	a	u	a	a	**A**
use time	u	a	a	a	u	**A**
use time	u	a	u	a	a	**A**
violent(ly) pain	u	u	u	u	u	**U**

APPENDIX H – List of deviant collocations as judged by the panel of raters, by lecturer (in the order they appeared in the texts)

Department	Lecturer	Deviant collocations (number of occurrences if more than one)
Large Animal Sciences	**L01**	caught animals
		small sound
		have salience
		high salience (x2)
		high sound
		give salience
	L02	incredible strong
		take a gallop
		big proportion (x3)
		on a pressure
	L03	-
	L04	do a palpation (x2)
		do a procedure
		quick interference
		through the phone
		refer someone for (a hospital) (x2)
		do colic
		handle medical(ly)
		handle surgical(ly)
		on a hospital
		perform a lecture
		perform a book
		give a possibility
		violent(ly) pain medicate control
		in a course
		demand of
	L05	do treatment

		do a sedation
		high listed animal
		do animals
		take in medicine
		put in anaesthesia
		make something survive
		make a coalition
	L06	take long time
		come with a sound
		how long time
Information Technology	**I07**	tell your name
	I08	solve a question
		make a bug
		small essay
		make a defect go away
	I09	cutting research
Mathematical Sciences	**M10**	make (this kind of) reasoning
	M11	-
	M12	prove something barehandedly
		prove results
	M13	get relations (between variables)
	M14	-
	M15	put something equal
		extremely many

APPENDIX I – Chart for converting examiner fluency criterion scores to a single fluency index figure

Fluency score given by one examiner	0	1-	1	1+	2-	2	2+	3-	3	3+	4-	4	4+	5-	5
Converted fluency index score	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

See appendix C for application of the chart

APPENDIX J – Fluency measure scores per lecturer (grouped according to global score) showing global score, fluency index, speech rate, mean length of run, and phonation-time ratio

Lecturer	Global certification score	Fluency index	Speech rate: syllables per minute	Mean length of runs in syllables	Phonation-time ratio
L03	5	28	179.2	9.1	66.5
M10	5	28	219.7	14.2	74.7
I09	5	25	215.7	14.6	76.1
M11	4	28	210.2	13.1	75.2
M12	4	27	195.6	12.6	60.9
L02	4	23	137.4	7.8	58.5
I07	4	22	172.9	10.7	60.8
M15	4	22	176.7	11.3	64.4
L01	3	19	170.6	8.6	64.1
L04	3	19	202.4	17.8	79.9
I08	3	18	193.9	12.5	73.3
M14	3	14	156.2	8.7	54.0
M13	2	17	165.6	8.5	59.4
L05	2	14	171.8	12.5	68.2
L06	2	12	123.5	6.6	53.2
Averages:	**3.53**	**21**	**179.4**	**11.2**	**66.0**

APPENDIX K – Collocational competence per lecturer (grouped according to global score) showing collocation types per thousand words, collocation tokens per thousand words, collocational type/token ratio, and deviant collocations produced per thousand words

Lecturer	Global certification score	Collocation types per 1000 words	Collocation tokens per 1000 words	Collocation type/token ratio	Deviant collocations per 1000 words
L03	5	44.2	58. 9	0.65	0.00
M10	5	13.2	16.7	0.69	0.49
I09	5	31.9	46.4	0.76	0.24
M11	4	16.2	25.0	0.63	0.00
M12	4	29.0	35.3	0.79	0.81
L02	4	39.7	48.4	0.85	2.74
I07	4	46.5	61.5	0.79	0.34
M15	4	30.5	43.8	0.81	0.78
L01	3	37.3	45.8	0.81	2.72
L04	3	33.8	42.5	0.82	5.59
I08	3	35.4	43.9	0.69	1.26
M14	3	22.4	35.8	0.80	0.00
M13	2	21.1	32.8	0.74	0.45
L05	2	30.2	38.0	0.64	3.14
L06	2	29.3	39.5	0.75	1.27
Averages	**3.53**	**30.7**	**40.9**	**0.75**	**0.93**

APPENDIX L – Comparison of the ten most frequent lexical items and their word partners not listed in the Oxford Collocations Dictionary from the three departments (extracted using AntConc software).

Headwords are written in bold type.

Dept.	Most frequent word partnerships	Frequency	Most frequent word partnerships	Frequency
Maths	c star **algebra(s)**	48	topological **space**	3
	differential graded **algebra(s)**	11	closed graph **theorem**	13
	matrix **algebra(s)**	4	open mapping **theorem**	5
	tensor **algebra**	5	big **theorem**	3
	A-infinity **algebras**	2	famous **theorem**	3
	z **star**	8	y **prime**	25
	r **squared**	5	u **prime**	4
	x **squared**	22	Cartesian **product**	2
	y **squared**	20	inner **product**	4
	z **squared**	5	tensor **product**	2
	Banach **space**	9	rational **point**	5
	dual **space**	2	**continuous** function(s)	6
	Hausdorff **space**	3	**continuous** map(s)	5
	Hilbert **space**	9	A-infinity **map**	3
	measure **space**	2		
Total number of domain-specific partnerships for Maths (types): **29** Total number of domain-specific partnerships for Maths (tokens): **238**				
IT	organisational **communication**	7	new **media**	9
	communication **genre**	6	**function** of	4
	Semmle **code**	3	static **analysis**	2
	C plus plus **code**	2	**Church-**Rosser theorem	2
	Java **code**	2	**Church-**Rosser diagrams	2
	lambda **term**	4	**Church-**Rosser property	4
	lambda **calculus**	17	declarative **language(s)**	4
Total number of domain-specific partnerships for IT (types): **14** Total number of domain-specific partnerships for IT (tokens): **68**				
LAS	colic **horse(s)**	5	horse **welfare**	2
	SNP **foal** test	2	**welfare** issue	2
	manifestation **colic**	2	gait **score**	14
	colic episode	3	Malayan **tapir(s)**	4
	colic case	2	hoarding **birds**	3
	leg **problems**	11	**mouth** speculum	2
	eye **problems**	2	animal **cognition**	2
	welfare **problem(s)**	7		
Total number of domain-specific partnerships for LAS (types): **15** Total number of domain-specific partnerships for LAS (tokens): **63**				