The Impact of IELTS Scores on Performance at University

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This paper considered two key issues. First, the relationship between English language proficiency, as measured by IELTS tests scores, and performance at University, as measured by Grade Point Average (GPA), was investigated using multi-level analysis. A significant and positive relationship was found. Second, the trade-off between raising IELTS entry scores and the consequent loss of international students was investigated at one South Australian university. Recommendations for raising IELTS scores for undergraduate and postgraduate students were made in the paper although it was recognised that on financial grounds the loss of international students might be too large to justify the increase in minimum English proficiency standards.

English proficiency, IELTS, academic performance, GPA, multilevel analysis

INTRODUCTION AND SIGNIFICANCE OF THE TOPIC

The proportion of funds that derive from government sources to support the core business of teaching students in universities is declining on a per capita basis. "Since the mid 1980s the higher education sector has grown at a rate faster than the level of Commonwealth funding for the sector" (Nelson, 2002, p.17) and "A return to full public funding of Australian universities will not occur. This would require a further $4 billion annually of Commonwealth funding." (Nelson, 2002, p.v). Therefore, income from other sources including "income from fee-paying students is an important and growing source of university revenue[1]" (Australian Vice Chancellors' Committee (AVCC) Fact Sheet 2, 2001, p.1). It follows that universities are increasingly dependent on alternative non-government sources of funding and full fee paying international students are a large and increasing source of that revenue[2]. Consequently, the financial future of Australian universities may well depend on the trend to enrol ever increasing numbers of international students who study both in Australia and offshore.

Additional to this funding imperative, there is both a moral and financial need to ensure that fee-paying international students who undertake university education are capable of succeeding. Hence, as for all university studies, standards are required to enable international fee-paying students to gain entry into university. These standards include academic entrance levels which are derived from a students' previous studies, work experience and academic entrance tests. In the case of international students from non-English speaking backgrounds, there is also a requirement that they have a minimum

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[1] In 1992 Fee-paying students contributed 5 per cent to university funding sources and in 1999 this rose to 12 per cent (AVCC Fact Sheet 2, 2001, p.1)
[2] Overseas fee paying students contribute 79 per cent of university fee-paying revenue (AVCC Fact Sheet 2, 2001, p.1)

standard of English proficiency for entrance into Australian courses and programs that are taught in English.

One of the most popular and most used tests of the standard of English is the International English Language Testing System (IELTS). IELTS scores are required for some students from particular countries[3] to gain their visas to enter Australia and Australian universities typically require students to have IELTS scores (or equivalent English proficiency standards) to gain entry. Although there are other English language proficiency tests available and in use, IELTS is the best regarded by Australian universities and the Australian government. The minimum IELTS score for university entrance is typically an average score of 6.0 (or equivalent) although some universities require higher scores for particular programs and postgraduate studies. "In general an Overall Band Score[4] between 6.0 and 7.0 in the Academic modules is accepted as evidence of English language proficiency for higher education institutions around the world" (Ciccarelli, 2001, p.1).

Despite these requirements there is a degree of disquiet amongst university colleagues about the English language abilities of some international students. In staff rooms and meetings they can be heard to be complaining about marking scripts of students whose English is below the standard that they consider acceptable for university study. Indeed, the recommendations published by IELTS Australia state that an IELTS score of 6.0 requires further English study for linguistically demanding academic courses and also linguistically less demanding academic courses and is said to be "acceptable" only for linguistically less demanding training courses. In fact, the IELTS guidelines recommend an IELTS score of 7.0 as "probably acceptable" for linguistically demanding academic courses and "acceptable" for linguistically less demanding courses (IELTS, 2001, p.22). It is clear that significant numbers of students are being admitted to Australian universities at a level below that suggested as acceptable by IELTS Australia.

This apparent contradiction between the levels of English deemed acceptable by most universities and the IELTS recommendations, and indeed the view of a growing number of academics, warrants further investigation. There is also a growing body of literature that suggests a link between English language proficiency and academic success:

> In relation to the IELTS test a number of predictive validity studies have been carried out which conclude that language proficiency is a critical factor in academic success and the IELTS is a useful predictor of a student's ability to cope with academic English (Ciccarelli, 2001, p.3).

Whilst the use of the word critical in the Cicarelli quote may overstate the statistical significance of the link between language proficiency and performance at university, it is indicative of the importance with which English language proficiency is viewed in some Australian universities.

However, Graham (1987, p.517), Burns (1991, p.75) and Dooey (1999, p.115) recommend that each institution conduct its own studies concerning the link between English proficiency levels and academic success and make its own decisions about acceptable English language proficiency levels. This suggestion is made for a number of reasons including the difficulty of generalising findings from previous studies and the limitations of these studies, many of

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[3] Recent changes in legislation require students from Categories 3 and 4 countries (such as Argentina and China) to have a minimum average IELTS score of 6.0 (or 5.0 IELTS and 30 weeks of English language study) to obtain a visa for tertiary study. Since July 1st, 2001 TOEFL or other equivalent tests are no longer acceptable for student visa purposes, unless gazetted by Parliament, as IELTS tests are viewed by the Department of Immigration as the test with the most integrity.

[4] The Overall Band score is the average of all four modules or sub-test items. Thus it is like an average test score for IELTS.

which are small-scale. In addition, it is argued, since there were a number of changes to the IELTS test in 1995 and much research was conducted prior to 1995, consequently further research is needed. The present study contributes to the field of research on English proficiency standards by using new statistical techniques to examine further the relationship between IELTS scores and academic performance for international students admitted in 2000 and 2001 to one university.

It is widely understood by academics and researchers that the reasons why students perform poorly at university are many, varied and complex. Personal background factors (for example age, gender, personality, attitude, and motivation), academic background factors and requirements (for example, previous studies within certain fields), teaching and support factors (for example, English language support and general study advice, the interest and ability of teaching staff) cultural factors and language proficiency factors all have a role to play in influencing how successful students will be in their tertiary study. For obvious reasons, particularly for international students cultural and language factors are prominent in the literature. Hill, Storch and Lynch (1999, p.63) claim "Nobody would argue that ELP [English Language proficiency] has no role to play in academic achievement". This study focuses on the impact of English language proficiency on performance.

LITERATURE REVIEW

This study focused on linguistic factors affecting performance by investigating the impact of English language proficiency tests on academic performance. Previous research has produced varied results. A number of studies (Criper and Davies, 1988; Elder, 1993; Ferguson and White, 1993; Cotton and Conrow, 1998; Hill et al, 1999; Kerstjens and Nery, 2000) have found a weak positive association between IELTS and GPA. A typical standardised regression coefficient of around 0.3 was common among many of these studies. However, in an Australian context at the University of Melbourne, Hill et al (1999, p.55) stated that that "the relationship between Grade Average and IELTS score was found to be moderately strong (r = 0.540)". To put this result in context, Hill et al (1999, p.55) also concluded "An examination of the various scatterplots suggested a violation of certain assumptions of the regression model".

At the University of Tasmania, Cotton et al (1998, p.98) found "a weak (positive) association for the Reading and Writing subtests (modules)" but "very low or negative associations between academic performance and the other subtest scores, as well as between IELTS global (average) scores and academic performance overall". Similarly, Kerstjens et al (2000, p.105), using RMIT student data found a "small-to medium predictive effect of academic performance from the IELTS score for the … Higher education group, accounting for ... 9.1 per cent of the variation in academic performance". At the University of Hong Kong, Ho and Spinks (1985, p.249) found that "English language skills had the most predictive value [compared to various factors such as intelligence and personality variables], accounting for about 10 per cent of the variance of performance measures.

Some studies found no statistically significant relationship between IELTS and academic performance (Traynor, 1985; Fiocco, 1987; Graham, 1987; Light, Xu, & Mossop, 1987; Gibson and Rusek, 1992; Rusek, 1992). In addition, others found their results inconclusive (Dooey, 1999, p.114). Dooey (1999, p.117) found that there was no evidence to suggest that students who did not meet the entry criteria (IELTS 6.0) were destined to fail but conversely most of the failures were students who entered Curtin University with high IELTS scores.

Moreover, it proved more difficult to find recent studies that predicted strong associations between the two variables. Dooey (1999, p. 115) claimed "most [studies] did not find a

strong overall positive association between IELTS scores and subsequent academic success". The exception seemed to be a study by Bellingham (1993, p.229) conducted in New Zealand that revealed a moderate association partly because of its unique nature in that it included students with a wide range of IELTS scores including some below 5.0. Most other studies were unable to include students with IELTS scores below 6.0 as this was the minimum entry standard required for university admission. The Bellingham study (1993, p. 231) found that "If these results were generalisable to the wider population, this would mean that with scores below 6.0 in IELTS, students have a 20 per cent chance of passing; whereas at 6.0 or more the chance is 50 per cent". Bellingham went on say that this finding was consistent with IELTS guidelines that at 6.5 "language proficiency is less likely to be a significant factor in influencing academic success". However further discussion in the Bellingham paper confirmed that factors other than language are also "integral to academic success".

Gibson and Rusek (1992, p.17) suggested that the contradictory results of various studies did not indicate that the tests were not valid measures of English proficiency but that "language skill is only one of the variables which predicts academic success, albeit an important one". They recommended that each institution should carry out its own research into acceptable English language levels based upon past student achievements.

In relation to the second research question, a minimum English language proficiency score of 6.0 IELTS has been established at a number of Australian universities. This level was informed by research and levels set by competing tertiary institutions. Ferguson et al from Edinburgh University have stated (1993, p.34) "Band 6 seems to represent some sort of cross-over line". Criper and Davies (1988, p.79) were also reported in Ferguson et al (1993, p.35) to have stated that Band 6 is "some kind of changeover score". Ferguson et al (1993, p.36) concluded "there is a level of proficiency below which failure increases sharply, and that language assumes a more important role in academic performance when proficiency is low." The study by Elder (1993, p.87) contradicted these findings to some extent as it indicated that "the strongest level of agreement between test predictions and academic outcomes occurred at Band 4.5 [which] casts some doubt on the recommendation that a Band score of 6.5 [should] be a minimum requirement".

RESEARCH QUESTIONS

This paper investigates two research questions. The first research question is What is the relationship between English language proficiency levels (as measured by IELTS scores) of international students and their academic performance at University, as measured by GPA? This question considers the degree to which IELTS test scores are meaningful predictors of success at university in 2000 and 2001.

The second research question considers whether the current minimum entrance score of IELTS 6.0 should be increased. The purpose of this research question is to examine whether there is a need to raise the minimum IELTS score that international students should have in order to gain admittance to university courses so they have a reasonable chance of success. This research question is investigated for both postgraduate and undergraduate students. The links between the two research questions is also investigated later in this paper.

METHOD

The method used to undertake the first research question in this study involved a commonly used technique called regression analysis.

> Regression analysis refers to a broad class of statistical techniques that are designed to study the relationship between a criterion (or dependent variable), *Y*, and one or more predictors (or independent variables), $X_1, X_2,…,X_p$. (Tatsuoka, 1997, p.648).

In this study the dependent variable was the performance of international students at university as measured by their Grade Point Average (GPA). The key independent variable was English proficiency as measured by students' IELTS scores on entry to university. The proposition addressed in this study was that there is a relationship between English proficiency levels (overall IELTS) and performance at university (GPA). Indeed, it was postulated that IELTS is positively related to performance of international students at this university.

Multiple regression analysis was undertaken in this investigation with the dependent variable of mean GPA and with the independent variables: IETLS and age (a continuous variable), semester of entry, division (broad discipline area of study), home country, gender, and level of study (postgraduate and undergraduate) which were categorical variables. Thus the general equation for this analysis was

$$\text{GPA} = f^{\,5} \qquad \text{(English proficiency, age, gender, entry semester, discipline area, home country, level of study)}$$

A particular type of regression analysis called multilevel analysis was conducted using GPAs gained progressively through Semester 1 to Semester 5. Five semesters were the maximum number of semesters studied by the international students who were accepted into the university in 2000 and 2001. Some students had only one mean GPA statistic for one semester if they enrolled in Semester 2, 2001 and others had up to five mean GPA scores if they enrolled in Semester 1, 2001 (one for each semester of enrolment in the two years and including a summer school). The multi level analysis used in this research was based upon models where sampling and measurement errors were estimated in a hierarchical manner at two levels. Use of this class of models assisted in the estimation of the impact of English language proficiency, as measured by IELTS test scores, over time as students progressed through their studies, while controlling for the effects of age, gender, entry semester, discipline area, home country and level of study. Multilevel analysis permitted a more appropriate and detailed intra and inter-student analysis of the relationship between IELTS and GPA than is possible with simple regression analysis using mean GPA scores.

The purpose of the multilevel analysis was to investigate the relationships between the variables, English language proficiency scores (IELTS) and GPA, at the intra and inter-student levels, after controlling for other factors that might influence GPA scores. The multilevel analysis was conducted using the hierarchical linear modelling (HLM) procedures (Bryk and Raudenbush, 1992). HLM made it possible to analyse variables at intra and inter-student levels simultaneously so that the impact of these variables on GPA were examined in one analysis. A further strength of HLM was that it was also possible to investigate the interaction effects between the variables at the two different levels.

According to Hox (1994, II) "multilevel regression models are essentially a multilevel version of the familiar regression model". Hox (1994, p.5) also stated "A multilevel problem is a problem that concerns the relationships between variables that are measured at a number of different hierarchical levels". Table 1 lists and explains the variables used in the analysis.

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[5] Where f is an unknown function but assumed to be linear for the purposes of the analysis

Table 1. Explanation of variables used in analysis

Variable	Score range and values	Notes
CRITERION		
GPA	1.43.-7.0	Mean Grade Point Average for students for a semester of study.
LEVEL 1		
OCCASION	Up to five time points	Changes to GPA over time.
LEVEL 2		
IELTS	4.5 – 8.5	International students' (recorded on the ISIS database) IELTS mean overall test score in either 2000 or 2001. These scores are the mean of four individual module scores for Reading, Writing, Speaking and Listening.
IELTS module scores	4-8	Individual test scores for each of the modules (Reading, Writing, Speaking and Listening). Their average is the overall mean IELTS score.
AGE	17-40	Age of student (in years).
GENDER	0 = male, 1 = female	Sex of student (Male or Female).
COUNTRY	1-35	Home country of student.
CHINA	0 = all other countries	Students born in China as a variable.
	1 = born in China	
VIET	0 = all other countries	Students born in Vietnam as a variable.
	1 = Vietnamese born	
LEVEL	0 = undergraduate	Level of study - Postgraduate or undergraduate study.
	1 = postgraduate	
DISCIPLINE	BUE, EAS, ALS, IEE, HSC	Broad area of study divided into six disciplines as defined by faculty (division) structures.
BUE	0- = all other disciplines	Students from the Business and Enterprise Division as a variable.
	1- = students from BUE (Business and Enterprise Division)	
EAS	0 = all other disciplines	Students from the Education, Arts and Social Science Division as a variable.
	1 = students from EAS (Education, Arts and Social Science Division)	
HSC	0- = all other disciplines	Students from the Health Sciences Division as a variable.
	1 = students from HSC (Health Science Division)	
IEE	0 = all other disciplines	Students from the Technology and Engineering Division as a variable.
	1 = students from IEE (Technology and Engineering Division)	
ALS		Students from the Access and Learning Support Unit.

The student group included in this study were 101 international students, from a total of 964 international onshore students, who were admitted to one university on the basis of their IELTS score during 2000 and 2001. The IELTS student group characteristics can be summarised as follows:

- approximately 50 per cent were males and 50 per cent were females

- approximately 50 per cent were postgraduate and 50 per cent were undergraduate students.

- they were aged between 17 and 40, with a mean age of 25.6 years.

- they originated from 30 different countries, with Malaysian, Indonesian, Thai and Chinese students dominant.

- they were studying in five disciplines areas with most students (47%) enrolled in a business faculty.

- they had GPA scores ranging from 1.5 to 7.00, with a mean GPA of 4.87.

- they had IELTS scores ranging from 4.5 to 8.5, largely between 6.0 and 7.0.

The second research question was investigated in this study by conducting an analysis of the trade-off between the loss of student numbers experienced by raising the current minimum scores (from IELTS 6.0) and the subsequent increase in GPA of the remaining students. Various methods of selection by raising the scores were tested including raising the overall scores and imposing some minimum requirements for the module scores. Examples included raising the IELTS overall score to 6.5 for undergraduates and 7.0 for postgraduates. Five different methods of selection were tested for undergraduate students and six alternative methods of selection were tested for postgraduate students. The loss of students, calculated as the percentage of students who would not have gained entry to the university using the higher scores for each method of selection, was considered against a calculation of the rate of increase of GPA. The rate of GPA increase was calculated by comparing the GPA of all students who entered the university in 2000/2001 with an IELTS score with the GPA of the smaller group who would have been admitted under the higher score requirements. As the appropriate minimum English proficiency score was largely a political decision to be made by university management, this trade-off was considered an appropriate way to analyse this question.

CONTEXT

IELTS was "designed to assess the language ability of candidates who need to study or work where English is used as the language of communication" (IELTS, 2001, p.1). The test was originally designed at the University of Cambridge and jointly developed with the British Council in 1980 but now can be taken in "251 test centres in over 105 countries" (IELTS, 2001, p.4). It has been widely accepted and used in Australia since 1989. In 1995, a number of significant changes were introduced to address concerns with practical issues, administrative problems, technological developments and theoretical issues (Charge and Taylor, 1997, p.379).

At the present time, an IELTS score of between 6.0 and 7.0 is commonly accepted at Australian universities as the minimum score necessary to demonstrate English language proficiency for admitting international students. The IELTS has two components: Academic or General with four modules: Reading, Writing, Listening and Speaking. The Speaking and Listening modules are common to both the Academic and General components, but the Reading and Writing modules are different for each component. The Academic module is used for entry into universities, as the focus of the General module is "on basic survival skills in a broad social and economic context" (IELTS, 2001, p.4). Students who sit the IELTS are scored in Bands from zero (did not attempt the test) to nine (expert user).

MULTILEVEL ANALYSIS FINDINGS

The models presented below for IELTS students are the null model (Table 2) and the final and best fitting model (Table 3). The multi-level analysis undertaken in this study is an analysis of the change data at two distinct Levels. At the first Level, the regression relationship examines how student performance (GPA) changes over time. At the second Level, the factors influencing average student performance (GPA) and change in GPA over time are examined. Multi-level analysis is used as it produces a model that controls for change in GPA over time and also controls for factors that may affect change in GPA over time. Other studies, the results of which are outlined earlier in the Literature Review and which use less effective regression analysis, are not able to control statistically for those factors which confound the relationship between IELTS scores and GPA. Using multi-level analysis, and with this control of factors, the relationship between IELTS scores and average GPA is made clearer.

Table 2. Null model for IELTS students

Summary of the model specified (in equation format)

	Level-1 Model	$Y = B0 + R$
	Level-2 Model	$B0 = G00 + U0$

The outcome variable is   GPA

Final estimation of fixed effects:

Fixed Effect	Standard Coefficient	Approx. Error	T-ratio	d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	4.88	0.11	44.78	84	0.000

Deviance =   655.39293

Number of estimated parameters =   1

Table 3 shows no significant effects at Level 1 (the micro level within the 97 students in the sample) but some significant effects at Level 2 (the macro level between students). At Level 1, the variable OCCASION (B_1) has virtually no effect on GPA for most students. However, both the variables IEE (students from the Information Technology and Engineering discipline) and VIET (students born in Vietnam) have a significant interaction with OCCASION (at the $p < 0.05$ level of statistical significance). Table 3 shows that at Level 2, IEE has a significant interaction (at the 5% level, p-value of 0.030, t ratio of 2.17) with OCCASION (changes in GPA over time during the five semesters in 2000 and 2001) given that the model described in Table 3 is the best fitting model for IELTS students. With IEE as one of two predictors and given a positive regression coefficient of +0.27, this indicates that the 25 engineering/technology students with an IELTS score have a GPA that is rising over time when compared with other students. This also shows that IEE students are improving on their GPA over time because either their language proficiency levels are becoming less important as they proceed through their program or that having the opportunity to study in Australia leads to improving language proficiency skills. This interaction effect is displayed in Figure 1 below.

Table 3 also shows that at Level 2, the variable VIET (7 students born in Vietnam) has a significant interaction (at the 5% level, p-value of 0.000, t ratio of –3.74) with OCCASION (changes in GPA over time during the five semesters in 2000 and 2001) given that the model described in Table 3 is the best fitting model for IELTS students. With VIET as one of two predictors and given a negative regression coefficient of –0.58, this indicates that Vietnamese born students with an IELTS score have a GPA that is declining over time when compared with all other students. This is of concern as it shows that VIET students have a

worsening GPA over time because either their language proficiency levels are becoming more important as they proceed through their program or studying in Australia has led to a deterioration of their language proficiency skills. This interaction effect is also displayed in Figure 1.

Table 3. Final model for IELTS students

Level-1 Model $Y = B0 + B1*(OCC) + R$

Level-2 Model $B0 = G00 + G01*(IELTS) + G02*(LEVEL) + G03*(CHINA) + G04*(HSC) + U0$

                 $B1 = G10 + G11*(IEE) + G12*(VIET) + U1$

The outcome variable is   GPA

Final estimation of fixed effects:

Fixed Effect	Standard Coefficient	Approx. Error	T-ratio	d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	4.30	0.14	31.69	92	0.000
IELTS, G01	0.39	0.13	2.92	92	0.004
LEVEL, G02	0.79	0.17	4.52	92	0.000
CHINA, G03	0.99	0.41	2.41	92	0.016
HSC, G04	1.20	0.35	3.48	92	0.001
For OCC slope, B1					
INTRCPT2, G10	0.01	0.07	0.20	94	0.843
IEE, G11	0.27	0.12	2.17	94	0.030
VIET, G12	-0.58	0.15	-3.74	94	0.000

Final estimation of variance components:

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	0.75	0.56	64	374.47	0.000
OCC slope, U1	0.19	0.04	66	72.58	0.270
level-1, R	0.62	0.38			

Statistics for current covariance components model

      Deviance =   566.5804

      Number of estimated parameters =   4

Figure 1 shows the combination of these two effects (VIET and IEE).

At Level 2 (B_0), all of the dependent variables shown in Table 3 are significant (at the $p < 0.05$ level). The variable IELTS, with a p-value of 0.004 and a t ratio of 2.92, has a significant relationship with GPA. A regression coefficient of +0.39 for IELTS indicates that there is a positive relationship between the IELTS score and GPA. Thus higher IELTS scores are related to higher mean GPA scores. For every one-unit increase in IELTS scores, assuming other variables are kept constant, mean GPA increases by 0.39. The regression coefficient of +0.39 (and a t-ratio of 2.92) indicate that the relationship is relatively weak but in line with other studies (Criper and Davies, 1988, Ferguson and White, 1993, Elder, 1993, Cotton and Conrow, 1998, Hill et al, 1999, Kerstjens and Nery, 2000).

The variable, LEVEL (level of study), has a p-value of 0.000 and a regression coefficient of +0.79, and with a t-ratio of 4.52, indicates a strong positive relationship between level of study and mean GPA for IELTS students. In practice it can be argued that IELTS students with a higher level of study (postgraduate students) are associated with higher mean GPA

scores. Postgraduate students on average have a higher mean GPA (by 0.79) compared to undergraduate students after adjustments are made for the other variables. Thus postgraduate students with IELTS scores have a greater chance of success than undergraduate students with the same IELTS scores, all other variables being equal.
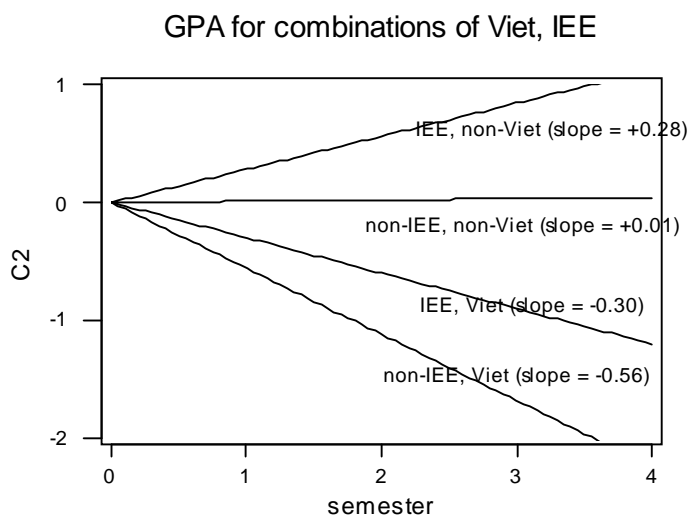
GPA for combinations of Viet, IEE

IEE, non-Viet (slope = +0.28)

non-IEE, non-Viet (slope = +0.01)

IEE, Viet (slope = -0.30)

non-IEE, Viet (slope = -0.56)

Figure 1: Interaction effect for IELTS students

The variable, CHINA (7 students whose home country is China), has a p-value of 0.016 and a regression coefficient of +0.99 (with a t-ratio of 2.41) indicating a relatively weak relationship between students from China (with IELTS scores) and GPA. This indicates that on average students from China have a higher GPA (by 0.99) than students from other non-Chinese countries after adjustments are made for other variables. In practice this shows that Chinese born students are likely to be relatively more successful than non-Chinese born students with the same IELTS score, all other variables being equal.

The variable, HSC (7 students who are from the Health Sciences division), has a p-value of 0.001 and a regression coefficient of +1.20 (with a t-ratio of 3.48), indicating a medium level positive relationship between students from the Health Sciences division (with IELTS scores) and GPA. This indicates that on average students from Health Sciences have a higher GPA (by +1.2) than students from other non-Health Science disciplines after adjustments are made for other variables. In practice this shows that Health Science students are likely to be relatively more successful than non-Health Science students with the same IELTS score, all other variables being equal.

Figure 2 provides a diagrammatic representation of the Level 1 and Level 2 effects for IELTS students.

ANALYSIS OF THE SECOND QUESTION

This analysis was undertaken by investigating various methods of selection by raising English proficiency entrance scores and comparing the percentage loss of students with the resulting GPA increases for each method of selection. It should be noted that the IELTS student group were analysed separately for postgraduate and undergraduate students for each equivalent method of selection. These results were analysed separately for postgraduate and undergraduate students because of the findings for Question 1, which suggested that the variable LEVEL was significantly related to mean GPA. Undergraduate and postgraduate

students were shown to have different English proficiency characteristics and therefore were examined separately.
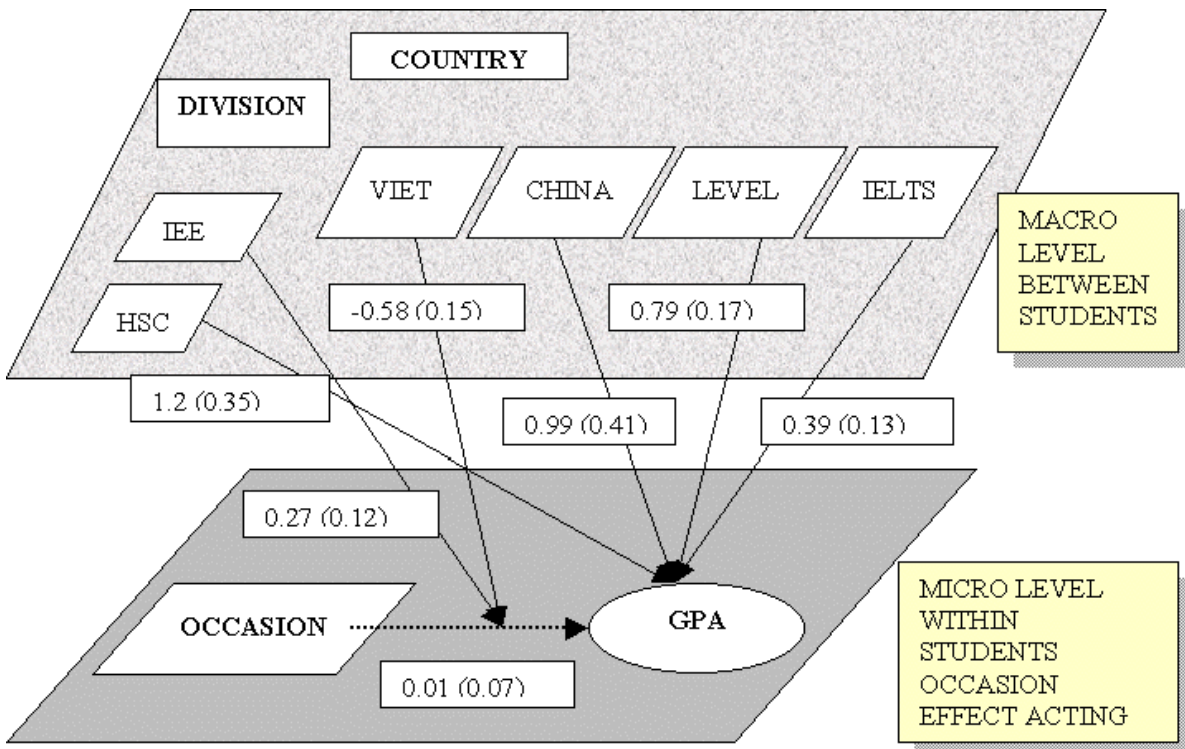
(*Metric regression coefficients are recorded for each effect shown, with standard errors in parentheses. The effect associated with OCCASION is shown as a dotted line because the effect is not statistically significant)

Figure 2*. Summary of Level 1 and Level 2 effects for IELTS students

Undergraduate IETLS students

Table 4 compares the trade-off results of five methods of selection by raising the cut-off score for 46 undergraduate students (all students with a recorded overall IELTS score and a recorded mean GPA) from the present level of IETLS 6.0. Five methods of selection by raising the score are used: Method 1: Overall IELTS score at least 6.5, Method 2: Each module score at least 6.0 regardless of overall score, Method 3: Writing and Reading module score at least 6.0 and overall score at least 6.5, Method 4: Writing and Reading score at least 6.0 regardless of total score and Method 5: Writing and Reading score at least 6.0 and total score at least 6.0. These methods of selection are chosen because they are ways of minimally raising either the total IELTS score or the module or sub-test scores or a combination of the two. Given the results in Question 1, which show a relatively weak significant relationship between IELTS scores and GPA, it is not considered reasonable that raising the IELTS scores by greater amounts should be considered.

Table 4 clearly shows the trade-off between the reduction in international student numbers with IELTS scores and increase in GPA for the five proposed ways of changing IELTS entry cut-off scores for undergraduate students. Raising the overall IELTS score from 6.0 to 6.5 (Method 1) involves a loss of 50 per cent of the student population with a consequent increase of 0.89 per cent in GPA. Raising each module score to at least 6.0 regardless of the overall score (Method 2) reduces the international student population by 41 per cent and results in a 3.1 per cent improvement in GPA. Requiring a score of at least 6.0 on the

Writing and Reading modules and an overall score of at least 6.5 (Method 3) involves a loss of 57 per cent of international students with an IELTS score and results in a grade increase of 2.88 per cent. Method 4 involves a requirement for two module scores (Reading and Writing) to be at least 6.0 regardless of total scores, which results in a GPA increase of 2.88 per cent and a loss of 39 per cent of students. The final method, which requires a total score of at least 6.0 and a Reading and Writing score of at least 6.0, results in a GPA increase of 0.89 per cent with a loss of 43 per cent of students.

Table 4.   Comparative results from raising minimum cut-off scores for undergraduate IELTS students

Five proposed entry Methods	GPA of original students (n = 46)	GPA of remaining students	Change in GPA	% improvement in GPA (base = 4.51)	Original numbers of students	Loss of international students not admitted	% reduction in international student population
1: Overall IELTS score at least 6.5	4.51	4.55	+.04	0.89	46	23	50
2: Each module score at least 6.0 regardless of overall score	4.51	4.65	+0.14	3.10	46	19	41
3: Writing and Reading module score at least 6.0 and overall score at least 6.5	4.51	4.64	+0.13	2.88	46	26	57
4: Writing and Reading score at least 6.0 regardless of total score	4.51	4.64	+0.13	2.88	46	18	39
5: Writing and Reading score at least 6.0 and total score at least 6.0	4.51	4.54	+0.04	0.89	46	20	43

Given the above information extracted from Table 4 and assuming these figures are deemed sufficient to warrant an increase in IELTS scores, Method 5 is recommended as the best way of raising the IELTS cut-off score for undergraduate students. Method 5 provides the security of maintaining the existing cut-off score at 6.0 and raises the minimum standards by using a relatively simple requirement of a minimum score of 6.0 for two of the key skills required at university (Reading and Writing), thus making it relatively simple to administer. It also results in a loss of international students in the middle range (43 per cent) in comparison to the other alternative methods.

The other methods are eliminated for the following reasons:

• Methods 1 and 3 are not selected because they result in an unacceptably high loss of international students (50 per cent or above).

• Despite its relatively low loss of students (41 per cent) and highest GPA increase (3.10 per cent), Method 2 is quite complex to administer and involves the possibility that a lower overall score may result.

• Despite involving the lowest loss of students (39 per cent), Method 4 involves a possibility that this would result in a lower minimum overall cut-off score (below 6.0), as there is no minimum overall requirement.

As there is not much difference between Methods 2, 4 and 5 particularly in terms of student loss percentages, and given that Method 5 results in a lower GPA increase than Methods 2 and 4, it may be that either Method 2 or 4 is considered preferable despite the above

recommendation. Method 2 or 4 may be preferred especially if there is no concern for ensuring a minimum overall score.

Postgraduate IETLS students

Table 5 compares the results of six methods of raising the cut-off score for 51 postgraduate students (all students with a recorded overall IELTS score and a recorded GPA) from the present level of IETLS 6.0. Six methods of selection are used: Method 1: Overall IELTS at least 7.0, Method 2: Each module score at least 7.0 regardless of overall score, Method 3: Writing and Reading module at least 7.0 and overall score at least 7.0, Method 4: Overall IELTS at least 6.5, Method 5: Each module score at least 6.0 regardless of the overall score and Method 6: Reading and Writing module at least 6.0 and overall score at least 6.5. These methods of selection are used as they represent ways of increasing the total and module IELTS scores for postgraduate students to a higher level than for undergraduate students. Given the findings in Question 1, which suggest that postgraduate students with an IELTS score have a greater chance of success than undergraduate students with the same IELTS score, it seems sensible that these scores are able to be raised more than for undergraduate students.

Table 5. Comparative results from changing minimum cut-off scores for IELTS postgraduate students

Six proposed entry Methods	GPA of original students (n = 46)	GPA of remaining students	Change in GPA	% improvement in GPA (base = 4.51)	Original numbers of students	Loss of international students not admitted	% reduction in international student population
1: Overall IELTS at least 7.0	5.19	5.65	+0.46	8.87	51	40	78
2: Each module score at least 7.0 regardless of overall score	5.19	5.50	+0.31	5.97	51	32	63
3: Writing and Reading module at least 7 and overall score at least 7.0	5.19	5.80	+0.61	11.8	51	42	82
4: Overall IELTS at least 6.5	5.19	5.38	+0.19	3.66	51	34	67
5: Each module score at least 6.0 regardless of the overall score	5.19	5.32	+0.13	2.50	51	24	47
6: Writing and Reading module at least 6.0 and overall score at least 6.5	5.19	5.41	+0.22	4.24	51	35	69

Table 5 clearly shows the trade-off between the reduction in international student numbers and increase in GPA for six proposed ways of changing IELTS entry cut-off scores for postgraduate students. Raising the overall IELTS score from 6.0 to 7.0 (Method 1) results in a loss of 78 per cent of the international student population with a consequent increase of 8.87 per cent in GPA. In comparison, raising the overall IELTS score to 6.5 (Method 4) results in a 67 per cent student loss and a 3.66 per cent GPA rise. Raising each module score to at least 7.0 regardless of the overall score (Method 2) reduces the student population by 63 per cent and results in a 5.97 per cent improvement in GPA. In contrast, raising each module score to at least 6.0 regardless of the overall score (Method 5) results in a 47 per cent student loss with a 2.5 per cent grade increase. Requiring a score of at least 7.0 on the Writing and Reading module and an overall score of at least 7.0 (Method 3) results in a loss of 82 per cent of international students with an IELTS score and a grade increase of 11.8 per

cent. Finally, Method 6 produces a loss of 68 per cent of international students and a gain of 4.24 per cent in GPA.

Given these comparisons and the tradeoffs results provided in Table 5 and assuming a willingness to raise IELTS scores for postgraduate students based upon these figures, the recommended method is Method 6. Method 6 raises the overall IELTS requirements, provides the security of a minimum overall score and includes an administratively simple way of raising the minimum score for the two key skills required at university. The other methods were not chosen for the following reasons.

- Methods 1 and 3 both involve an unacceptably high student loss of approximately 80 per cent despite giving the highest GPA increases of all six methods.

- Method 2 is complex to administer and results in a relatively high student loss (over 60 per cent)

- Method 4 is less desirable than Method 6 because it produces a smaller grade increase with a similar student loss percentage and does not guarantee that postgraduate students are proficient in both Reading and Writing

- Method 5 produces the smallest student loss (47 per cent) but involves the lower GPA rise of all methods and is quite complex to administer

Eliminating these methods, Method 6 remains as the preferred method although the student loss of 68 per cent may be considered a difficulty with this method. Indeed none of these methods produces an ideal solution. Indeed Methods 2, 4 and 6 produce relatively similar trade-off results.

Ultimately for both undergraduate and postgraduate student groups, political decisions and processes will decide which methods, if any, the university chooses to adopt. It may even be decided that the small grade increases are not worthy of the relatively large loss of students for both the postgraduate and undergraduate student body and consequently no changes will be made to English language entry requirements on the basis of these figures. It may be considered preferable to consider other ways of strengthening English language proficiencies of international students such as better supporting them once they have gained entry into university. Diverting resources towards employing extra staff skilled in assisting students to improve their English may be a preferred option. However, a mitigating factor is that some of the large losses are due to the fact that students with IELTS scores of less than the minimum score of 6.0 are being admitted to the university. The inclusion of these students (5 undergraduates and 18 postgraduates) as losses in the calculations inflates the loss percentages considerably, especially for postgraduates. Therefore, a first step may be to tighten up current English proficiency entrance procedures to prevent this from happening.

CONCLUSION

Analyses of the results of Question 1 suggest that that there is a positive relationship of IELTS, LEVEL, CHINA and HSC with mean GPA. A strong conclusion is that that there is a significant and positive, but weak, relationship between English language proficiency, as measured by the IELTS scores, of international students and their performance, as measured by their GPA.

These findings complement an investigation of a second question that involves scrutinising various methods of raising the common cut-off scores of IELTS 6.0 for both undergraduate and postgraduate students. Of five methods investigated and on the basis of a trade-off

between the loss of student numbers and GPA gain, for undergraduate students, it is recommended that the best method of raising the IELTS requirements is that the overall IELTS score be kept at 6.0 but a new requirement be introduced to stipulate that students have a Reading and Writing module score of a minimum of 6.0. This result involves a trade-off loss of just over 40 per cent of international students for a GPA gain of 0.9 per cent for undergraduate students. Of the six methods investigated for postgraduate students, it is recommended that the best method of raising the IELTS requirements is that the overall score be raised to 6.5 with an additional requirement of 6.0 in Reading and Writing. This result involves a trade-off loss of almost 70 per cent of international students for a GPA gain of just over 4 per cent for postgraduate students. It is acknowledged that these recommendations may result in unacceptably high losses of international students for very modest GPA gains. Comparatively large reductions in the percentage of students admitted are shown to be the result of raising the minimum IELTS entry scores and thus from a political and financial perspective the university may not choose to raise these entry standards. Although, it is acknowledged that a mitigating factor is that some of these losses are partly attributed to the fact that some students have entered the university with scores of less than the minimum IELTS cut-off of 6.0 or TOEFL 550, a better choice may be to raise support levels for those students who gain entry at present test score levels. This option may assist international students to improve their English language proficiency skills.

Alternatively, linking the two research questions may lead to another conclusion. The multilevel IELTS regression analysis shown in response to Question 1, indicates that if the cut-off score of 6.0 were to be raised to 6.5 for all international students the expected change in GPA would be to lift the mean level of GPA by half of the IELTS score coefficient of +0.39 or 0.20, with all other significant factors remaining unchanged. Moreover, since the analysis of Question 1 also shows that the postgraduate GPA score is already expected to exceed the undergraduate score by 0.80, it may be unnecessary to develop a separate method for changing postgraduate IELTS entry scores. However, given that the analysis includes students with IELTS entry scores below 6.0, it may also be concluded that raising the IELTS entry score for all international students from 6.0 to 6.5 may not be required. Instead, merely not allowing students entry with IELTS scores below 6.0 may be the solution.

This research has merely canvassed some options using statistical methodologies. The final decision, to be made by university management, also involves political and financial considerations.

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