

# University of Reading

**The predictive validity of IELTS, vocabulary size and an in-house  
assessment at a Higher Education Institution in Oman where English is  
the medium of instruction**

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Commendation

*The predictive validity of IELTS, vocabulary size and an in-house assessment at a Higher Education Institution in Oman where English is the medium of instruction.*

The primary aim of this dissertation was to evaluate the predictive validity of IELTS, vocabulary size and the CAS GFP final score in a group of Omani students studying at an HEI where English is the medium of instruction. It also attempted to determine if the CAS FY exams were equivalent to an IELTS band 5.0. A Quantitative approach was adopted and data collected from the measures was analysed using correlation and multiple regression analysis. The main findings of the study were that proficiency measures could account for less than 50% of variance in GPA. IELTS was the least predictive of the three measures, but the CAS exams and vocabulary measures had a significant predictive effect. The CAS listening exams were found to have a relationship with the IELTS listening exam. On the basis of these findings a recommendation was made to widen the number of measures included in the regression model to include measures from other GFP subjects and consider other variable such as motivation. Also, additional vocabulary testing could be undertaken to identify where the gaps in students' vocabulary knowledge are and incorporate this into the curriculum. It was also suggested that vocabulary size estimates could be used to identify at risk students earlier. Finally, the low scores in the IELTS exam may suggest that the CAS exams do not meet their expected benchmark of 5.0 so a full benchmarking exercise should be carried out as this is important for the accreditation of the GFP. In the more general context, the study highlights the need to continue context specific studies which consider different learning environments outside the Anglophone context.

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## **List of Abbreviations**

CAS = Colleges of Applied Sciences

EMI = English as a Medium of Instruction

HEI = Higher Education Establishment

GFP = General Foundation Programme

GPA = Grade Point Average

IELTS = International Language Testing System

OAAA = Oman Accreditation Authority

MEI = Medium of Instruction

UCLES = University of Cambridge Local Examinations Syndicate

## List of Keywords

Academic success	This can be measured in many different ways, in this study it refers to the ability of a student to maintain a passing GPA within the CAS system.
IELTS band 5 user	Described by IELTS as a modest user. They user can understand overall meaning in most situations, but make a lot of mistakes. (IELTS, 2017(b))
Predictive validity	How well the measure we are using can predict a student's performance in another measure (Paltridge & Phakiti, 2010)
Productive vocabulary knowledge	The ability to not only recognise but use a word freely or at the behest of an interlocutor. (Laufer & Nation, A Vocabulary-Size test of controlled productive ability, 1999)
Proficiency measures	A tool used to measure a student's proficiency in a given ability, in this case language.
Vocabulary estimates	Studies carried out to determine the vocabulary size of specific groups e.g. college educated native speakers.
Receptive vocabulary knowledge	The ability to recognise a word, but not necessarily give a definition (Milton, 2009)
Vocabulary size	A measure of the size of student's vocabulary which could be receptive or productive.

## **Chapter 1 - Introduction**

### *1.1 Background to the study*

The context for this study is the Sultanate of Oman, a country located in the Arabian Gulf with a local population of 2.5 million, of which 18.6% are under the age of 25 and are heavy users of Higher Education (CIA, 2017). Higher Education is a relatively new development in Oman. As recently as the 1970s Oman did not have a comprehensive education system and radical changes were made with the ascension to the throne of His Majesty Sultan Qaboos Al-Busaidi in 1972 (UNESCO, 1972). As part of its long term educational strategy the government in Oman established the Oman Academic Accreditation Authority (OAAA) in 2001 (previously known as the OAC). Its role is to ensure the quality of higher education in Oman by overseeing the quality assurance process and granting accreditation to programmes. As part of the accreditation process, all Higher Education Institutions (HEIs) in Oman must provide a General Foundation Programme (GFP) which has been accredited by the OAAA. All HEIs are undergoing the process of initial accreditation now (Oman Academic Accreditation Authority, 2018). In line with the OAAA GFP specifications (Oman Accreditation Council, 2016) the Colleges of Applied Sciences, Oman (CAS) have set an overall IELTS band score of 5.0 and passes in maths and IT, as the level required for entry to its degree programmes. The language proficiency element can be demonstrated in one of three ways: 1) production of an IELTS certificate, 2) passing the CAS Challenge Test or, 3) after completing the GFP, achieve a passing grade in the CAS FPEL 0901 and FPEL 0902 courses. The FPEL 0901 course has an exit exam which is benchmarked to an IELTS band 5.0 in line with the OAAA guidelines. FPEL 0902 requires completion of a project and a presentation. A pass in both English courses and Maths and IT, results in entry to Year 1. The majority of the CAS students enter the GFP and progress through the latter route, completing at least one semester of GFP (Ministry of Higher Education Oman, 2017).

Generally, Higher Education Institutions (HEIs) around the world have systems in place to decide which students should be admitted to their institutions. They set entry standards which determine whether students can study at the HEI. Where they admit students for whom English is a second language and the medium of instruction at the HEI is English, they also have to set an additional language



criterion, at which level they think that L2 students can achieve academic success. Given the size of international trade in HEI (Bashir, 2007), HEIs require a measure of proficiency which can give standardised results. The preferred proficiency measures for many HEIs are IELTS or TOEFL, but IELTS is the standard used by most HEIs (Dooley & Oliver, 2002). The HEIs are effectively using IELTS (in combination with other entry criteria) to predict a student's achievement on an academic programme where the medium of instruction is English. This is not the purpose for which IELTS was designed. In fact, UCLES (University of Cambridge Local Examinations Syndicate) who govern the IELTS exam, specifically state that band scores are "a reflection of English language proficiency alone and not predictors of academic success or failure" (UCLES, 1999, p. 8). Research into the predictive validity of IELTS has not been conclusive. Studies such as Cotton & Conrow (1998), Feast (2002), Woodrow (2006) and Yen & Kuzma (2009) found a positive relationship with academic achievement. However, Others have pointed to the limitations of IELTS as a predictor of academic success and have suggested other measures could be used in place of or in conjunction with IELTS. Daller & Phelan (2013), Daller & Wang (2017) and Roche & Harrington (2013) carried out studies which compared the predictive validity of IELTS against the predictive validity of other measures. These studies found that IELTS had less predictive validity than measures which estimated the size of student's vocabulary. They suggested that either vocabulary estimates could either be used in place of IELTS or in addition to enhance predictive validity.(Harrington & Roche, 2014).

The continued growth of students studying in HEIs where the English is the medium of instruction (EMI), but the L1 in the country where they are studying is not English, adds another dimension to the issue of using IELTS as a predictor of academic success. A 2014 report from the British Council and Oxford University commented that "there is a fast-moving worldwide shift from English being taught as a foreign language (EFL) to English being the medium of instruction (EMI) for academic studies" (Dearden, 2014, p. 2). Dearden carried out a worldwide survey across the British Council network and determined that of the 55 countries surveyed, 40% of countries had EMI in their education system. Of those, 78.2% had EMI in the public higher education sector and 90.9% in the private higher education sector. Given the very different experiences of studying in an EMI HEI in an Anglophone country or in an HEI which uses EMI, but the language outside the

classroom is different from the EMI, the question of the level of proficiency required to enter a non-Anglophone HEI becomes important. In the Introduction by IELTS included in a IELTS research report on the predictive validity of IELTS, Dr. Gad S. Lim raises this question about the level of proficiency

“...should a higher standard be required, given that students will not have exposure to English in the wider environment, or should it be the opposite, because expectations should be tempered for the same reason?” (Arrigoni & Clark, 2015, p. 3).

For most inner circle nations, such as Australia and the UK, an IELTS 6.0 or higher is required for entry to an HEI. However, universities in expanding circle countries may accept lower IELTS scores for entry to university. As the English programmes in schools are often being developed at the same time as the higher education system is being developed, lower levels of proficiency need to be tolerated to begin the process of building the HEI sector.

There is limited data about the effect on predictive validity where students in the sample are below 6.0. Studies which have included participants with IELTS lower than 6.0 have suggested that at lower levels of proficiency IELTS is actually a stronger predictor of academic success (Bellingham, 1993) (Arrigoni & Clark, 2015) (Breeze & Miller, 2011). Cotton & Conrow (1998) suggest that this lack of inclusion of students with a score of below 6.0 is the reason that studies have failed to find strong correlations between the IELTS and academic achievement.

### *1.2 Aims of the current study*

The primary purpose of this dissertation is to evaluate the predictive validity of a number of measures, for a group of Omani students studying at an EMI HEI to determine which is the better predictor of academic success. The measures considered are: IELTS, vocabulary size and the CAS GFP final score. The study also attempts to determine if the CAS GFP exams are equivalent to an IELTS band 5.0 as this is an important issue for the HEIs under OAAA accreditation process in Oman.

The study on which this dissertation is based was carried out in CAS Sohar, Oman. The 63 participants in the study completed the GFP in June 2017 and were in the first semester of their degree programme. The study used three predictive

measures IELTS band, vocabulary size and CAS GFP final score. GPA was used as the dependent variable to represent academic achievement. The participants were given a vocabulary test which estimated the size of their receptive vocabulary and an IELTS listening test. The CAS GFP final score was collected in June 2017 when the participants completed the GFP. The correlations between the predictor measures were then calculated to determine the effect size and then a multiple regression carried out to determine which predictors were the most significant.

The students included in this study all have IELTS band scores which are below 6.0 and are studying at an HEI with EMI. Accordingly, through answering the research questions set out in Chapter 2, this current study aims to add to the limited number of studies into predictive validity of IELTS in non-Anglophone contexts and with students with band scores below 6.0.

In addition, the study aims to consider two other predictive measures and whether they are more effective measures of academic achievement than IELTS. First the predictive validity of vocabulary size estimates will be considered. A previous study in Oman by Roche & Harrington (2013) suggested vocabulary size was a strong predictor of academic achievement in Omani students. The third measure is the CAS GFP score. As part of the OAAA accreditation process, HEIs must be able to demonstrate that their programme can be benchmarked to the level of proficiency required of an IELTS band 5 user (Oman Accreditation Council, 2016). Accordingly, a high level of significance is placed on the predictive validity of IELTS within the accreditation process. There has been no significant research carried out into the predictive validity of the CAS exams and their equivalence to IELTS. Accordingly, this study aims to contribute some data to begin to fill this gap.

In summary, given the lack of IELTS predictive validity research in non-Anglophone countries where the medium of instruction in HEIs is English but the L1 outside the classroom environment is not English, this study intends to investigate the predictive validity of IELTS in an Omani context. In addition, it will consider whether an estimate of the vocabulary size would give a more accurate prediction of academic achievement. Finally, given the importance of students achieving an IELTS 5.0 equivalent, it aims to test the assumption that a student with a passing grade in the CAS final exam would score an equivalent of 5.0 in the IELTS Academic English exam.

### *1.3 Organization of the dissertation*

This dissertation consists of six chapters. Chapter 2 reviews the literature relevant to the research questions this dissertation attempts to address. It first considers studies into the predictive validity of IELTS. Then, it discusses the predictive validity of vocabulary size including some background issues related to the calculation of vocabulary size and setting of vocabulary size goals. Potential gaps in knowledge in these areas are identified and the research questions for the dissertation are set. Chapter 3 describes the methodological approach taken in the study. It identifies the context of the study, and the methods of data collection and analysis employed. The results of the data analysis and the implications of these findings are both considered in Chapter 4. Readers of an early draft commented that an integrated results and discussions chapter might be more useful for the reader. Accordingly, it was decided to combine these chapters. Chapter 5 discusses the implications of the findings for the Omani HEI context, summarizes the findings including pedagogical implications and areas for further research.

## **Chapter 2 Literature review**

### ***2.1 Introduction***

This dissertation aims to consider the predictive effect on academic achievement of three measure IELTS, vocabulary size and a CAS in-house exam. In order to contemplate the different areas of pertinent literature, the literature review has been split into two sections, First, the predictive validity of IELTS, and second the predictive validity of vocabulary size. As CAS exams are in-house, there is no real research into their predictive effect to discuss. The research questions are presented at the end of the chapter.

### ***2.2 Literature concerning predictive validity of IELTS***

As Table 1 shows, the results of studies concerning the predictive validity of IELTS are not conclusive. Some studies have found varying degrees of correlation between IELTS and academic success, whereas others have found no significant relationship. The majority of research has been focused on L2 users studying at Anglophone universities, predominantly Australia, the UK and the USA. Limited research has been carried out at HEIs with EMI, where the L1 outside the classroom is not English (Breeze & Miller, 2011) (Arrigoni & Clark, 2015) (Roche & Harrington, 2013). This study is based in a country where English is not the L1 and the cut-off entry score for entry to HEIs is usually below band 6.0. Therefore, we need to consider not only Anglophone based studies, (Criper & Davies, 1988) but whether the limited context specific literature shows that the learning environment or the majority of participants being under IELTS band 6.0, affects predictive validity.

Whilst reviewing the results of the various studies, we must be aware of a number of factors which differ among the studies and could affect our comparisons. Cotton & Conrow (1998) point out that the criteria used to judge academic success varies between predictive validity studies. Some studies measure academic success in terms of pass or fail, other studies set certain grades or percentages as pass marks. This makes it difficult to compare the results, particularly the correlation coefficients. A further issue to consider when attempting to compare IELTS predictive validity studies is the changes made to the exam over time. In particular, significant changes were made to the exam following the validation study carried

out by Criper and Davies (1988) which changed the exam from examining specialist subject knowledge to more general academic knowledge (Woodrow, 2006).

Accordingly, when comparing results, care must be taken to understand how academic success is measured and which version of IELTS exam was used.

	<b>Context</b>	<b>Method</b>	<b>Correlations (IELTS band score)*</b>	<b>Correlations (IELTS listening)</b>	<b>Overall conclusion</b>
Cotton and Conrow (1998)	Australia	Comparison of IELTS scores to GPA and other measures of academic success.	$r=.24$	.19	No significant correlation between IELTS and GPA
Yen & Kumza (2009)	UK	Comparison of IELTS score with GPA over 2 semesters	$r= .46$ $(p<.01)$	.45 $(p<.01)$	IELTS has a predictive effect which weakens over time
Woodrow (2006)	Australia	Comparison of IELTS score (and other measures) to GPA	$r=.40$ $(p<.01)$	.35 $(p<.05)$	IELTS has a moderate predictive effect which is more pronounced in students with lower proficiency scores
Dooley & Oliver (2002)	Australia	Comparison of IELTS scores to GPA	$r=.014$ $r= .076$	$r=-.094$ $r=-.067$	IELTS has no real predictive effect
Daller & Phelan (2013)	UK	Comparison of IELTS scores (and other measures) to GPA	$r=.803$ $p<.01$	$r=.353$ $p<.05$	IELTS correlated significantly with GPA, but was found not to be significant in the multiple regression
Roche & Harrington (2013)	Oman	Comparison of IELTS writing scores (and other measures) to GPA	$r=.40$ $p<.01$	N/A	Medium correlation between IELTS writing and GPA.
Daller & Wang (2017)	UK	Comparison of IELTS scores (and other measures) to GPA	$r= .377$ $p<.01$	N/A	IELTS correlated significantly with GPA but was found not to be significant in the multiple regression method

Table 1: Overview of studies of predictive validity included in the literature review

\* Pearson's correlation coefficient

### *2.2.1 Studies which found no real predictive validity*

Dooley & Oliver (2002) conducted a study of 89 international students studying in Australian university. They investigated how accurate IELTS scores were as a predictor of a student's academic success. The overall correlation between IELTS and the Semester Weighted Average (SWA) was not significant. In fact, students with higher IELTS band scores did not necessarily have high scores in their academic studies and of the twenty students who scored 6.5 or below, many performed well in studies. It should be noted that only 2 of these participants scored below IELTS 6.0. They concluded that universities should look beyond language scores when making selection judgements about students. Daller & Phelan (2013) used a number of measures to investigate the proficiency requirements for international students to successfully study at universities in English speaking countries. The measures included IELTS listening and writing tests, a C-test of vocabulary knowledge, and a test of verbal intelligence. They conducted correlation and multiple regression analysis and, although there was a significant correlation between IELTS listening and writing measures and GPA ( $r=.803$ ,  $p<.01$ ;  $r=.353$ ,  $p<.05$ ), both were found to not be significant by the final multiple regression model. It was noted that the multiple regression could have been affected by decreased sample size for the listening and writing elements. They concluded that there are many factors which influence academic success, but their findings suggested that vocabulary knowledge was a key factor in predicting the academic success of students. Daller & Yixin (2017) carried out a similar study. They also found that although IELTS had a significant correlation with GPA ( $r=.377$ ,  $p<.01$ ), but it was not significant when introduced into the regression model. They concluded that the other measures in the model could much more easily and effectively predict student's academic achievement.

### *2.2.1 Studies which found a relationship between IELTS and academic success*

Cotton & Conrow (1998) carried out a predictive validity study involving international students studying at an Australian university. They used a number of measures to determine academic success including GPA, staff evaluation of students, and students' self-evaluations. They found moderate to weak correlations

between GPA and IELTS reading and writing band scores ( $r = .42$  and  $r = 0.11$ ), but they found no significant correlation between the IELTS overall band score and academic success. Stronger correlations were reported between IELTS and staff ratings and student's self-evaluation measures. They concluded that "... language proficiency alone, as measured by IELTS, is no guarantee of success. Other variables may be of equal importance" (Cotton & Conrow, 1998, p. 109). The authors acknowledged that their sample was small ( $n=33$ ) and recommended a larger sized study should be carried out.

Feast (2002) reported a weak but significant relationship between IELTS and academic achievement in a study carried out in an Australian university. The participants were international postgraduate and undergraduate students whose IELTS scores ranged from 4.5 to 8.5. The regression analysis reported a significant relationship between IELTS scores and GPA ( $\beta = .39$ ,  $t = 2.92$ ,  $p < .05$ ). Feast (2002) concluded that a positive, weak relationship exists between IELTS and GPA. This paper also considered the effect on admissions of raising the IELTS band score required for international student. Feast found that raising the overall required score to 6.0 and individual band scores of 6.0 in reading and writing resulted in an increase in GPA of 0.89%, but at a loss of 43% of students. Feast acknowledges that this attrition rate would be unacceptable to HEIs from a financial and political perspective and instead suggests increased support for students who have IELTS scores lower than 6.0.

Woodrow (2006) also reported a small, but significant correlation between overall IELTS bands and GPA ( $r = .40$ ,  $p < 0.01$ ), and writing, speaking and listening individual band scores and GPA. Woodrow also compared other variables (difficulty of study, study problems and previous professional experience), but they did not result in significant correlations. The study noted that "for students scoring 6.5 or lower, proficiency may influence their academic achievement, whereas with students scoring 7 and above, English proficiency does not influence academic performance". Cotton & Conrow (1998) also concluded that lower levels of proficiency and IELTS scores seem to correlate more with academic achievement.

A predictive validity study was carried out with a group of Chinese students studying at a UK university by Yen & Kuzma (2009). Overall, they reported a significant, medium sized correlation between the IELTS band scores and



academic performance, as measured by GPA over two semesters. They noted that the effect was larger in the first semester ( $r=.45$ ,  $p<.01$ ) than the second.

Therefore, like Woodrow (2006) they concluded that the predictive effect of IELTS decreased over time. This study is worth noting as it is with a group of fairly homogenous students who were all from the similar cultural and educational backgrounds. As Yen and Kumza point out, studies with homogenous samples are rare but they can decrease the influence of intervening variables such as age, culture, L1 etc. This is relevant to the current study, as the students are all from the same culture, speak the same language, are from the same educational background and are the same age.

### *2.2.3 Research outside of the Anglophone context*

As Cotton & Conrow (1998) and Feast (2002) mention, the context in which the research takes place could have a significant impact on findings. Issues of L1 outside the classroom, differing education systems and culture could all have an impact. Therefore, it is important to consider studies with a similar context.

Unfortunately, studies outside the Anglophone system are limited (Breeze & Miller, 2011) and those for Arab learners studying in EMI HEIs but language outside the class room is not English, are even rarer. Perhaps not coincidentally, the studies which have included students with scores less than IELTS 6.0 have generally taken place outside Anglophone countries where the standard entry criteria is IELTS 6.0.

Breeze and Miller (2011) carried out a study into the predictive validity of IELTS listening scores as an indicator of student coping abilities on a bilingual law programme at the University of Navarra, Spain. They found a significant small to moderate correlation between IELTS listening band scores and the final grades of the students on courses taught in English. Correlations were reported using Spearman's, as the data was not distributed normally, so the results have not been reported in the table above. This study is of note because it included students who had bands 4.0 and 5.0 and it was in a non-Anglophone context.

A study carried out by Arrigoni and Clark (2015), focused on over 1,000 L1 Arabic speakers studying at an Egyptian EMI HEI. The aim was to determine whether IELTS band could predict academic achievement as measured by GPA, and student and teacher perceptions. A weak but significant correlation between overall IELTS band and GPA was discovered. IELTS reading and GPA had the strongest

correlation, but the correlation between listening and GPA was not significant. Spearman's rather than Pearson's correlation coefficient was calculated.

Roche & Harrington (2013) also considered the predictive effect of IELTS writing scores. The participants were 70 Omani students studying in an EMI HEI. The study was more vocabulary based and its aim was not to establish predictive validity of IELTS. However, the correlation statistics it reports for IELTS writing and GPA are worth noting due to the Omani context. There was a significant, medium sized correlation between IELTS writing and GPA ( $r=.40$ ,  $p<.01$ ). The regression analysis showed that the IELTS based writing component was the better predictor compared to vocabulary size. Roche and Harrington (2014) reported a similar correlation between IELTS writing and GPA of  $r=.405$ ,  $p<.01$  in a study based at a private Omani university.

#### *2.2.4 Conclusion*

Although the literature is not conclusive on the predictive nature of IELTS, it does come to some common conclusions. First, the predictive validity of IELTS seems to become weaker as proficiency levels increase. As most of the participants in the study are already studying at university they are band 6.0 or over this could have affected the findings. Second, there is a need for context specific studies. As Breeze & Miller (2011) concluded, "Results from English-speaking countries cannot simply be transferred to other situations where many of the parameters are utterly different" p6. Given the growth of higher education generally, and EMI in HEI in countries like Oman (Bashir, 2007), research needs to be expanded further to determine how different contexts affect the predictive validity of IELTS. This paper hopes to contribute some information to this discussion.

#### **2.3 Vocabulary**

Laufer & Nation (1999), Nation (2006), Daller & Phlean (2013), Roche & Harrington (2013), Harrington & Roche (2014) and Daller & Yixin (2017), have suggested that a student's vocabulary size may be a useful predictor of academic achievement. However, use of vocabulary size as a predictor of academic achievement leads us to questions about the size of vocabulary needed for a student to achieve academic success, and the way to measure the vocabulary size. Although much research has been carried out in the area of estimates of vocabulary size, it has resulted in some

very different estimates which makes it difficult to compare the literature. This section will consider the different ways of measuring vocabulary, how this can affect vocabulary size estimates and the vocabulary size which a learner requires to successfully study in an English medium HEI. The focus of this paper is on the predictive validity of vocabulary size and not different generation methods of vocabulary estimates, so the discussion attempts to give an awareness of issues in this area, rather than a detailed account of vocabulary selection techniques.

### 2.3.1 *Measuring vocabulary size*

There have been many studies which have attempted to measure the vocabulary size of the average English speaking school or college-educated student. An early attempt by Kirkpatrick (1891) estimated vocabulary size of US college graduates to be in the region of 20,000 and 100,000 words. On the other hand, more recent studies carried out by Milton (1990) and Milton & Treffers-Daller (2013) have suggested that UK university students have a vocabulary size of between 9,000 and 10,000 words when entering an HEI. These estimates in turn seem small compared to Nagy and Anderson's (1984) receptive vocabulary estimate of 88,500 words.

The wide variety in the estimates highlights a problem when trying to compare studies meaningfully and to determine some ideal size of vocabulary requirement. Milton & Treffers-Daller (2013) suggest four reasons for differences in estimate size. First, *how the words being counted are defined, i.e.* whether every word is counted or words are grouped into word families. Second, *how word knowledge is defined i.e.* if a learner recognizes the word, does this determine word knowledge or do they have also to have to demonstrate definition knowledge. Third, *how word knowledge is being tested and calculated*, and finally, *the source of words selected for testing*.

As Treffers-Daller (2013) suggests, different studies have used different definitions of what counts as a word and different sources to generate the words to be tested. This accounts for some of the variations in the estimates. Early vocabulary estimates like Kirkpatrick used dictionary counts where all the different forms of the word found in the dictionary were counted as different words e.g. think, thinks and thinking would be counted as different words rather than inflected forms of the same word. For most learners, if they know one form of the word then they will

know other common derivations and inflections, therefore their inclusion inflates the vocabulary size estimate (Milton, 2009). More recent studies such as Golden et al (1990) and D'Anna et al (1991) have focused on word families where inflections and derived forms are treated as one word family rather than separate words and these estimates have tended to be smaller.

The selection of words included in the sample to be tested can also affect the estimate size, as they are dependent on the dictionary or corpus chosen to generate the sample (Nagy & Anderson, 1984). Dictionary based counts sample a subset of words from a chosen dictionary and then test a learner's knowledge of these words. The more recent estimate studies have taken advantage of the development of large computer based corpuses to generate the vocabulary samples used for testing. For example, Nation (2007) used the British National Corpus (BNC) to generate the vocabulary lists used in his Vocabulary Size Test (VST) which is the test instrument used in this study.

Another difference between vocabulary estimates is that some studies measure receptive or passive vocabulary knowledge whilst others measure productive knowledge.

“Productive vocabulary ability is not a yes/no phenomenon, but implies degrees of knowledge...we refer to the ability to use a word at one's own free will as free productive ability (and)... controlled productive ability to use a word when compelled to do so by a teacher or a researcher” (Laufer & Nation, 1999, pp. 36-37)

As learners can often recognise a word, but find it difficult to give a definition Milton (2009) and Webb (2005) observes much teaching and learning of vocabulary is receptive so “...learners are more likely to gain receptive knowledge than productive knowledge” (Webb, 2005, p. 38). Accordingly, we would expect estimates of receptive knowledge to be larger than of productive knowledge. Laufer & Paribakht (1988) measured both the receptive and controlled active productive of L2 learners in Canada and Israel. They found that receptive vocabulary was 1.3 times larger than controlled productive vocabulary. Both D'Anna et al (1991) and Goulden et al (1990) used tests which had an element of controlled active production. D'Anna et al asked students to rate a vocabulary item on a scale of one to five, from 1= never experienced the word before to, 5 = know the meaning of the

word well enough to give a definition. Goulden et al used a YES/NO format where students were asked to say if they recognised the word and as a check they were asked to give a definition of the last five words they ticked on their list. These studies showed smaller vocabulary sizes than the studies using purely receptive tests and the difference in the type of knowledge tested could explain the smaller counts.

### *Conclusion*

Although there are very different vocabulary size estimates reported, the norm in more recent studies is to use word families as a counting method. However, differences in the source of the words used, the type of vocabulary knowledge tested, or the methods used to collect data for the estimate can cause differences in these vocabulary estimates. Accordingly, we must take care when we want to compare results from studies as these differences in methodology can make our comparison meaningless.

#### *2.3.2 How large a vocabulary is required for study at an HEI?*

There is no clear consensus in the literature about the size of vocabulary required to successfully undertake study in L2 at an HEI. Nation (2006) summarizes that there are a number of ways to set a target vocabulary size. We could work out how many words there are in English and set that as our learning goal. He points out that in fact most native speakers don't know all the words there are in English, so this is an unrealistic goal for L2 learners. Second, we could determine the number of words that a native speaker actually knows and set this as a learning goal. He notes that studies that have attempted to measure the number of words a native speaker knows such as Goulden et al (1990) show that well educated native speakers can have a vocabulary size of around 20,000 word families, so again this appears to be an unrealistic target for L2 learners. He suggests a third way to set vocabulary targets is to determine how much vocabulary is required to carry out certain tasks such as reading a newspaper. Hu and Nation (2000) concluded that 98% coverage of text (i.e. 1 out of 50 words is unknown) is required for minimum comprehension to take place. Kurina (as cited by Nation,2006) found that even at 98% text coverage L2 learners will have difficulty with comprehension, so 98% should be a minimum requirement for comprehension. Nation (2006) aimed to determine the vocabulary size required to reach 98% coverage of text in a number

of receptive tasks such as, reading a newspaper or watching a film etc. He found that, for novels 80.88% of the total running words come from the first 1,000 word families of the BNC vocabulary lists. To reach the goal of 98% coverage a learner requires a vocabulary size of 9,000 words. Nation also considered newspapers, these are more akin to academic text as they use more proper nouns and vocabulary from the academic word list appears more frequently. He discovered that the most frequent 2,000 words in the BNC account for about 83% of the running words, but 4,000 words is required to get to 95% coverage and 8,000 to get to 98% coverage plus nouns means a target of 8,000 – 9,000.

Schmitt (2008) reports unpublished research by Larson and Schmitt that suggests, for listening, 90% coverage may be adequate for comprehension. Bonk (2000) reports a coverage figure of 95% may be adequate. This would translate to a vocabulary size of 2,000 – 3,000 word families at the 95% level and 6,000 to 7,000 at the 98% level required to understand spoken English. However, overall Schmitt cautions that there is not enough evidence to state a vocabulary size requirement for learners. He concludes that

“...while learners may be able to cope with a smaller vocabulary, 8,000- 9,000 word families seems to be a more realistic target if they wish to read a wide variety of texts without unknown vocabulary being a problem” (Schmitt, 2008, p. 331). Milton and Treffers-Daller (2013) concluded that to study successfully in an EMI HEI, students need a vocabulary size between 9,000 to 10,000 word families.

### *2.3.3 Studies of the predictive nature of vocabulary size*

If we accept that learners require a certain vocabulary size to comprehend English texts, then we can extend this to determine if the size of a learner’s vocabulary has an effect on their academic achievement. There have been a number of studies which have attempted to measure the predictive validity of vocabulary size on GPA and they have found that there is a significant relationship between vocabulary knowledge and academic success of L2 learners (Morris & Cobb, 2004) (Daller & Phelan, 2013) (Roche & Harrington, 2013) (Harrington & Roche, 2014) (Daller & Yixin, Predicting Study Success of International Students, 2017).

Milton and Treffers-Daller (2013) reported small and medium significant correlations between vocabulary size and academic performance. This study considered monolingual and bilingual students studying in the UK, but EFL students were removed from the final analyses due to statistically significant differences between the groups. Daller and Yixin (2017) conducted a study with 107 international students studying at Swansea University to which compare the predictive validity of a number of measures including vocabulary knowledge and IELTS. They used a C-test format which was adapted from an earlier study by Daller and Phelan (2013) as a language proficiency measure. They also used a writing task adapted from IELTS materials. Correlation analysis showed that both IELTS and vocabulary correlated significantly with GPA ( $r = .377, p < 0.01$ ;  $r = .457, p < 0.01$ ). A multiple regression model with all the predictor variables included resulted in a significant model which could explain 34.7% of the variance in GPA. IELTS did not make a significant impact in the model, but that the C test did. The authors concluded that vocabulary size was a better predictor of GPA than IELTS.

Roche and Harrington (2013) considered the relationship between the vocabulary knowledge and academic performance (as measured by GPA) of 70 Omani EFL students studying in an EMI HEI. A timed, computerised YES/NO test was given to the participants. Vocabulary was drawn from words from the BNC. The test was split into two parts each consisting of 100 items. The first part (Basic Accuracy) was based on the less frequent words used in the 2K, 3K, 5K and 10K bands. The second test (advanced accuracy) was based on more common words from the 1K-5K frequencies. The participants had to respond with YES if they recognised the vocabulary item as a word and NO to non-words. They were penalised for choosing YES for non-words. The authors reported a medium effect correlation with regard to basic word accuracy and GPA, ( $r = .34, p < 0.01$ ), and a weak relationship which was not significant between advanced word accuracy and GPA. In the hierarchical regression analysis, they concluded that both the vocabulary and writing measures predicted significant amounts of variance in the model, however the writing measure was the better predictor of the two. A further study by Harrington & Roche (2014) with Omani students reported similar results.

## *Conclusion*

Overall, research seems to suggest that vocabulary size can have a significant impact on a learner's academic achievement and could be useful as a way to predict academic success. However, another factor to consider is the context of the studies. Most large vocabulary studies are based in an environment where English is also used outside the classroom. There is limited research in the context of learners who are using L2 as a medium of instruction, but English exposure is limited to inside the classroom. These students are likely to have smaller vocabulary sizes and if vocabulary size estimates such as Milton and Treffers-Daller (2013) or Nation (2006), are used as an HEI entry requirement, this would greatly restrict the number of learners with access to HEI. Given the relative newness of HEIs in countries such as Oman and the importance of HEI to its economic development plans. HEIs could perhaps use a lower entry threshold vocabulary size, but use the knowledge gained from vocabulary testing to support students with lower than required scores as suggested in Harrington & Roche (2014).

## **2.4 Conclusion and Research Questions**

Review of the literature points to the need for context specific studies into the predictive validity of IELTS and vocabulary size, accordingly the first four research focus on this area. In addition, the reliance of the OAAA and HEIs in Oman for benchmarking purposes makes it important to determine if the CAS GFP programme does produce students with an equivalent of IELTS 5.0, so this is the focus of question 5. Accordingly, this study will consider the following research questions.

1. How well does an IELTS band (as measured by the IELTS listening component) predict a CAS student's academic achievement (as measured by their Year One, Semester 1 GPA)?
2. How well does vocabulary size predict a CAS student's academic achievement (as measured by their Year One, Semester 1 GPA)?
3. How well does GFP overall score predict a student's academic achievement (as measured by their Year One, Semester 1 GPA)?



4. How well do IELTS band, vocabulary size and GFP overall score predict a student's achievement ((as measured by their Year One, Semester 1 GPA) when considered together?
  
5. How well does the GFP listening score predict the IELTS listening score?

## **Chapter 3 - Methodology**

### **3.1 Introduction**

This chapter discusses the methodological approach and research design of this study. A quantitative, experimental approach was taken. The reason for this choice is discussed below. The chapter is divided into three sections Participants, Measures and Procedure. Section 3.2 provided details about the participants and context of the study. Section 3.3 describes the measures and instruments used and discusses validity, reliability and ethical issues. Section 3.4 describes the data collection procedures and data analysis methods used.

As the aim of this research was to measure a trend, the effect of various predictor variables on GPA, rather than individual diversity, a quantitative approach was (Anderson & Poole, 1994) indicated. Dörnyei (2016) summarises the differences as quantitative research is “categorising the world” as it offers “a structured...way of achieving a macro-perspective of overarching trends...” p29. On the other hand, qualitative research is about “perceiving individual diversity” and “represents a flexible and highly context-specific micro-perspective of the world” p29. Anderson and Poole (1994) suggest that a combination of both qualitative and quantitative methods can “maximize the theoretical implications of research” p. 29. The author of this study recognises the value a qualitative element would add to the study, but given the scale of describing and analysing the predictive nature of three measures it was decided that adding a qualitative element was not feasible. Previous studies which have considered the predictive validity of IELTS or vocabulary size have taken a mainly quantitative approach (Daller & Phelan, 2013) (Daller & Yixin, 2017) (Yen & Kuzma, 2009) (Roche & Harrington, 2013). Although some studies, Woodrow (2006) have used mixed methods to elucidate the results they have tended to be larger scale projects. Therefore, given the level of depth afforded by a dissertation and that fact that previous studies mainly used quantitative methods, a quantitative approach was chosen.

### **3.2 Participants**

The participants in the survey are Omani male and female students aged 18-19, attending CAS Sohar, a HEI located in the Sultanate of Oman. CAS Sohar is part of a network of five colleges located throughout Oman. The individual colleges

operate under the banner of Colleges of Applied Sciences (CAS) and come under the direct governance of the Ministry of Higher Education. Each college offers different majors and CAS Sohar offers Bachelor's degrees in Engineering and Information Technology.

To be eligible to study at CAS, students must have completed the Omani High School Diploma and must have met specific grade requirements which differ between programmes. For the Engineering programme students are required to have a minimum D grade in Maths, Physics and English from high school to be eligible to compete for a place. For IT, they must have a minimum of D grade in Maths and English. The MoHE then allocates places on the basis of the number of available seats to the students with the highest grades.

Students allocated a place at CAS either begin their studies immediately, or complete the CAS GFP depending on their English, Maths and IT proficiency. They sit placement tests for all three subjects which will either allocate them to a GFP level, or determine if they are eligible to sit a waiver test. Both the placement test and the waiver test are benchmarked to an IELTS 5.0. Accordingly, if students pass the waiver test it is assumed they have language proficiency equivalent to an IELTS 5.0. If they pass the waiver tests in all three subjects, they can proceed directly to their academic studies. Students can by-pass this procedure if they can produce a valid IELTS certificate showing a 5.0 band score (Ministry of Higher Education Oman, 2017). The majority of students are required to complete at least one semester in the GFP.

The General Foundation Program (GFP) consists of four levels from Beginner to Intermediate. Depending on their score on the placement test, students can spend between one to four semesters in GFP. On completion of the GFP, it is assumed that students have reached a proficiency level equivalent to an IELTS band 5.0 (Ministry of Higher Education Oman, 2017).

The initial sample (n=63) was a random sample of four sections from the current year one cohort. These students were the most recent GFP graduates. It was decided that a sample of 63 participants was acceptable as, even allowing for a 50% dropout rate, this number would be sufficient for parametric testing (Field, 2016) and it represents about 50% of the year 1 cohort. The groups are homogenous in terms of age, language and culture so it was decided to select the

groups with the largest number of students to allow more data to be collected. The participants were a mixture of IT students (n=20) and Engineering students (n=43), and included both females (n=39) and males (n=24).

### **3.3 Measures**

The aim of the study was to examine the ability of language proficiency measures to predict academic success. Three predictive measures were chosen based on initial review of research: IELTS, vocabulary size and CAS GFP Score.

Different studies have used different dependent variables to measures of academic success, and this has caused some of the issues when it comes to consistency of results between studies. GPA was chosen in this current study as it is the measure used by CAS to determine academic success.

The first predictive measure is IELTS. HEIs worldwide currently rely on IELTS to predict academic success despite the fact this is not the purpose of IELTS (UCLES, 1999) and the findings of IELTS predictive validity research is not conclusive. Given this general reliance on IELTS as a predictor of academic success, the lack of context specific studies, and the use of IELTS in Oman by HEIs in their admission criteria and as part of the accreditation process of OAAA, IELTS band score was selected as a predictive measure for this study. Initially the plan was to administer an IELTS listening and reading test, but given the limited time available this was not possible. Accordingly, only an IELTS listening test was administered. The listening was chosen over the reading for two reasons. First, as the majority of academic content is provided to students through lecture at CAS Sohar rather than independent reading of sources, a student's ability to listening in English may have an important impact on their academic success (Breeze & Miller, 2011). Second, one of the other measures tested is vocabulary. Given the close relationship between vocabulary and reading (Schmitt, 2008) it was felt that there was more overlap between these two measures so reading was sacrificed.

Similar studies carried out in an Omani HEI by Roche & Harrington (2013), Roche & Harrington (2014) and Harrington & Roche (2014) suggest that vocabulary size can be a reliable predictor of academic achievement in Omani students. Accordingly, the second predictive measure chosen was vocabulary. As word family is the more

common measure of vocabulary size in research now (Milton & Treffers-Daller, 2013) (Schmitt, 2008) it was chosen as the unit of measure.

The third predictive measure chosen was the CAS Overall GFP score. This is made up of scores from two courses, General English Skills (GES) and Academic English Skills (AES). If a student's combined score from the two courses is more than 50%, the student is given a pass from the GFP. Unlike the other measures, it is not only measuring language proficiency. However, as it is the current method used by the CAS system to determine if a student is equivalent to an IELTS 5.0 It was chosen as a predictive measure.

### 3.3.1 *Data collection instruments*

Two test instruments were used to collect the data required for the study, IELTS listening test and a vocabulary test. The CAS GFP score were archived data and not a test instrument. Appendix one contains the IELTS test used and a description of the VST as it is an online test.

#### (i) *IELTS Listening Test*

The IELTS listening test is in four sections and has 40 questions. The first two sections deal with listening in everyday situations and the last two in educational contexts. There are a number of different task types e.g. Multiple choice, sentence completion etc. which test different listening skills such as listening for detail and identifying key information. The recording is heard only once. (IELTS, 2017 (c))

#### (ii) *Vocabulary Size*

Two methods of measuring vocabulary size were considered, a C-test and the computerized VST test developed by Paul Nation available on the website [www.my.vocabularysize.com](http://www.my.vocabularysize.com). The C-test is a controlled- productive vocabulary test whereas the VST is a receptive vocabulary test.

The C-test and the VST were reviewed by a group of CAS teachers. They raised concerns that the C-test could give an inaccurate estimate of the CAS students vocabulary size due to recognised spelling issues among Arab speaking learners (Fender,2008) (Milton, 2009). Also, students would be unfamiliar with the test format. It was felt that the MCQ format of the VST would be more familiar to students and there would be no issues with spelling. A possible issue with the VST

is that the MCQ format allows students to guess and there is no penalty for choosing the incorrect answer, so the estimate could be inflated (Stewart, 2014). In addition, there is always a risk of possible technical difficulties when delivering an online test. After all these factors were considered, it was decided to use the VST as the spelling issue was the one most likely to affect the outcome.

The VST is “a proficiency measure used to determine how much vocabulary learners know” (Nation, 2007, p. 10). It tests receptive vocabulary knowledge drawn from the spoken section of the British National Corpus. A computerized version of the test can be found at [www.my.vocabularysize.com](http://www.my.vocabularysize.com). The test takes the form of 140 multiple choice questions. A short non-defining sentence is given and students select the option which defines the given word. Figure 1 shows an example. However, this is a more recent version of the VST which includes an option “I don’t know”, however the version considered for this study did not have this option. The VST gives a score in number of words which is the test score multiplied by 100. The test score indicates the number of word families, so it was used in the data analysis.

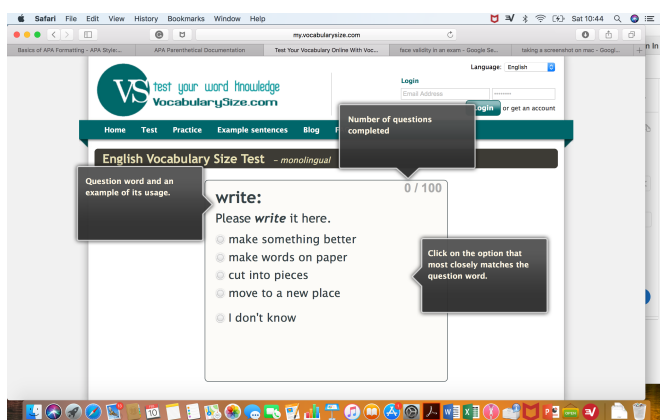


Figure 1: Screenshot from VST

### (iii) CAS GFP Score

As mentioned in 3.3 the CAS GFP score is generated by various test instruments. This study used the archived data from those instruments rather than the actual test instruments themselves.

(iv) GPA

GPA was used as the dependent variable, as a way to measure academic success. GPA is calculated on a 4-point scale as shown below.

	A	B+	B	B-	C+	C	C-	D+	D
GPA	4.0	3.7	3.3	3.0	2.7	2.3	2.0	2.0	1.3

Table 2 GPA scores (Adapted from CAS Regulations (Ministry of Higher Education, 2007))

### 3.3.2 Measurement characteristics.

Validity and reliability are key factors when contemplating quality criteria in quantitative research.

Validity, includes both 'research validity' and 'measurement validity'. Research validity is related to the overall quality of the research project. The dependability of the research and whether the results can be generalized in the population. Measurement validity considers whether interpretation of the data is meaningful and done in a suitable way (Dörnyei, 2016).

Dörnyei identified six main threats to validity. Some of the threats to validity identified by Dörnyei, like practice effect and fundamental changes in the participants e.g. maturity level, are not relevant because study was not longitudinal. However, participant mortality and desire to meet expectations are relevant. More students did the VST than the IELTS test because the IELTS was given in the last week of semester and less students attended class then. It's unclear whether this is a specific cause which could affect the validity or a random cause. In terms of desire to meet expectations, a small group of students may have used their mobile phones during the VST to try to inflate their scores. However, their scores were removed from the data set.

### 3.3.3 Reliability

"Reliability indicates the extent to which our measurement instruments and procedures produce consistent results in a given population in different circumstances" (Dörnyei, 2007/2016, p. 50). Bachman (2004) suggests that differences in administration of the measure, differences in the tests takers over a

period of time, or variations in the test or the raters can cause significant changes meaning results will not be reliable. Cronbach's alpha, is the most common reliability estimate which measures internal consistency and this was calculated for IELTS and VST.

As IELTS is an international exam they produce reliability estimates for their exams. The IELTS website reports the Cronbach's alpha for the listening in 2015 was  $\alpha = 0.91$ . However, Dörnyei, (2016) warns against using documented reliability scores as reliability related not to the instruments used, but to the data collected. Based on the data for this study the  $\alpha$  for IELTS and VST were  $\alpha = .981$   $\alpha = .998$ . Item analysis was not available for CAS scores, so the alpha could not be computed. Overall, the alpha values suggest that the data is reliable. Inter-rater reliability was not an issue for the measures. IELTS and Vocabulary data are both objective measures and were double marked.

### **3.4 Procedures**

#### *3.4.1 Procedures used for each measure*

##### **(i) IELTS**

An IELTS listening test was randomly chosen and administered. The researcher or class teacher gave the participants the paper and then started the recording. They used their own laptops and classroom speakers. The students were given an answer sheet to transfer their answers to and these were marked.

The test was first marked using the official IELTS answer key and then re-marked to give credit for correct answers which were spelt incorrectly (except where the answer had been specifically spelt out in the recording). Arabic speaking students tend to encounter greater difficulty with English spelling and word processing than ESL learners of similar proficiency levels from other L1 backgrounds, so it was decided not to penalise spelling mistakes (Fender, 2003) (Al-Amrani, 2009) (Roche & Harrington, 2013) (Milton, 2009). This also reflects the practice in the CAS exams where, if an answer is phonetically correct, it is accepted and research question 5 requires a comparison between IELTS and CAS Listening. All papers were then re-marked by a third marker and no significant differences were found. The adjusted score was converted into an IELTS band. The scale available on the IELTS website



does not extend below 5.0. Given that a large number of scores were below 5.0, an adjusted scale to account for lower scores was developed based on composite of various websites was produced and agreed on by a number of CAS Sohar teachers (see Appendix 2)

**(ii) VST**

The VST was delivered in the English department computer laboratory. The researcher explained the purposes of the measure and outlined how the VST worked. Each student had their own computer and were asked to work through the test at their own speed. They were given a guide time of 45 minutes to complete the task. The researcher was on hand to deal with any technical problems. The researcher had set up individual groups on the VST website to collect the data. For two of the groups, there was an issue with internet connectivity during the test and the results were not saved correctly on the VST website. However, the researcher had kept a manual record of each student's vocabulary score in case of such issues.

**(iii) CAS GFP Score**

The CAS GFP scores were provided on a spreadsheet by the Head of the English Department after consent had been obtained from the Dean of the college and the participants. They show the GES Final and Mid-Term exam, and AES marks which combine to form the CAS GFP score

**(iv) GPA**

The individual GPA scores were provided by the CAS Sohar Registration Department after consent had been obtained from the Dean of the college and the participants. The GPA score was based on the first semester exams which took place in January, and continuous assessments carried out during the semester.

**3.4.2 Ethical considerations**

In accordance with the ethical guidelines of the XXXXXXXXXXXXX and CAS Sohar, privacy and confidentiality were respected throughout the research process.

Informed consent for the use of data was sought and given by the individual participants. Appendix 5 and 6 contain a sample of the Participant Information Sheet and the Consent Forms. Hard copies of all consent forms have been sent, as

requested, to the XXXXXXXXXXXX. Students were informed about the project by their class teacher before the data collection took place. Prior to the VST and the IELTS being administered the researcher explained the research process, what data was being collected, what it was being used for and where it would be stored. Students were then asked to read an information sheet, sign the consent form and return it to their teacher. Due to a logistical problem with the original consent forms, the researcher had the students re-sign the forms. Any student who did not re-sign were removed from the sample. These have also been sent to XXX.

### *3.4.3 Method of Analysis*

The data was analysed using two methods, correlation and regression analysis. All statistics were generated using SPSS (see Appendix 8). The results of the analyses are reported in chapter 4.

Correlation coefficients are used to estimate the size of an effect. The Pearson product-movement correlation coefficient was used to calculate correlations between variables. It is a standardized measure which allows us to compare covariance regardless of the initial units of measurement (Brown, 1988). This is required in this study as the measures all have different units of measurement. First, the correlation between the predictor variables was calculated to rule out issues of multicollinearity. Then, the correlations between the predictor variables and the dependent variable GPA were calculated to determine the effect size of the relationship.

Where we have multiple predictor variables and we are trying to identify which one is the better predictor, as is the case in research question four, we should use multiple regression analysis. Multiple regression allows us to consider the predictive effect of the variables relative to one another (Bachman, 2004). When conducting a multiple regression, a key question is in which order to enter the predictor variables into the model. Field (2016: 322) advises that, as a rule, known predictors (i.e. predictors that previous research tells us are the most important) should be entered into the model first and then other predictors entered in a hierarchical or stepwise manner, depending on whether we have reason to believe that one is more important than the other. If there is no strong theoretical basis for the order of entry of predictors, Field states that either a forced entry method or a stepwise method should be used. Forced entry is where the predictors are chosen by the researcher

on the basis of their research, but no decision is made by them about the order of the predictor is used. In a stepwise method, the predictors are put into the model in an order that is chosen using solely mathematical criteria and the researcher has no input into the order of entry. Field has reservations about the use of stepwise methods as they are influenced by random variables in data and the results are not consistent if the model is retested with different data (p.322). However, he does state that a stepwise method is appropriate for explanatory model building and that the forced entry method is more appropriate for model testing. On this basis, a stepwise backward method was selected for the regression analysis as we are building the model through exploration at this stage. (A hierarchical method was also carried out and the results regarding the importance of the model were very similar and indicated that the same variable was not important to explaining variance in GPA).

### 3.5 Conclusion

This dissertation considered the ability of various language proficiency measures to predict academic success. Three predictive measures were tested IELTS Listening Band, VST score, CAS GFP score. The dependant variable used to measure academic success was GPA. The study considered the individual predictive validity of each of the measures using correlation analysis. Then the predictive validity of the measures relative to each other by use multiple regression analysis. The findings and interpretation of the analyses follow in Chapter 4. Table 3 summarises how the data collected for the measures has been used to address each research question.

	Measures used to answer research questions
Research Q1	IELTS Band/GPA
Research Q2	VST/GPA
Research Q3	GFP Score/GPA
Research Q4	IELTS Band + VST + GFP/ Score
Research Q5	GFP Listening Score/IELTS Listening Band

*Table 3 – Measures used to answer research questions*

There were a number of factors which limited the study. First, as the test instruments were delivered in class time, it was not practically possible to give participants a full IELTS test. This limits the analysis to only one language skill.

Second, participant drop out meant that the sample was smaller than originally intended, however it was still large enough to carry out parametric testing.

The ability to generalize this research is restricted due to the use of a relatively homogenous sample. All the participants were Omani teenagers, with L1, age, culture and educational background in common. Therefore, the results are not generalizable outside of this specific context.

## **Chapter 4 - Results of analysis and discussion of Results**

### **4.1 Introduction**

This chapter presents a summary of the data collected in the study, the analysis of that data was conducted and the results from that analysis. This chapter also contains a discussion of the implications of these results. It was decided that it was more convenient for the reader to have the analysis and discussion reported together due to the level of statistics involved. Section 4.2 gives an overview of the data by reporting the scores from each measure and the related descriptive statistics. The third section presents the results from the correlation analysis and section four discusses the results of the multiple linear regression analysis. Section five is a discussion of the results in light of the research questions and previous studies. The wider pedagogical implications of the findings will be dealt with in the next chapter.

### **4.2 Summary of test Scores and descriptive statistics**

During the data collection period participants completed the VST and IELTS listening test described in the previous chapter. The CAS scores were provided by the English HOD and the registration department with the permission of the Deanship of the college. The scores and descriptive statistics are reported in tables R1 and R2. (Appendix 8 shows the corresponding SPSS output).

Table 3 reports the descriptive statistics for Sample 1. Participant's data was included in this sample regardless of how many measures they completed. The sample size shown in this table varies across the measures as not all students completed all the measures.

Table 4 reports the same statistics but for Sample 2, where only the data for participants who completed all the measures was included. A boxplot of the VST scores showed two outliers with extremely high score (Figure 1). The invigilating teacher had reported suspicions that these participants had used mobile phones for translation during the test. Their data was removed from the sample and this resulted in a sample size of 33 which was still considered large enough for both correlation and multiple regression analysis Field (2016) and is almost one third of the current year one cohort.

	N	Possible range	Actual range	Mean	St. Dev.
<i>IELTS Listening Score</i>	38	0 - 40	3 - 20	9.37	3.98
<i>IELTS Band</i>	38	1.0 - 9.0	1.0 – 5.5	3.46	0.91
<i>Vocabulary (Score)</i>	53	1 - 140	14– 73	45.42	11.74
<i>Vocabulary (words)</i>	53	1 - 14,000	1,400 – 7,300	4,542	1174.15
<i>CAS GFP Score</i>	56	1 - 100	57– 93.50	76.9	8.47
<i>CAS Listening Score</i>	56	1 – 20	6– 20	16.66	3.27
<i>CAS Y1 GPA Score</i>	56	1.0 – 4.0	51 – 3.47	2.29	0.73

*Table 4 – Descriptive statistics (Sample 1, all participants included)*

	N	Possible range	Actual range	Mean	St. Dev.
<i>IELTS Listening Score</i>	33	1 - 40	3 – 20	9.39	4.12
<i>IELTS Band</i>	33	1.0 - 9.0	1.0 – 5.5	3.44	0.95
<i>Vocabulary (Score)</i>	33	1 - 140	14 – 59	42.45	10.17
<i>Vocabulary (words)</i>	33	1 - 14,000	1,400 – 5,900	4,245	1,017.07
<i>CAS GFP Score</i>	33	1 - 100	57 – 93.50	76.77	9.26
<i>CAS Listening Score</i>	33	1 – 20	6 – 20	16.52	3.48
<i>CAS Y1 GPA Score</i>	33	1.0 – 4.0	0.51 – 3.47	2.32	0.736

*Table 5 – Descriptive Statistics (Sample 2, Reduced sample, n=33)*

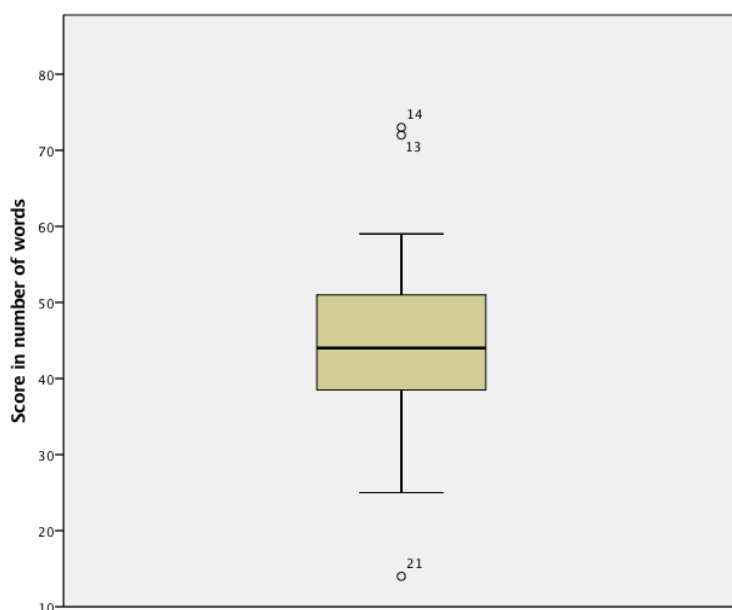


Figure 1 – Box plot showing vocabulary test outliers.

When the descriptive statistics of the two samples were compared, there were no significant changes in the reported means or standard deviations of the measures. This suggested that the sample was still representative even with the smaller sample.

It should be noted that the variation in the IELTS band scores is very limited ( $M=3.44$ ,  $SD= 0.95$ ). This is to be expected where the range of possible scores is limited. The variation is greater when we consider IELTS scores rather than band ( $M= 9.39$ ,  $SD=4.12$ ) as the range of possible scores is greater. However, this truncated sample has consequences for the correlation statistics because the more variability there is in the data the larger the value of  $r$  and vice versa (Goodwin & Leech, 2006) (Field, 2016)

#### 4.3 Correlation analyses

This section reports the results of the correlation analyses. Correlations for research question five have been reported separately as the dependant variable is different from the other research questions. Sample 2, where participants had completed all three predictive measures, was used to calculate both correlation and regression analysis ( $n=33$ ). The Pearson's product movement correlations was used to estimate correlations as it allows comparison between variables with

different units of measurement. Correlation coefficients can be positive or negative and have a value between -1 and +1. A coefficient of  $\pm 0.1$  indicates a small effect;  $\pm 0.3$  indicates a medium effect and  $\pm 0.5$  indicates a large effect. (Field, 2016, p. 267).

#### 4.3.1 Research questions one to three

Research questions one to three question how well IELTS, vocabulary size and GFP Overall Score can predict academic success individually. The correlations between the three predictor variables and GPA were calculated in order to address the research questions.

First, the correlations between the three predictor variables were calculated to identify any issues of multicollinearity i.e. a relationship between the predictor variables, which would influence the multiple regression (Field, 2016). The correlation coefficients between the predictor variables are shown in table 5. The correlations are all lower than .9, which suggests that there is no issue with multicollinearity (Field, 2016:325). A more robust method of analysing multicollinearity is the variance of inflation factor (VIF) and tolerance statistics which are generated during the multiple regression analysis. According to Field (2016), VIF should be below 10 and tolerance should be above 0.1. The VIF and tolerance statistics reported in table 10 seem to support this as the VIFs are in the range from VIF 1 to 1.6, and the tolerances are above 0.1. Therefore, there do not appear to be any issues with multicollinearity.

	IELTS band	Vocabulary	GFP overall Score
IELTS Band	-	.349*	.599**
Vocabulary		-	.225
GFP Overall Score			-

\*significant at the .05 level \*\* significant at the .01 level (both two-tailed)

Table 6 – Correlations between the predictor variables (Sample 2, n=33).



To determine the relationship between the predictor variables and academic achievement as measured by GPA, the correlation between GPA and the predictor variables was calculated. The coefficients reported in table R3 show that there is a significant, large effect between GFP overall score and GPA ( $r=.544$ ,  $p<.001$ ) and a significant, medium to large sized effect between vocabulary and GPA ( $r=.477$ ,  $p<.001$ ). However, the smallest and least significant effect is between IELTS and GPA ( $r=.350$ ,  $p<.005$ ). However, as discussed above, this would be expected as the variation in scores for IELTS band score and GPA is very limited ( $SD = 0.95$ ) and ( $SD=0.74$ ). Goodwin & Leech (2006) note that a truncated range is a phenomenon that is common in predictive validity studies as the test instruments have restricted range as they are used as a means of selection. If the range of scores for GPA and IELTS was larger, the correlation between them would increase (Goodwin & Leech, 2006). If we replace the IELTS band with the raw score band we see an increased correlation of ( $r=.457$ ,  $p<.001$ ) This is because the possible range of scores is wider, even though this is the same data.

	IELTS band	Vocabulary	GFP overall score
GPA	$r=.350^*$  $p< .05$  (medium effect)	$r=.477^{**}$  $p<. 01$  (medium to large effect)	$r=.544^{**}$  $p< .01$  (large effect)

\*significant at the .05 level \*\*significant at the .001 level (both two tailed)

*Table 7 – Correlations between predictor variable and GPA (n=33)*

#### 4.3.1 Research question five

This research question considers whether the CAS GFP listening score can predict the IELTS score of the participants. A significant, medium effect was found between the two variables ( $r=.378$ ,  $p<.005$ ).

#### 4.4 Multiple Regression

Correlations can tell us about the relationship between multiple independent variables and the dependant variable, but not the relationship between the independent variables. If we want to know the predictive power of the variables

relative to one another, we need to complete a multiple regression. A stepwise backward multiple regression method was chosen as this is appropriate for explanatory model building (Field, 2016). In a stepwise backward regression, all the variables are entered at the same time and the least significant are removed. Tables 8, 9 and 10 show the outcome of the regression analysis. Tables 8 and 9 show the model summary and change statistics for both the original and final model. Table 10 shows the regression coefficients for the final model.

	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error
Model 1 (original)	.659 <sup>1</sup>	.434	.375	.528
Model 2 (final)	.655 <sup>2</sup>	.428	.390	.575

1. Predictors: (constant), vocabulary, IELTSs band, GFP overall score
2. Predictors: (constant), vocabulary, GFP overall score
3. Dependent variable: GPA

*Table 8: Model summary – Model 1(original) and Model 2 (final)*

	R <sup>2</sup> change	F change	SIG F change	Durbin Watson
Model 1 (original)	.659 <sup>1</sup>	.434	.375	.528
Model 2 (final)	.655 <sup>2</sup>	.428	.390	.575

1. Predictors: (constant), vocabulary, IELTSs band, GFP overall score
2. Predictors: (constant), vocabulary, GFP overall score

*Table 9: Change statistics*

	B	SE B	$\beta$	t	Sig.	Tolerance	VIF
Constant	-1.635	.882		-1.854	.074		
GFP overall score	.037	.011	.460	3.249	.003	.949	1.053
Vocabulary	.027	.010	.373	2.633	.013	.949	1.053

*Table 10: Final model coefficients*

Overall, the model is significant ( $F=11.241$ ,  $p<.001$ ). The  $R^2$  value, tells us how much of the variance in the dependant variable is accounted for by the model. The higher the value of  $R^2$  the more variability is accounted for. In our model, we see that only 43% of the variance in GPA is accounted for ( $R^2 = .428$ ). This means that other variables not included in the model contribute significantly to the variance.

In a multiple regression, we determine which variables to remove by looking at the t statistic and the Sig. values. The higher the t value the more important the measure is, but only measures with a Sig. value of less than 0.5 are considered significant and should be included in the final model. In a backwards regression, any measures with a sig value of less than 0.5 are removed (Field, 2016). In the original model, with all the predictor variables included, the t-value of IELTS shows it is less important than the other variables and the Sig. value is more than 0.5, so it is not significant ( $\beta = -.094$ ,  $t = -.519$ ,  $p = .608$ ). Therefore, it has been removed from the final model. The Sig. values for the other predictor variables are less than 0.5, therefore, they are significant in explaining the variance in GPA. We can see from the  $R^2$  change statistic in table 9 that the exclusion of IELTS has only reduced  $R^2$ , or how much variance is explained by the model, by  $-.005$ .

In the final model, shown in table 10, we can see that GFP overall score has more impact on GPA than vocabulary score as its t value is higher ( $\beta = .460$   $t=3.249$ ,  $p=.003$ ). Therefore, it appears that it is a better indicator of academic success than vocabulary score, although the vocabulary score is also significant ( $\beta = .373$   $t=2.633$ ,  $p=.013$ ). The model implies that both GFP overall score and vocabulary are reasonable predictors of GPA.

In summary, IELTS does not account for a significant amount of the variance when considered with the other measures under multiple regression. Vocabulary and CAS GFP score are better predictors of academic achievement in CAS students. However, as the model only explains 42.8% of the variance ( $r^2 = .428$ ), other variables must contribute significantly to the GPA score and these should also be identified and considered in the model in a further study.

## 4.5 Analysis

This section considers the implications of the results for each research question. The practical implications of these findings and the further areas of research they suggest will be dealt with in Chapter 5.

*4.5.1 Research question one - How well does an IELTS band (as measured by the IELTS listening component) predict a CAS student's academic achievement (as measured by their GPA at the end of year)?*

The results show that the average IELTS listening score is band 3.5. If we take this as representative of the overall band score, this means that the CAS students are not equivalent to a IELTS band 5.0 user which is a pre-requisite for study at CAS. Correlation analysis suggests that a relationship exists between IELTS and academic achievement, however when considered in a multiple regression, this relationship is not significant compared to other proficiency measures.

The correlation analysis showed that there was a relationship between IELTS and GPA, but it had the smallest effect size of all the variables. The correlation results are similar to the studies reported in table LR1 in Chapter 2 which found a positive relationship between IELTS and GPA (Woodrow, 2006) (Yen & Kuzma, 2009). Although both these studies suggested that research including participants with band scores below 6.0 should show greater predictive validity, this is not the case here. However, this is mainly due to the truncated sample discussed above. The previous studies had truncated samples with only students with band scores above 6.0, whereas this study has a truncated sample with only students with a band score below 5.5. This is an issue with the use of IELTS as a predictive measure as the sample is usually truncated due to the lack of range in scores.

It is difficult to compare the results with other studies which included participants with scores under 6.0 (Breeze & Miller, 2011) (Arrigoni & Clark, 2015) as both these studies used non-parametric methods.

The multiple regression showed that IELTS was not a significant predictor of GPA when it was considered with other proficiency methods. Studies which added regression analysis to compare the predictive validity of IELTS with other measures have generally reported that IELTS does not make a significant contribution to explaining variance in GPA (Daller & Phelan, 2013) (Daller & Yixin, 2017). The

regression findings in this study concur with Daller & Phelan (2013) who also used a stepwise backwards regression method to analyse their data. Although they had a small sample size, Daller & Phelan (2013) concluded that “The listening and writing scores based on IELTS band descriptors are significant predictor variables on their own but are excluded from the final model in multiple regression analysis” p189. An Omani HEI based study Harrington & Roche (2014) used IELTS reading and writing as measures and found a significant correlation between with both measures and GPA. In their hierarchical multiple regression model both measures were included and reported significant contributions to the variance in GPA ( $\beta = .526$ ,  $p < .0001$  and  $\beta = .186$   $p < .01$ ). The  $R^2$  change statistics showed .276 for writing and .032 for reading when they were included in the model. The authors used an amended version of the IELTS exam which they had designed to reflect the level of the target group and this could account for greater predictive validity than the actual IELTS exam used in this study. Overall, they found that IELTS writing was a significant predictor of GPA however, like this current Harrington & Roche (2014) study they found that “...whether all or even most of the students were at the benchmark IELTS 5 (overall score) as prescribed by the Omani education authorities is doubtful” p.40.

Overall, the findings for this research question seem to concur with previous reported findings, with the exception of the greater predictive validity at lower levels of proficiency. If this result, that IELTS is not a good predictor of academic achievement, is generalized across Omani HEIs it could have implications for HEIs in Oman who base their entry criteria on IELTS and also for the OAAA accreditation process which relies heavily on IELTS for benchmarking.

#### *4.5.2 Research Question Two - How well does vocabulary size predict a CAS student's academic achievement (as measured by their GPA at the end of the year)?*

The current study found that there was medium to large significant correlation between vocabulary size and GPA. Vocabulary also made a significant contribution to explaining the variance in GPA in the regression analysis.

The average vocabulary size estimate from this study is around 4,500. This is significantly lower than the goals suggested in the literature for students to successfully study at HEIs with EMI (Nation, 2006) (Milton & Treffers-Daller, 2013).

Nation (2006) suggests that a vocabulary size of 4,000 words results in about 95% text coverage, so CAS students with a vocabulary size of 4,500 are below the minimum 98% coverage required for unassisted comprehension. In other words, this would mean that 3/50 words would be unknown, which in a text of 500 words would mean 30 words were unknown. This would suggest that CAS students have significant difficulty reading academic texts.

The correlation and multiple regression concur with the findings of Daller & Phelan (2013), Daller & Wang (2017) and Roche & Harrington (2014). Roche & Harrington's Omani based studies also reported similar vocabulary sizes.

Average GPA is low for CAS students. The average GPA score reported at CAS Sohar was 2.3. There are no national average GPA statistics currently available in Oman to compare it to, however similar studies carried out in Omani HEIs report similar average GPA score (Roche & Harrington, 2013) (Alkhausi, et al., 2015). As the correlation between Vocabulary size and GPA has a medium to large effect the findings seem to suggest that vocabulary size has an important role to play in improve academic success and therefore curriculum design for the GFP. This is discussed further in Chapter 5.

*4.5.3. Research question three: How well does GFP overall score predict a student's academic achievement (as measured by their GPA at the end of the year)?*

Both the correlation and multiple regression analysis show that the GFP overall score is the best predictor of the three measures. The GFP overall score is not strictly just language proficiency as it includes both the general English and academic English combined score. However, when the same analyses are done using just the GFP final exam scores, the results are the similar.

There is no significant literature to compare these findings to as the CAS exams are in-house. However, HEIs in Oman are required to consider this question as part of the OAAA accreditation process and these findings could contribute to the knowledge of CAS about the predictive validity level of their exams.

*4.5.4. Research question four - How well do IELTS band, vocabulary size and GFP overall score predict a student's achievement (as measured by their GPA at the end of the year) when considered together?*

This research question can be addressed by making a summation of the findings for the previous research questions.

Overall, the regression model containing all three predictor variables could only explain 42% of variation in GPA. This means that other factors make a large contribution to the variation in the GPA of CAS students. Studies by Dooley & Oliver (2002) Arrigoni & Clark (2015) also found that academic achievement could not be explained by English proficiency alone. On the other hand, Daller & Wang (2017) found that proficiency in their study could account for academic success. The issue of context may explain some of the differences in findings. Daller and Wang were dealing with UK based, international students. Students in this context may have different motivations, academic backgrounds, etc. which affect their academic performance. This seems to reinforce the point made by Woodrow (2006) about the importance of context related studies. A study carried out in Oman in Sultan Qaboos University (SQU) found that a number of non-linguistic factors affected a student's ability to succeed academically (Alkhausi, et al., 2015) This current study was limited to measures of language proficiency, but the inclusion of other predictor variables would likely increase the predictive power of the model.

#### *4.5.4 Research question five: How well does the GFP listening score predict the IELTS listening score?*

The correlation coefficient was calculated to determine the effect size of the relationship between the IELTS listening score and the GFP listening score. There is a significant, medium effect between the two variables ( $r=.378$ ,  $p<.005$ ). GFP listening score was included in the multiple regression as part of the GFP overall score, but wasn't included as a separate variable as it was being compared to a different dependant variable, the IELTS listening score.

This question has important repercussions for the benchmarking of Omani HEIs exam. This result indicates that there is a relationship between the GFP listening exam and the IELTS listening score, which in turn may indicate a relationship between the GFP overall scores and the overall IELTS band. Given that the reported average IELTS Listening score was 3.5, this may give cause for concern about the benchmarking of the CAS exams against IELTS 5.0. This average score is significantly below the expected level set by the OAAA and the MoHe as a criterion for study at an Omani EMI HEI. However, there are a number of mitigating

factors which should be considered. First, students who have practiced for the IELTS exam would be expected to score higher scores. Most of the participants in this sample had not had exposure to the IELTS test format and this could have resulted in lower scores. Second, students were aware that their score on the IELTS test had no impact on their final grades so they may not have been motivated to perform well. Although the VST had no impact either, participants may have been more motivated by it because it would tell them their vocabulary size at the end.

There is no reported literature to compare these results to. However, in 2014 a group of CAS students sat an official IELTS exam as part of MOHE IELTS benchmarking exercise. That group completed a short preparation course and they recorded average scores of 4.5 overall and 4.0 – 4.5 in listening scores. The average score reported in this current study also seems low when you consider the average IELTS listening score reported by UCLES in Oman is 5.09 (IELTS, 2017(d)) Accordingly, the IELTS listening scores could underestimate the actual listening proficiency and this limits the interpretation that can be made.

#### **4.6 Conclusion**

In terms of the first four research questions, although reported correlations show that there is a relationship between IELTS and GPA, the correlations between GFP overall score, vocabulary and GPA are stronger, but this is in part due to the truncated sample. However, the multiple regression showed that IELTS was the least predictive of the three measures used. Overall, the regression model accounted for around 43% of the variance in GPA scores, which suggests that there are other variables which could be added to the model to increase its predictive power.

For research question five, a medium effect was reported between IELTS listening and CAS Final exam listening scores. This seems to suggest that the CAS final listening exam may not be equivalent to an IELTS 5.0 which may mean that CAS students' proficiency is lower than the required entry standard of IELTS 5.0.



## **Chapter 5 - Conclusion**

### *5.1 Introduction*

This chapter presents a summary of the key findings of the study followed by a discussion of some practical implications of the findings and recommendations for further research.

### *5.2 Summary of key findings*

Data was collected from 33 CAS year one students to test the predictive validity of three proficiency measures: IELTS, vocabulary size, and the GFP final score. GPA was used to measure academic success. This data was then analysed using correlation and multiple regression analysis.

Overall, the study found that the combined measures could only predict 42.8% of the variance in GPA. This means that there are other significant factors beyond language proficiency which contribute to CAS students' academic success. Of the language proficiency measures, IELTS was the least predictive and was not included in the final regression model. Vocabulary was found to be a significant predictor of academic achievement amongst CAS students, but the best predictor was the GFP final score.

This study had similar outcomes to other studies of predictive validity (Woodrow, 2006) (Yen & Kuzma, 2009), particularly where regression analysis had been carried out (Daller & Phelan, 2013) (Daller & Yixin, 2017). One difference was that it did not find that the predictive validity of IELTS was stronger with lower proficiency levels, however this was possibly as a result of the truncated scores for IELTS.

The findings on the predictive validity of these measures is specific to the Omani context where the research was carried out. Previous research has pointed towards the need for context specific studies in this field (Woodrow, 2006) (Breeze & Miller, 2011) and accordingly, the findings should not be generalized outside that context.

### *5.3 Practical Implications and recommendations for further research*

As only 42.8% of the variance in GPA scores could be explained by proficiency measures, i.e. CAS GFP score and vocabulary size this means that 57.2% of the variance is unexplained and other factors have a significant impact on the

academic achievement of CAS students. As part of the GFP, students also study Maths and IT. It would be interesting to extend the current regression model to include measures from these areas to determine whether they can contribute to understanding the variance GPA, particularly as the areas of study offered by CAS Sohar are engineering and IT. Other issues such as motivational issues should also be examined.

The results of this current study have shown that IELTS is not the best predictor of academic success in this context and that vocabulary size estimates may be a more useful tool in predicting students' success and failure. However, the CAS students' vocabulary size estimates are much lower than the literature recommends for students studying at an EMI HEI. The relationship established between vocabulary size and academic success suggests that greater emphasis needs to be placed on vocabulary acquisition in GFP to facilitate increased GPA in year 1. An initial review of the data produced by the VST shows gaps in knowledge in the 2k to 3k vocabulary lists and beyond the 4k list. The VST is not really designed to identify the level where gaps in vocabulary knowledge occur. So, further testing and research should be carried out with a larger sample and a suitable test instrument. Once the knowledge gaps have been identified adjustments can be made to the current curriculum.

Testing of vocabulary size of all GFP students along with the current assessment regime could help to identify academically at-risk students. The CAS average GPA scores are low when compared with Anglophone contexts. The average GPA score reported at CAS Sohar was 2.3. There are no national average GPA statistics currently available in Oman to compare to, however similar studies carried out in Omani HEIs report similar average GPA score. (Roche & Harrington, 2013) (Alkhausi, et al., 2015). However, CAS Sohar currently has a high proportion of students on academic probation and is actively looking for ways to identify these students early and provide them with enhanced support. Given the apparent relationship between vocabulary and academic success, tests of vocabulary size carried out at placement and before exit from the GFP could identify at risk students earlier so they could be given enhanced support.

A potential issue with the IELTS equivalence of the CAS exams was identified. To determine the extent of the issue a full benchmarking exercise needs to be carried

out. An IELTS benchmarking exercise is planned for later this year by the MoHE. A group of students from each CAS college will take the full IELTS exam. Further analysis of the result of this benchmarking exercise may give a clearer picture of the true IELTS band of the students and the equivalence of the CAS exams.

Overall, the results from this study seem to suggest that language proficiency is not enough to predict academic success in a group of Omani students studying at an EMI HEI. Other factors need to be considered. As Breeze & Miller (2011) concluded “Results from English-speaking countries cannot simply be transferred to other situations where many of the parameters are utterly different”. This current study seems to reinforce this need for further context specific research on predictive validity, particularly with Arabic L1 speakers studying in an EMI HEI context.

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## **List of Appendices**

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## **Appendix 1 – Test instruments**

Two test instruments were used to collect the data required to measure the predictive validity of the three independent variables. An IELTS listening test and the VST vocabulary size test.

### **1. IELTS Listening**

An IELTS listening test was given to the participants (Cambridge, 2009). A copy of the test has been attached here.

# Test 1

## LISTENING

### SECTION 1 Questions 1-10

#### Questions 1-5

Complete the notes below.

Write **NO MORE THAN THREE WORDS** for each answer.

### Transport from Airport to Milton

Example	Answer
Distance:	.....147..... miles

#### Options:

- Car hire
  - don't want to drive
- 1 .....
  - expensive
- Greyhound bus
  - \$15 single, \$27.50 return
  - direct to the 2 .....
  - long 3 .....
- Airport Shuttle
  - 4 ..... service
  - every 2 hours
  - \$35 single, \$65 return
  - need to 5 .....

10

REPRODUCED FROM: CAMBRIDGE IELTS 7, 2009  
CAMBRIDGE UNIVERSITY PRESS

Listening

Questions 6–10

Complete the booking form below.

Write **ONE WORD AND/OR A NUMBER** for each answer.

AIRPORT SHUTTLE BOOKING FORM			
To:	Milton		
Date:	6 .....	No. of passengers:	One
Bus Time:	7 ..... pm	Type of ticket:	Single
Name:	Janet 8 .....		
Flight No:	9 .....	From:	London Heathrow
Address in Milton:	Vacation Motel, 24, Kitchener Street		
Fare:	\$35		
Credit Card No:	(Visa) 10 .....		

Test 1

**SECTION 2**      *Questions 11–20*

*Questions 11–16*

Choose the correct letter, *A, B* or *C*.

- 11 PS Camping has been organising holidays for
- A 15 years.
  - B 20 years.
  - C 25 years.
- 12 The company has most camping sites in
- A France.
  - B Italy.
  - C Switzerland.
- 13 Which organised activity can children do every day of the week?
- A football
  - B drama
  - C model making
- 14 Some areas of the sites have a 'no noise' rule after
- A 9.30 p.m.
  - B 10.00 p.m.
  - C 10.30 p.m.
- 15 The holiday insurance that is offered by PS Camping
- A can be charged on an annual basis.
  - B is included in the price of the holiday.
  - C must be taken out at the time of booking.
- 16 Customers who recommend PS Camping to friends will receive
- A a free gift.
  - B an upgrade to a luxury tent.
  - C a discount.

*Listening*

*Questions 17–20*

What does the speaker say about the following items?

Write the correct letter, *A, B or C*, next to questions 17–20.

- |          |  |
|----------|--|
| <b>A</b> | They are provided in all tents.                  |
| <b>B</b> | They are found in central areas of the campsite. |
| <b>C</b> | They are available on request.                   |

- 17 barbecues .....
- 18 toys .....
- 19 cool boxes .....
- 20 mops and buckets .....

Test 1

**SECTION 3**      *Questions 21–30*

**Questions 21–23**

Complete the notes below.

Write **ONE WORD ONLY** for each answer.

**DIFFERENCES BETWEEN INDIVIDUALS  
IN THE WORKPLACE**

Individuals bring different:

- ideas
- **21** .....
- learning experiences

Work behaviour differences are due to:

- personality
- **22** .....

Effects of diversity on companies:

*Advantage:* diversity develops **23** .....

*Disadvantage:* diversity can cause conflict



**Questions 24–27**

Choose the correct letter, **A**, **B** or **C**.

- 4 Janice thinks that employers should encourage workers who are
- A potential leaders.
  - B open to new ideas.
  - C good at teamwork.
- 5 Janice suggests that managers may find it difficult to
- A form successful groups.
  - B balance conflicting needs.
  - C deal with uncooperative workers.
- 6 Janice believes employers should look for job applicants who
- A can think independently.
  - B will obey the system.
  - C can solve problems.
- 7 Janice believes managers should
- A demonstrate good behaviour.
  - B encourage co-operation early on.
  - C increase financial incentives.

**Questions 28–30**

Complete the sentences below.

Write **ONE WORD ONLY** for each answer.

- 8 All managers need to understand their employees and recognise their company's .....
- 9 When managing change, increasing the company's ..... may be more important than employee satisfaction.
- 10 During periods of change, managers may have to cope with increased amounts of .....

## 2. VST

The VST (VocabularySize.com, 2010) is an on-line vocabulary test, so it cannot be included here or even on a USB. It was developed from the papers based VST written by Paul Nation (Nation, 2006). However, some screen shots of the test have been included here to show the how the test instrument works. The full test can be viewed at <http://my.vocabularysize.com/select/test> (VocabularySize.com, 2010)

Students open the website and chose to start the test (figure 3). Then they are asked to choose their native language. Arabic has been chosen here as that is what the participants of this study would have chosen (figure 4). The appropriate test is selected and the participant is given some instructions and a practice question (figures 5 and 6). They must answer this question correctly to be able to start the test (figure 7). The test then commences and students have to answer 140 questions. This is a slightly different version of the test used in the current study as a further option "I don't know" has recently been added (figure 8 and 9). After the participant has completed the test they are asked to fill in some demographic details before they are given the test results (figure 10). The test results are given in terms of word families with an indication of what that vocabulary size means (figure 11). Then an explanation of word families and some advice is given about improving vocabulary (Figure 12). The researcher can then view the results in their account.



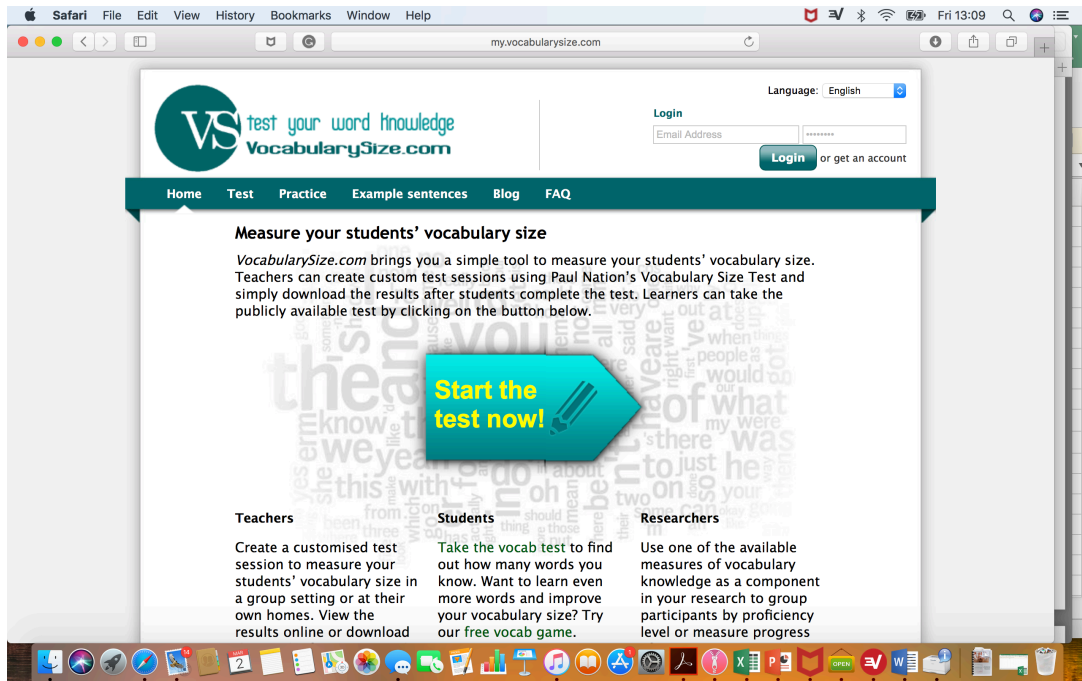


Figure 3 – Screenshot from VocabularySize.com

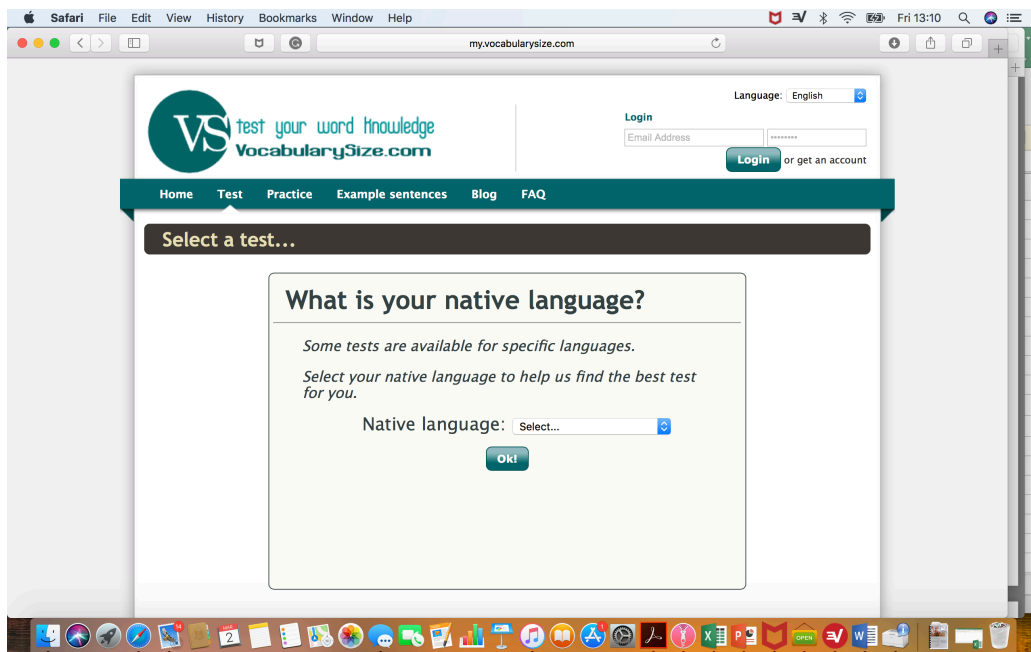


Figure 4 – Screenshot from VocabularySize.com

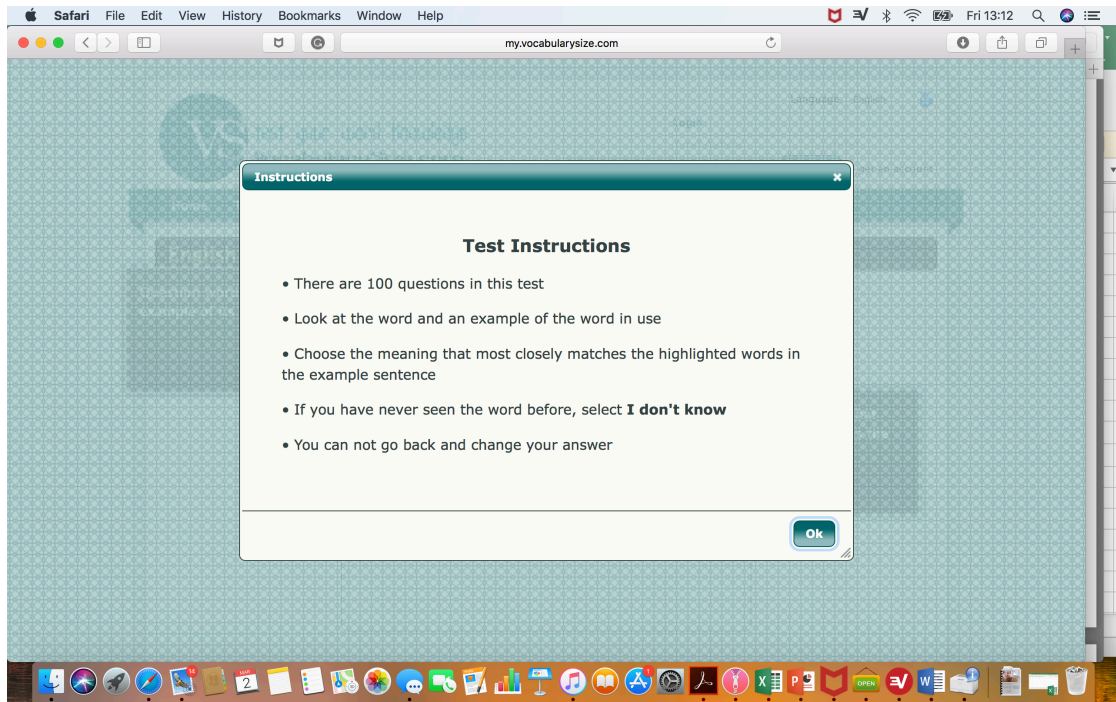


Figure 5 – Screenshot from VocabularySize.com

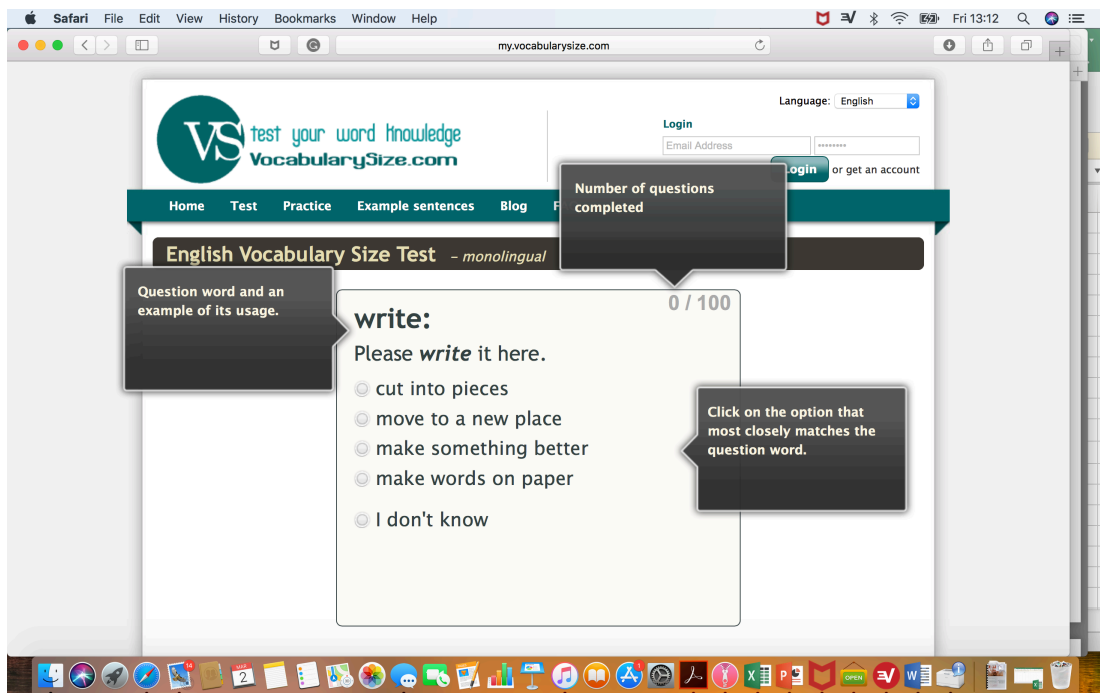


Figure 6 – Screenshot from VocabularySize.com

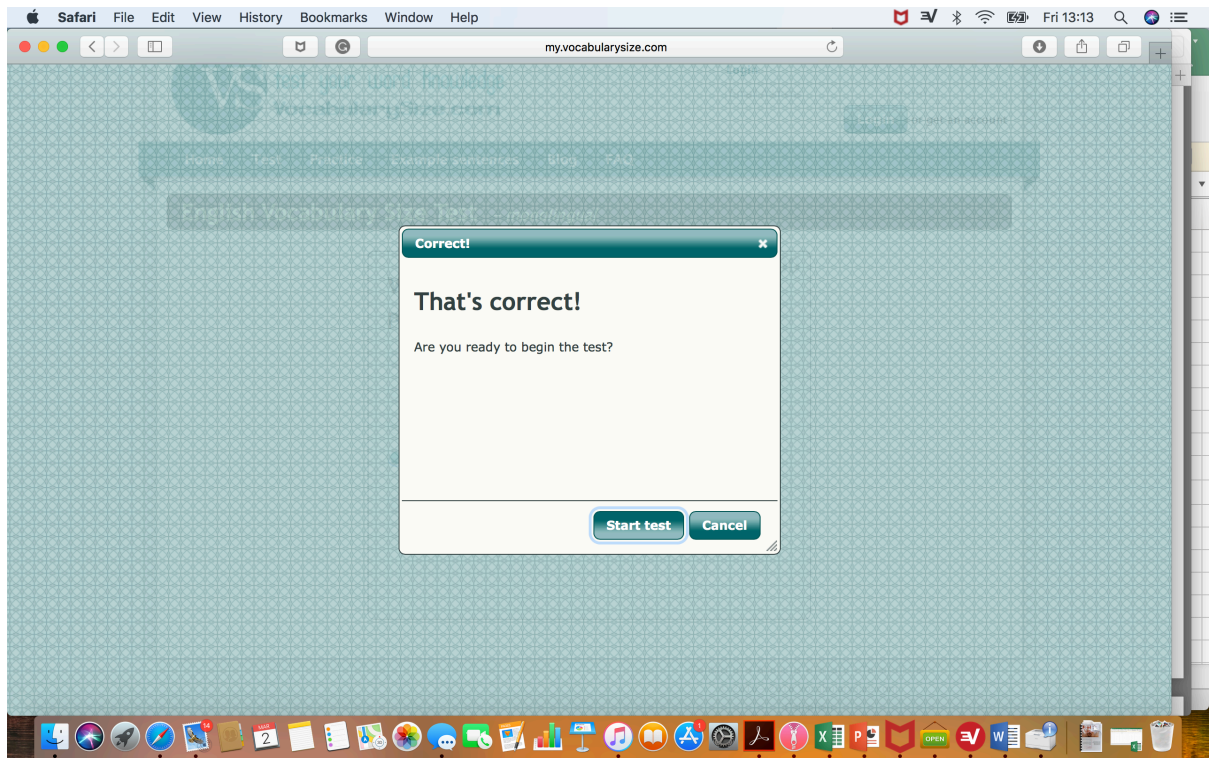


Figure 7 – Screenshot from VocabularySize.com

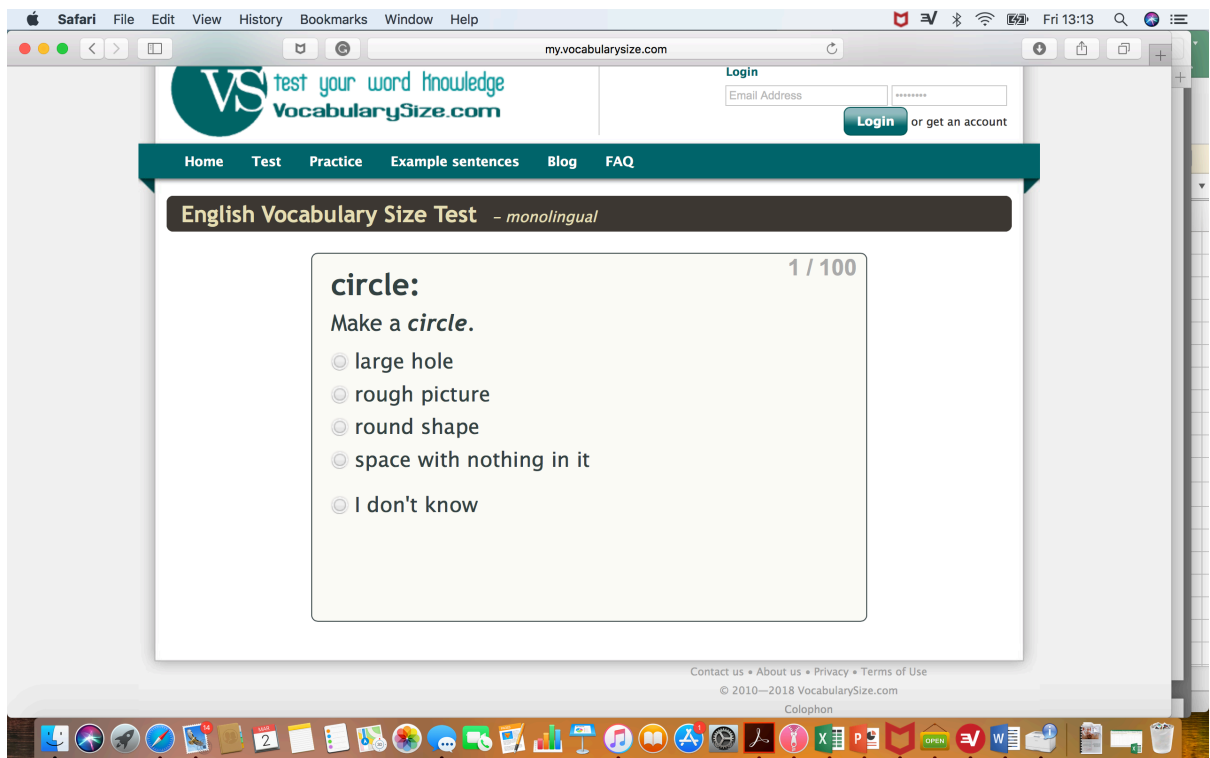


Figure 8 – Screenshot from VocabularySize.com

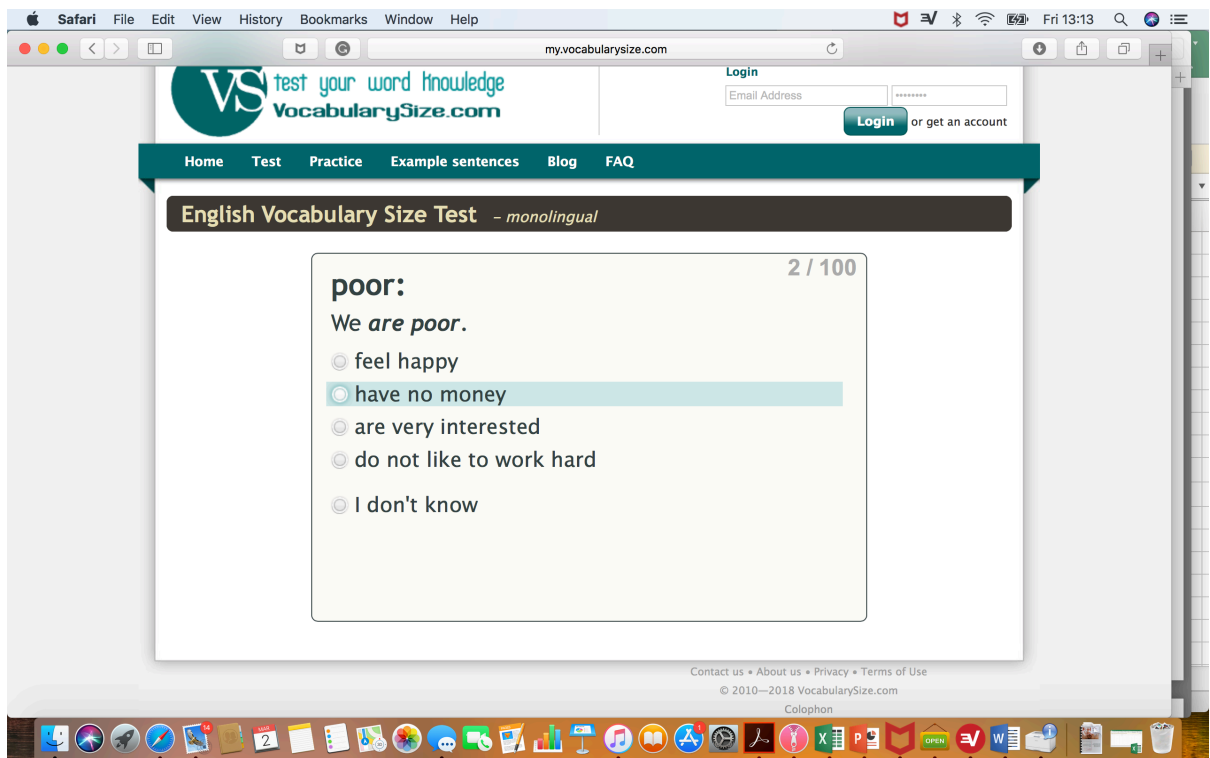


Figure 9 – Screenshot from VocabularySize.com

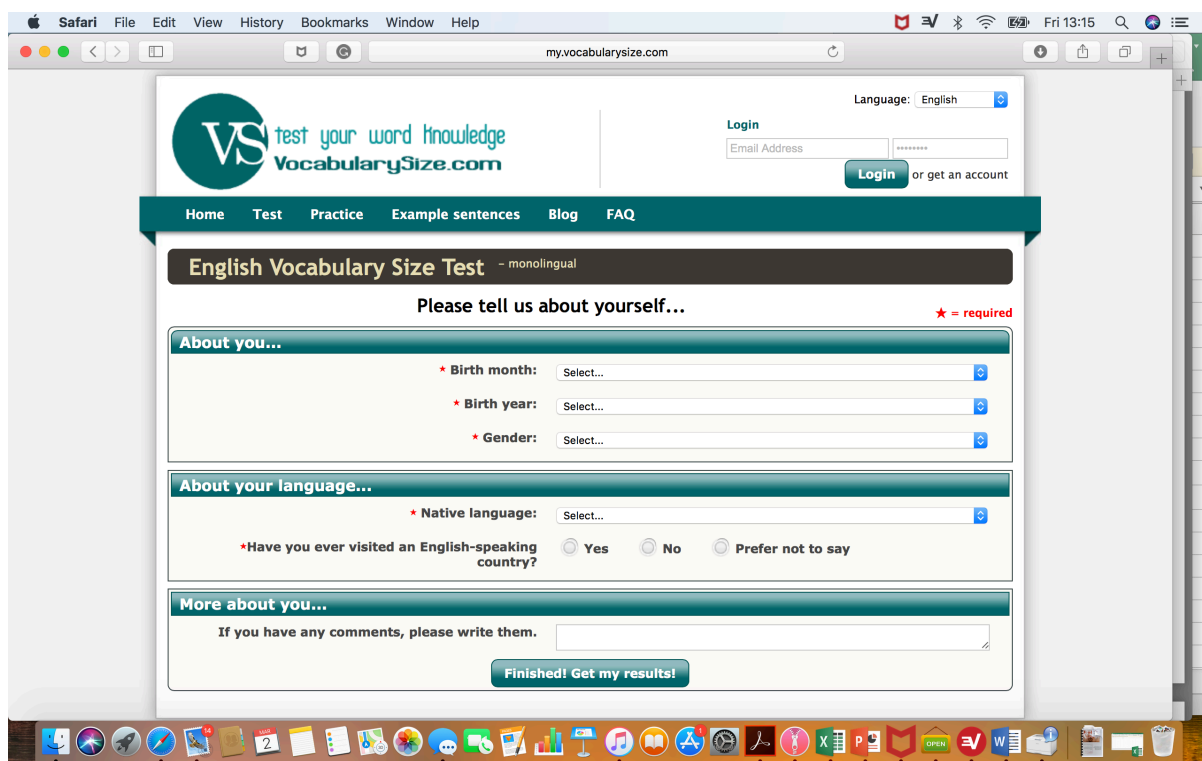


Figure 10 – Screenshot from VocabularySize.com

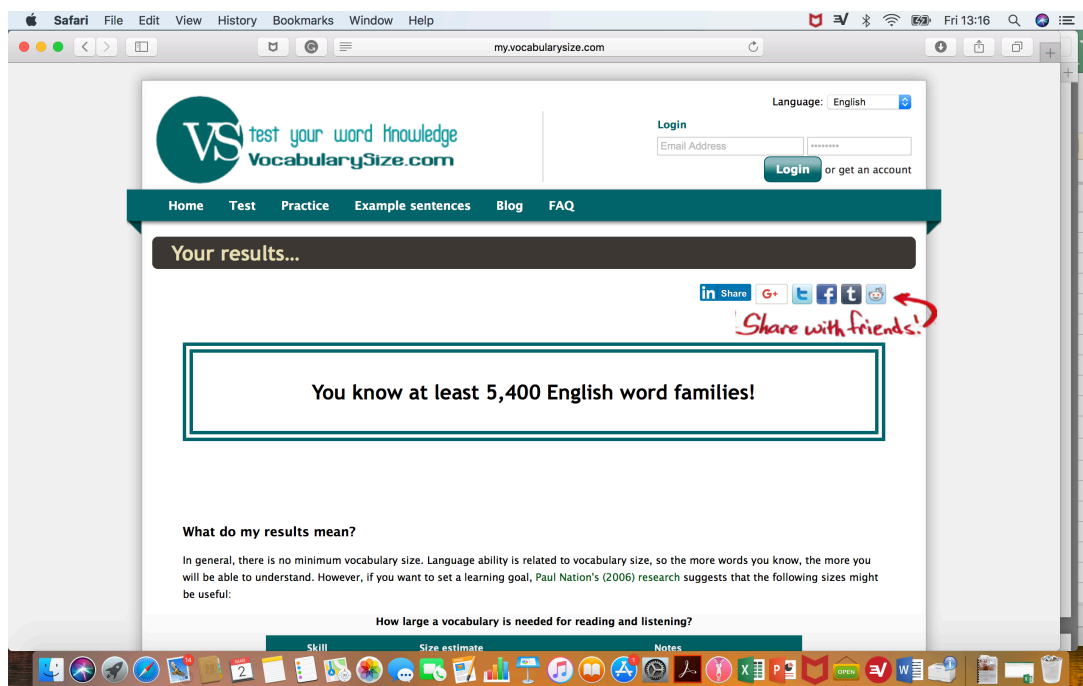


Figure 11- Screenshot from VocabularySize.com

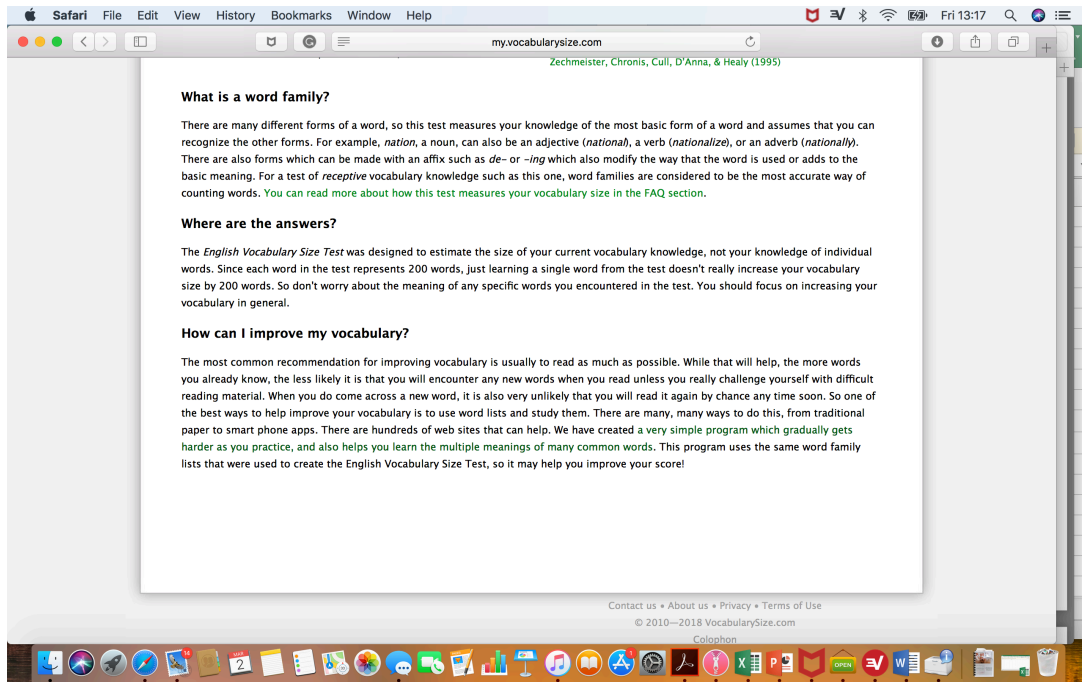


Figure 12 – Screenshot from VocabularySize.com

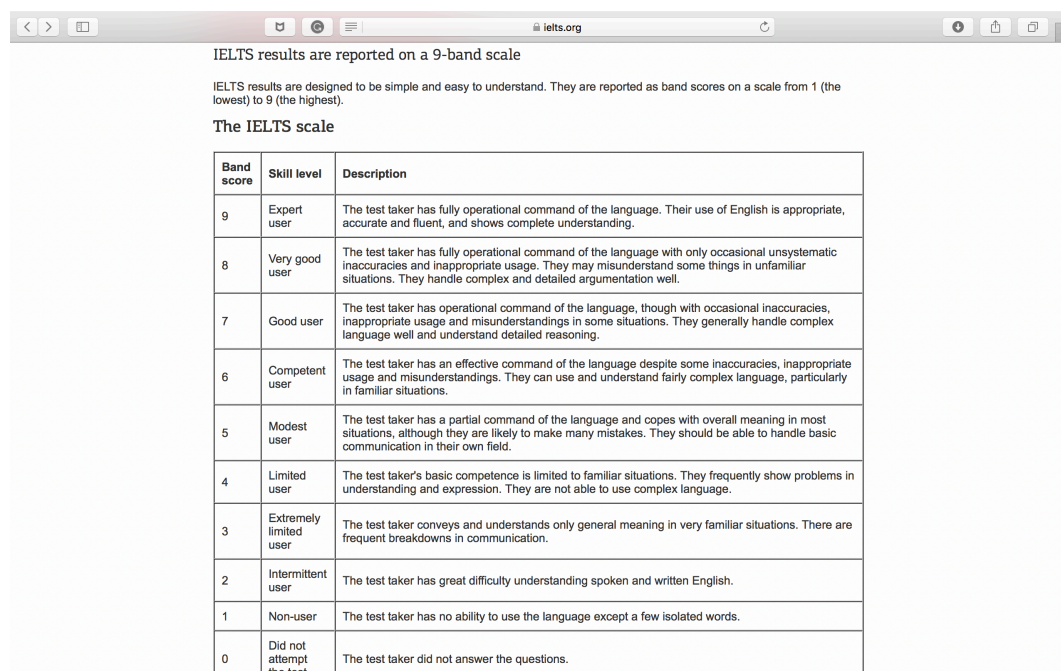


## Appendix 2 – Conversion of IELTS raw scores to band scores

One of the predictive measures used in the study was IELTS listening. The participants were given an IELTS listening test which was double marked and the raw scores recorded on a spreadsheet (Appendix 7 has the complete data set). A test taker doing an official IELTS test would not be given a raw score, instead they would be given a band score. Accordingly, it was necessary to convert the raw scores in this study to a band score. IELTS provide a score converter on their website for band scores over 5.0, however there is no official conversion available for band scores below 5.0. As the majority of the participants scores fell below band score 5.0, it was necessary to devise a way of converting these raw scores to band scores

### 1. IELTS band scores

IELTS results are divided into 9 band scores where 9 is the highest and 1 is the lowest. The band scores are designed to show the level of proficiency of the test taker and what can be expected of a user at that level.



The screenshot shows a web browser window with the URL [ielts.org](https://www.ielts.org). The page content includes the heading "IELTS results are reported on a 9-band scale" and a paragraph explaining that IELTS results are reported as band scores on a scale from 1 to 9. Below this is the heading "The IELTS scale" followed by a table with three columns: Band score, Skill level, and Description.

Band score	Skill level	Description
9	Expert user	The test taker has fully operational command of the language. Their use of English is appropriate, accurate and fluent, and shows complete understanding.
8	Very good user	The test taker has fully operational command of the language with only occasional unsystematic inaccuracies and inappropriate usage. They may misunderstand some things in unfamiliar situations. They handle complex and detailed argumentation well.
7	Good user	The test taker has operational command of the language, though with occasional inaccuracies, inappropriate usage and misunderstandings in some situations. They generally handle complex language well and understand detailed reasoning.
6	Competent user	The test taker has an effective command of the language despite some inaccuracies, inappropriate usage and misunderstandings. They can use and understand fairly complex language, particularly in familiar situations.
5	Modest user	The test taker has a partial command of the language and copes with overall meaning in most situations, although they are likely to make many mistakes. They should be able to handle basic communication in their own field.
4	Limited user	The test taker's basic competence is limited to familiar situations. They frequently show problems in understanding and expression. They are not able to use complex language.
3	Extremely limited user	The test taker conveys and understands only general meaning in very familiar situations. There are frequent breakdowns in communication.
2	Intermittent user	The test taker has great difficulty understanding spoken and written English.
1	Non-user	The test taker has no ability to use the language except a few isolated words.
0	Did not attempt the test	The test taker did not answer the questions.

Figure 13 – IELTS band scores (Taken from IELTS website

<https://www.ielts.org/about-the-test/how-ielts-is-scored>) (IELTS, 2017(a))

## 2. Converting raw scores to band scores

The IELTS website shows test takers how to convert raw scores to band scores (IELTS, 2017(b)). Figure M21 is a screen shot of the conversion table taken from this website.

The tables below indicate the average number of marks required to achieve a particular band score in Listening, Academic Reading and General Training Reading.

Listening		Academic Reading		General Training Reading	
Band score	Raw score out of 40	Band score	Raw score out of 40	Band score	Raw score out of 40
5	16	5	15	4	15
6	23	6	23	5	23
7	30	7	30	6	30
8	35	8	35	7	34

Figure 14– Conversion of IELTS raw score to band score. (Taken from IELTS website <https://www.ielts.org/ielts-for-organisations/ielts-scoring-in-detail>)

The majority of students in the current study scored below 16 out of 40 in the listening test so no raw score to band score conversion was available. There are a number of unofficial websites which give score conversions. After reviewing these, the following conversion table was agreed between the two markers. It was also decided that half band scores e.g. 5.5, were required as these would be awarded in the official exam, so a conversion was set for these too.

The raw scores on the spreadsheet were then converted by the researcher and then double checked by the second marker. The band scores were then transferred to SPSS ready for analysis.



Band Score	Raw Score out of 40
6.0	23 – 29
5.5	19 – 22
5.0	16 – 18
4.5	13 – 15
4.0	11 – 12
3.5	8 – 10
3.0	6 – 7
2.0	4 – 5
1.0	1 – 3

*Table 11 – Table used to convert IELTS raw scores to band scores.*

### Appendix 3 – Reliability Measures

The Cronbach's Alpha scores were calculated for the IELTS listening and VST. First, item analysis was carried out on an Excel spreadsheet for both IELTS and the VST (this data is included on the flash drive of data include with the dissertation). Then this data was transferred to SPSS where the Alpha scores were calculated. The results of the reliability calculations are shown in the SPSS output below.

Reliability Statistics	
Cronbach's Alpha	N of Items
.998	140

Fig 15 Cronbach's Alpha for VST calculated using SPSS

Reliability Statistics	
Cronbach's Alpha	N of Items
.981	40

Fig 16 Cronbach's Alpha for IELTS listening test calculated using SPSS

#### **Appendix 4– Ethical Considerations**

The study was carried out in accordance with the ethical guidelines of the XXXXXXXXXXXXXXXX and the College of Applied Sciences (CAS). Privacy and confidentiality of the recipients was respected throughout the research process. Appendix 5 contains a blank copy of the consent form and Appendix 6, the information sheet which was given to the students. The researcher has retained a list of the names of all the participants and the original, signed consent forms have been sent to UoR as requested. The original consent forms were damaged after a small flood in the researcher's office caused by heavy rain, so the students were asked to resign the consent forms.

The Deanship of CAS Sohar and the CAS Programme Director of English (PD English) gave permission for the students GFP marks and GPA scores to be used by the researcher (below). The PD English also gave permission for the average IELTS scores from a previous IELTS benchmarking test to be reported. The following email conversations show that the permission of the Dean and the PD English was sought to use CAS confidential data and that permission was granted.

The data collected was stored on the researcher's personal laptop which is password protected and the documents were also given a password. The IELTS listening data was only accessible to the researcher and two other teachers who acted as a second marker and third markers. The VST vocabulary size estimate was accessible to the researcher and the participants. The breakdown data provided by the VST site was only accessible to the researcher. The CAS exam marks and GPA are obviously available to students and other CAS employees as their primary purpose was not for this research project.





## Appendix 5 – Blank copy of the information sheet sent to students

### INFORMATION SHEET

**Dear Section 10/Section 20,**

I am doing some research for my Master's degree and I would like your help please. I need to collect some information from CAS Suhar year students and I have chosen your sections to help me. I want to try and find out if a student passes the final exam at the end of Foundation, will they will pass all their subjects in year one?

To find this out, I want to give you an **IELTS listening test** and a **Vocabulary test** and see what you're score is. I will then ask registration to tell me your **GPA** at the end of the first semester in Year 1 and compare it with your IELTS and vocabulary score. I also want to compare your IELTS score, vocabulary test score and your **final exam score** to see if they are similar.

I will keep your IELTS score, your vocabulary test score, Final Exam score and GPA on my computer. I will use a special password on all the computer files and delete the information when I am finished my Master's studies. I will keep the papers in a locked drawer in my office. I will use this information to write my final project for my Master's degree. I will not use your names. I will use your student numbers so no one will know it is your information. If you want to read a copy of my project send me an email and I will send you a copy.

If you agree, can you please sign your name and write the date on the page opposite. If you change your mind and don't want me to use your information you can email me and tell me.

This project has been subject to ethical review by the School Ethics Committee, and has been allowed to proceed under the exceptions procedure as outlined in paragraph 6 of the University's *Notes for Guidance* on research ethics

If you have any questions or want more information about my project you can ask me or you can email my project supervisor at my university. His name is

Thank you for your help.



## **Appendix 6 – Blank Copy of Consent Sheet sent to students**

### ETHICS COMMITTEE

#### Consent Form

**Project title:** The predictive validity of IELTS as an indicator of academic success in a group of Omani tertiary level students.

I understand the purpose of this research and understand what is required of me; I have read and understood the Information Sheet relating to this project, which has been explained to me by Miss XXXXXXXXXXXX. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.

I understand that my participation is entirely voluntary and that I the right to withdraw from the project at any time.

I have received a copy of this Consent Form and of the accompanying Information Sheet.

Name:

Signed:

Date:



## **Appendix 7 – Data set**

The study aimed to estimate the predictive validity of three different measures IELTS, Vocabulary Size and the performance in an in-house exam. Three instruments were used to collect the data required for the study IELTS listening test, VST on-line vocabulary test and CAS GFP overall score. The final data set used for analysis is shown below and is included on the flash drive included with the dissertation.

Table 11 shows the spreadsheet of data for Sample 1. In this sample data for all students who participated and gave consent to their data being used is included. Students who completed all measures are shown first followed by students who did not complete all the measures.

Data Sorted by Number of measures completed													
Participants Details				VST		IELTS			GPA	1= Include 0 = Exclude	GFP Mark	Listening Score	
ID	Section	Major	M/F	Score	Size	IELTS Score	No spelling penalty Score	IELTS Band					
1	2015293111	40	INTC	F	53	5300	4	6	3	1.72	1	65.50	18
2	2016293006	40	INTC	F	55	5500	14	15	4.5	2.29	1	68.00	18
6	2016293069	40	INTC	F	55	5500	13	17	5	2.56	1	79.50	19
7	2016293070	40	INTC	F	40	4000	7	9	3.5	2.29	1	84.50	20
9	2016293078	40	INTC	F	40	4000	4	4	2	2.46	1	71.50	17
10	2016293088	40	INTC	F	32	3200	9	11	4	2.24	1	84.00	19
11	2016293102	40	INTC	F	49	4900	10	10	3.5	3.21	1	78.50	19
14	2016293112	40	INTC	F	59	5900	9	12	4	3.47	1	93.50	16
15	2016293132	40	INTC	F	42	4200	7	10	3.5	1.54	1	57.00	14
16	2016298140	40	ENGN	F	54	5400	5	5	2	2.93	1	68.50	19
17	2014293201	60	INTC	F	32	3200	3	3	1	1.27	1	57.00	20
18	2015298009	60	ENGN	M	55	5500	12	13	4.5	2.98	1	84.00	19
20		60	INTC	M	72	7200	9	11	4	2.49	1	73.50	9
21		60	INTC	M	73	7300	6	7	3	1.1	1	70.00	19
22	2016293039	60	INTC	F	45	4500	7	8	3.5	2.4	1	82.50	6
25	2016298039	60	ENGN	M	50	5000	4	9	3.5	1.56	1	75.50	14
27	2016298053	60	ENGN	F	52	5200	8	10	3.5	2.95	1	85.00	6
28	2016298067	60	ENGN	M	38	3800	4	6	3	2.48	1	79.00	19
29	2016298079	60	ENGN	F	50	5000	15	15	4.5	3.02	1	82.00	20
32	2016298159	60	ENGN	F	47	4700	10	12	4	2.98	1	76.00	10
34	2016298021	90	ENGN	M	14	1400	7	7	3	0.51	1	77.00	20
35	2016298046	90	ENGN	F	27	2700	8	8	3.5	2.29	1	79.50	18
36	2016298015	90	ENGN	F	37	3700	7	9	3.5	2.29	1	86.00	20
37	2016298145	90	ENGN	M	47	4700	8	9	3.5	1.79	1	83.00	16
38	2016289066	90	ENGN	F	25	2500	9	10	3.5	2.68	1	78.50	18
39	2016298001	90	ENGN	M	41	4100	7	8	3.5	1.4	1	74.50	19
41	2016298007	90	ENGN	M	39	3900	6	6	3	0.51	1	63.50	18
42	2016298062	90	ENGN	M	45	4500	8	8	3.5	1.93	1	83.50	17
43	2016298156	90	ENGN	M	27	2700	6	6	3	1.84	1	59.00	18
45	2016298003	100	ENGN	F	40	4000	7	7	3	2.86	1	80.00	17
46	2016298011	100	ENGN	F	44	4400	13	18	5	2.88	1	85.00	18
50	2016298057	100	ENGN	F	44	4400	4	4	2	2.26	1	72.00	17
53	2016298089	100	ENGN	F	49	4900	16	20	5.5	3.26	1	92.50	20
55	2016298096	100	ENGN	F	34	3400	7	10	3.5	2.74	1	78.00	18
57	2016298124	100	ENGN	F	40	4000	5	5	2	3.01	1	70.00	11
3	2016293010	40	INTC	F	47	4700	A	A	A	2.51	0	81.00	16
4	2016293050	40	INTC	F	49	4900	A	A	A	3.28	0	80.00	16
5	2016293053	40	INTC	F	52	5200	A	A	A	1.41	0	70.50	18
8	2016293071	40	INTC	F	46	4600	A	A	A	2.76	0	73.00	16
12	2016293110	40	INTC	F	62	6200	A	A	A	2.62	0	76.00	11
13	2016293111	40	INTC	F	28	2800	A	A	A	1.53	0	65.50	18
19	2015298082	60	ENGN	M	72	7200	A	A	A	0.82	0	80.00	15
24	2016298035	60	ENGN	F	45	4500	A	A	A	3.08	0	87.50	19
26	2016298042	60	ENGN	M	53	5300	A	A	A	2.28	0	89.50	17
30	2016298082	60	ENGN	M	60	6000	A	A	A	2.44	0	85.00	18
31	2016298109	60	ENGN	F	35	3500	A	A	A	2.17	0	82.00	16
33	2016298033	60	ENGN	F	A	A	12	14	4.5	3.37	0	89.00	19
40	2016298158	90	ENGN	M	37	3700	A	A	A	2.11	0	76.50	18
44	2016298171	90	ENGN	F	A	A	6	6	3	3.07	0	86.50	13
47	2016298019	100	ENGN	F	50	5000	A	A	A	2.73	0	74.50	14
48	2016298040	100	ENGN	M	31	3100	A	A	A	0.87	0	71.50	19
51	2016298061	100	ENGN	F	50	5000	A	A	A	1.81	0	68.00	16
52	2016298085	100	ENGN	M	50	5000	A	A	A	1.84	0	64.50	17
54	2016298091	100	ENGN	M	43	4300	A	A	A	1.91	0	72.00	19
56	2016298118	100	ENGN	F	51	5100	A	A	A	2.54	0	75.00	16
57	2016298122	100	ENGN	M	A	A	8	8	3.5	3	0	82.00	16
					Mean	45.42	4542	8	9.37	3.46	2.29	76.90	16.66
					Std. Dev	11.74	1174.15	3.247	3.98	0.911	0.73	8.47	3
					No. of participants	53	53	38	38	38	56	56	56

Table 11 - Data Set (Sample 1)

Due to unexpected high scores and behaviour during the test, it was suspected that two students had used mobile phones during the VST. Their data was removed and this reduced data set became Sample 2 (See table 12). The descriptive statistics of the data set sample 2 are shown below the data. This was the data set used for analysis. Table 13 shows the data set Sample 2. as it was exported to SPSS. The titles shown at the top of the table are the variable names which were used in the SPSS analysis.

Final Data Set used in SPSS for analysis

Participant Details				VST		IELTS			GPA	1= Include 0 = Exclude	GFP Mark	CAS Listening Score
Section	Major	M/F	Score	Size	IELTS Score	No spelling penalty Score	Band					
1	40	INTC	F	53	5300	4	6	3	1.72	1	65.50	18
2	40	INTC	F	55	5500	14	15	4.5	2.29	1	68.00	18
6	40	INTC	F	55	5500	13	17	5	2.56	1	79.50	19
7	40	INTC	F	40	4000	7	9	3.5	2.29	1	84.50	20
9	40	INTC	F	40	4000	4	4	2	2.46	1	71.50	17
10	40	INTC	F	32	3200	9	11	4	2.24	1	84.00	19
11	40	INTC	F	49	4900	10	10	3.5	3.21	1	78.50	19
14	40	INTC	F	59	5900	9	12	4	3.47	1	93.50	16
15	40	INTC	F	42	4200	7	10	3.5	1.54	1	57.00	14
16	40	ENGN	F	54	5400	5	5	2	2.93	1	68.50	19
17	60	INTC	F	32	3200	3	3	1	1.27	1	57.00	20
18	60	ENGN	M	55	5500	12	13	4.5	2.98	1	84.00	19
20										0		
21										0		
22	60	INTC	F	45	4500	7	8	3.5	2.4	1	82.50	6
25	60	ENGN	M	50	5000	4	9	3.5	1.56	1	75.50	14
27	60	ENGN	F	52	5200	8	10	3.5	2.95	1	85.00	6
28	60	ENGN	M	38	3800	4	6	3	2.48	1	79.00	19
29	60	ENGN	F	50	5000	15	15	4.5	3.02	1	82.00	20
32	60	ENGN	F	47	4700	10	12	4	2.98	1	76.00	10
34	90	ENGN	M	14	1400	7	7	3	0.51	1	77.00	20
35	90	ENGN	F	27	2700	8	8	3.5	2.29	1	79.50	18
36	90	ENGN	F	37	3700	7	9	3.5	2.29	1	86.00	20
37	90	ENGN	M	47	4700	8	9	3.5	1.79	1	83.00	16
38	90	ENGN	F	25	2500	9	10	3.5	2.68	1	78.50	18
39	90	ENGN	M	41	4100	7	8	3.5	1.4	1	74.50	19
41	90	ENGN	M	39	3900	6	6	3	0.51	1	63.50	18
42	90	ENGN	M	45	4500	8	8	3.5	1.93	1	83.50	17
43	90	ENGN	M	27	2700	6	6	3	1.84	1	59.00	18
45	100	ENGN	F	40	4000	7	7	3	2.86	1	80.00	17
46	100	ENGN	F	44	4400	13	18	5	2.88	1	85.00	18
50	100	ENGN	F	44	4400	4	4	2	2.26	1	72.00	17
53	100	ENGN	F	49	4900	16	20	5.5	3.26	1	92.50	20
55	100	ENGN	F	34	3400	7	10	3.5	2.74	1	78.00	18
57	100	ENGN	F	40	4000	5	5	2	3.01	1	70.00	11
3	40	INTC	F	47	4700	A	A	A	2.51	0	81.00	16
4	40	INTC	F	49	4900	A	A	A	3.28	0	80.00	16
5	40	INTC	F	52	5200	A	A	A	1.41	0	70.50	18
8	40	INTC	F	46	4600	A	A	A	2.76	0	73.00	16
12	40	INTC	F	62	6200	A	A	A	2.62	0	76.00	11
13	40	INTC	F	28	2800	A	A	A	1.53	0	65.50	18
19	60	ENGN	M	72	7200	A	A	A	0.82	0	80.00	15
24	60	ENGN	F	45	4500	A	A	A	3.08	0	87.50	19
26	60	ENGN	M	53	5300	A	A	A	2.28	0	89.50	17
30	60	ENGN	M	60	6000	A	A	A	2.44	0	85.00	18
31	60	ENGN	F	35	3500	A	A	A	2.17	0	82.00	16
33	60	ENGN	F	A	A	12	14	4.5	3.37	0	89.00	19
40	90	ENGN	M	37	3700	A	A	A	2.11	0	76.50	18
44	90	ENGN	F	A	A	6	6	3	3.07	0	86.50	13
47	100	ENGN	F	50	5000	A	A	A	2.73	0	74.50	14
48	100	ENGN	M	31	3100	A	A	A	0.87	0	71.50	19
51	100	ENGN	F	50	5000	A	A	A	1.81	0	68.00	16
52	100	ENGN	M	50	5000	A	A	A	1.84	0	64.50	17
54	100	ENGN	M	43	4300	A	A	A	1.91	0	72.00	19
56	100	ENGN	F	51	5100	A	A	A	2.54	0	75.00	16
57	100	ENGN	M	A	A	8	8	3.5	3	0	82.00	16
		Mean		42.45	4,245		9.39	3.44	2.32		76.77	16.52
		Std. Dev		10.17	1,017.07		4.12	0.95	0.736		9.26	3.48
		No. of participants		33	33	33	33	33	33		33	33

Table 12 - Data set (Sample 2)

Table 13 – Data Set (Sample 2)

Number	Section	Major	Gender	Score_Wor	Score_Words	IELTS_score	IELTS_Score_NSP	IELTS_Band	CAS_Score	CAS_FY_Grade	CAS_GES_Score	GPA	CAS_Listening_Score
1	40	INTC	F	53	5300	4.00	6.00	3.0	65.50	65.50	68.20	1.72	18.00
2	40	INTC	F	55	5500	14.00	15.00	4.5	68.00	68.00	71.00	2.29	18.00
6	40	INTC	F	55	5500	13.00	17.00	5.0	79.50	79.50	79.80	2.56	19.00
7	40	INTC	F	40	4000	7.00	9.00	3.5	84.50	84.50	81.40	2.29	19.00
9	40	INTC	F	40	4000	4.00	4.00	2.0	71.50	71.50	65.60	2.46	14.00
10	40	INTC	F	32	3200	9.00	11.00	4.0	84.00	84.00	82.00	2.24	19.00
11	40	INTC	F	49	4900	10.00	10.00	3.5	78.50	78.50	76.70	3.21	20.00
14	40	INTC	F	59	5900	9.00	12.00	4.0	93.50	93.50	89.10	3.47	19.00
15	40	INTC	F	42	4200	7.00	10.00	3.5	57.00	57.00	47.40	1.54	6.00
16	40	ENGN	F	54	5400	5.00	5.00	2.0	68.50	68.50	67.20	2.93	14.00
17	60	INTC	F	32	3200	3.00	3.00	1.0	57.00	57.00	47.40	1.27	6.00
18	60	ENGN	M	55	5500	12.00	13.00	4.5	84.00	84.00	78.70	2.98	19.00
22	60	INTC	F	45	4500	7.00	8.00	3.5	82.50	82.50	74.80	2.40	18.00
25	60	ENGN	M	50	5000	4.00	9.00	3.5	75.50	75.50	74.40	1.56	16.00
27	60	ENGN	F	52	5200	8.00	10.00	3.5	85.00	85.00	77.70	2.95	19.00
28	60	ENGN	M	38	3800	4.00	6.00	3.0	79.00	79.00	69.50	2.48	18.00
29	60	ENGN	F	50	5000	15.00	15.00	4.5	82.00	82.00	77.00	3.02	17.00
32	60	ENGN	F	47	4700	10.00	12.00	4.0	76.00	76.00	68.30	2.98	18.00
34	90	ENGN	M	14	1400	7.00	7.00	3.0	77.00	77.00	71.60	0.51	20.00
35	90	ENGN	F	27	2700	8.00	8.00	3.5	79.50	79.50	72.80	2.29	18.00
36	90	ENGN	F	37	3700	7.00	9.00	3.5	86.00	86.00	84.20	2.29	11.00
37	90	ENGN	M	47	4700	8.00	9.00	3.5	83.00	83.00	82.10	1.79	16.00
38	90	ENGN	F	25	2500	9.00	10.00	3.5	78.50	78.50	73.20	2.68	16.00
39	90	ENGN	M	41	4100	7.00	8.00	3.5	74.50	74.50	78.00	1.40	18.00
41	90	ENGN	M	39	3900	6.00	6.00	3.0	63.50	63.50	53.50	0.51	11.00
42	90	ENGN	M	45	4500	8.00	8.00	3.5	83.50	83.50	74.40	1.93	18.00
43	90	ENGN	M	27	2700	6.00	6.00	3.0	59.00	59.00	63.80	1.84	15.00
45	100	ENGN	F	40	4000	7.00	7.00	3.0	80.00	80.00	71.80	2.86	17.00
46	100	ENGN	F	44	4400	13.00	18.00	5.0	85.00	85.00	79.20	2.88	18.00
50	100	ENGN	F	44	4400	4.00	4.00	2.0	72.00	72.00	67.10	2.26	18.00
53	100	ENGN	F	49	4900	16.00	20.00	5.5	92.50	92.50	90.80	3.26	19.00
55	100	ENGN	F	34	3400	7.00	10.00	3.5	78.00	78.00	73.40	2.74	17.00
57	100	ENGN	F	40	4000	5.00	5.00	2.0	70.00	70.00	66.00	3.01	16.00

Table 13 - Data set as shown in data view in SPSS (Sample 2)

Table 14 – Data set as shown in data view in SPSS (Sample 2)

## Appendix 8 – SPSS Output

All statistical analysis was carried out on SPSS. The output document which shows the correlation coefficients and the regression analysis generated from the data are shown below.

### Regression

Notes		
Output Created		31-JAN-2018 15:14:58
Comments		
Input	Data	/Users/dorothyramsay/Documents/Masters-Vocabulary Size Data 1.sav
	Active Dataset	DataSet2
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	33
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.

Syntax		REGRESSION  /DESCRIPTIVES MEAN STDDEV CORR SIG N  /MISSING LISTWISE  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL CHANGE ZPP  /CRITERIA=PIN(.05) POUT(.10)  /NOORIGIN  /DEPENDENT GPA  /METHOD=BACKWARD IELTS_Band CAS_Score Score_Word_Families  /RESIDUALS DURBIN  /CASEWISE PLOT(ZRESID) OUTLIERS(2).
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.00
	Memory Required	8560 bytes
	Additional Memory Required for Residual Plots	0 bytes

### Descriptive Statistics

	Mean	Std. Deviation	N
CAS Y1 GPA score	2.3212	.73631	33
IELTS Band	3.439	.9500	33
CAS FY Overall score	76.7727	9.26021	33
Score in number of word families	42.45	10.171	33

**Correlations**

		CAS Y1 GPA score	IELTS Band	CAS FY Overall score	Score in number of word families
Pearson Correlation	CAS Y1 GPA score	1.000	.350	.544	.477
	IELTS Band	.350	1.000	.599	.349
	CAS FY Overall score	.544	.599	1.000	.225
	Score in number of word families	.477	.349	.225	1.000
Sig. (1-tailed)	CAS Y1 GPA score	.	.023	.001	.003
	IELTS Band	.023	.	.000	.023
	CAS FY Overall score	.001	.000	.	.104
	Score in number of word families	.003	.023	.104	.
N	CAS Y1 GPA score	33	33	33	33
	IELTS Band	33	33	33	33
	CAS FY Overall score	33	33	33	33
	Score in number of word families	33	33	33	33



**Variables Entered/Removed<sup>a</sup>**

Model	Variables Entered	Variables Removed	Method
1	Score in number of word families, CAS FY Overall score, IELTS Band <sup>b</sup>		Enter
2		IELTS Band	Backward (criterion: Probability of F-to-remove >= .100).

a. Dependent Variable: CAS Y1 GPA score

b. All requested variables entered.

**Model Summary<sup>c</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2
1	.659 <sup>a</sup>	.434	.375	.58208	.434	7.401	3	29
2	.655 <sup>b</sup>	.428	.390	.57495	-.005	.269	1	29

**Model Summary<sup>c</sup>**

Model	Change Statistics		Durbin-Watson
	Sig. F Change		
1		.001	
2		.608	1.716

a. Predictors: (Constant), Score in number of word families, CAS FY Overall score, IELTS Band

b. Predictors: (Constant), Score in number of word families, CAS FY Overall score

c. Dependent Variable: CAS Y1 GPA score

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.523	3	2.508	7.401	.001 <sup>b</sup>
	Residual	9.826	29	.339		
	Total	17.349	32			
2	Regression	7.432	2	3.716	11.241	.000 <sup>c</sup>
	Residual	9.917	30	.331		
	Total	17.349	32			

a. Dependent Variable: CAS Y1 GPA score

b. Predictors: (Constant), Score in number of word families, CAS FY Overall score, IELTS Band

c. Predictors: (Constant), Score in number of word families, CAS FY Overall score

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B
		B	Std. Error	Beta			Lower Bound
1	(Constant)	-1.764	.927		-1.903	.067	-3.660
	IELTS Band	-.073	.141	-.094	-.519	.608	-.361
	CAS FY Overall score	.041	.014	.512	2.933	.006	.012
	Score in number of word families	.029	.011	.394	2.643	.013	.006
2	(Constant)	-1.635	.882		-1.854	.074	-3.436
	CAS FY Overall score	.037	.011	.460	3.249	.003	.014
	Score in number of word families	.027	.010	.373	2.633	.013	.006

Model		Coefficients <sup>a</sup>					Collinearity Statistics	
		95.0% Confidence Interval for B	Correlations			Tolerance	VIF	
			Upper Bound	Zero-order	Partial			Part
1	(Constant)	.132						
	IELTS Band	.215	.350	-.096	-.073	.593	1.686	
	CAS FY Overall score	.069	.544	.478	.410	.641	1.560	
	Score in number of word families	.051	.477	.441	.369	.878	1.139	
2	(Constant)	.166						
	CAS FY Overall score	.060	.544	.510	.448	.949	1.053	
	Score in number of word families	.048	.477	.433	.363	.949	1.053	

a. Dependent Variable: CAS Y1 GPA score

Model		Dimension		Collinearity Diagnostics <sup>a</sup>			
				Eigenvalue	Condition Index	Variance Proportions	
				(Constant)	IELTS Band	CAS FY Overall score	Score in number of word families
1	1	3.920	1.000	.00	.00	.00	.00
	2	.042	9.718	.02	.62	.00	.33
	3	.033	10.953	.10	.11	.05	.64
	4	.005	27.072	.87	.27	.95	.03
2	1	2.959	1.000	.00		.00	.01
	2	.034	9.366	.06		.07	.99
	3	.007	20.599	.94		.93	.00

a. Dependent Variable: CAS Y1 GPA score

**Excluded Variables<sup>a</sup>**

Model	Beta In	t	Sig.	Partial Correlation	Collinearity Statistics			
					Tolerance	VIF	Minimum Tolerance	
2	IELTS Band	-.094 <sup>b</sup>	-.519	.608	-.096	.593	1.686	.593

a. Dependent Variable: CAS Y1 GPA score

b. Predictors in the Model: (Constant), Score in number of word families, CAS FY Overall score

**Casewise Diagnostics<sup>a</sup>**

Case Number	Std. Residual	CAS Y1 GPA score	Predicted Value	Residual
25	-2.143	.51	1.7421	-1.23215

a. Dependent Variable: CAS Y1 GPA score

**Residuals Statistics<sup>a</sup>**

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.2534	3.3802	2.3212	.48192	33
Residual	-1.23215	1.00295	.00000	.55669	33
Std. Predicted Value	-2.216	2.198	.000	1.000	33
Std. Residual	-2.143	1.744	.000	.968	33

a. Dependent Variable: CAS Y1 GPA score

