

Impact of English Proficiency on Academic Performance of Software Engineering Students

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ABSTRACT

This work aims to investigate the relationship between English language proficiency and the academic performance of students enrolled in Software Engineering course. The English language proficiency was measured using a reading assessment test as well as the student grades obtained from two English courses the students took during their preparatory year.

Data was collected from 63 students in the department of Information Technology, King Saud University located in Riyadh, Saudi Arabia. The results indicate that there is a significant but moderate positive correlation between the students proficiency in English and their academic performance in the Software Engineering course. The analysis also reveals that the students academic background do not play a role in their academic performance. We also find a positive correlation between the students self perception of English abilities and their performance on the assessment test. However, a negative correlation was concluded between the easiness of the test (rated by the students) and their scores.

CCS CONCEPTS

• **Computer systems organization** → **Embedded systems**; *Redundancy*; *Robotics*; • **Networks** → *Network reliability*.

KEYWORDS

English proficiency, academic performance, software engineering course, self-perceived English.

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1 INTRODUCTION

In most universities, the English language has become the main medium of instructions even in non-English speaking countries [8, 10]. Therefore, students in general and students enrolled in scientific and technical courses in particular are expected to exhibit

a proper level of English language proficiency. The role that the language plays in the science learning process has been widely addressed [4, 6, 8] and a positive correlation between the two has been identified [7, 13].

Non-English speaking students enrolled in computer science and information technology majors are expected to face the challenge of learning a considerable amount of new technical words. They are also expected to find new meanings for the familiar non-technical words as they may acquire new meanings specific to the current context. Since most programming languages are designed based on the English language, the effect of English proficiency on the students mastery of writing computer programs has been investigated. A significant correlation was identified [8, 12].

This study aims to investigate the extent of the impact of the English language proficiency on the academic performance of Saudi software engineering course students majored in information technology. Moreover, we investigate the impact of the educational background and the English language proficiency on the students' overall academic performance. The goal is to provide insights for institutions where English is used as the main language for teaching who want to promote academic success of their students.

In Saudi Arabia, public school students do not start learning English as a language until middle school. Also, at school level, English is taught as a language and is not used as a communication medium. As a result, the student's proficiency of the four main language domains (reading, writing, listening, and speaking) of the English language is often limited. At college level, however, English is the primary medium of instruction and is the main tool of communication.

We use two instruments to measure the English language proficiency of the students: their scores in assessment material the students took as part of this study and their scores in two English courses the students took during their preparatory (first) year in the university. To measure the academic performance of the students, we collect two pieces of information about each student: the GPA and the scores of the software engineering course.

2 RELATED WORK

In [7], the author investigates the relationship impact of English proficiency and the academic performance of preparatory year students in the British University in Egypt in three departments: Engineering, Business, and Informatics and Computer Science. The results show a significant moderate positive relationship.

A similar investigation was conducted in [13]. The authors compare the GPAs of first year science and mathematics university students in Ghana. They demonstrate a significant effect of English reading proficiency on the students GPA.

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In [11], the authors study the impact of self-perceived English language proficiency and academic performance of international students in a Louisiana university. Their analysis reveals that students with high levels of self-perceived English language proficiency and students who spoke at least three languages have the highest mean GPA.

For Saudi university-level students, a significant correlation between the English language proficiency and the academic performance was found among preparatory year medical students [1, 9] and microeconomics students [2]. However, no significant correlation was found among third year nursing students [3].

3 METHODOLOGY

This study is guided by the following four research questions:

- (1) What is the relationship between the English language proficiency and the academic performance of students in software engineering course?
- (2) What is the relationship between the students English language proficiency and their overall academic performance?
- (3) What is the relationship between the students academic background and their academic performance in software engineering course and their overall academic performance?
- (4) What is the relationship between a student self-perception of English ability and her English language proficiency?

Simple correlation analysis was conducted to address the first research question. To answer the second research question, descriptive statistic analysis was used to compare

3.1 Participants

The participants are King Saud University students studying in the Department of Information Technology (female campus). The students are enrolled in the software engineering course. There are 63 participants (out of 78 students). See Table 1 for general demographic and background information about the participants. All participants were asked to take a paper-based reading assessment test. There was a strict time limit set of 30 minutes to complete the test. Students participation was voluntarily.

3.2 Data Collection and Analysis

The data requested from the participants can be partitioned into main parts: assessment material (described below) and demographic information. The demographic information has the student identification number which was used by the PI to add the student Software Engineering course grade data. Each student grade has four components: score of the first midterm exam, score of the second midterm exam, score of the final exam, and the course overall grade.

Participants were also requested to provide some background information related to their English language including the type of grade school they attended¹, when they start learning English, and their grades in the two English courses they took during their first year in King Saud University.

¹In public schools in Saudi Arabia, students start learning English in middle school.

Table 1: General characteristics of the participants

Variable	Category	Percent
GPA	≥ 4.76	3.3%
	4.51 - 4.75	10%
	4.01 - 4.50	40%
	3.51 - 3.75	28.3%
	3.01 - 3.50	10%
	< 3.01	0%
Grade school	Didn't report	8.3%
	Public	55%
	Private	21.6%
	Both	21.6%
Started learning English	Didn't report	1.6%
	KG - 3rd grade	26.7%
	4th - 6th grade	33.3%
	Intermediate school	20%
	High school	11.7%
	Never before college	1.7%
Grade in Eng142	Didn't report	6.7%
	A - A+	65%
	B - B+	25%
	C - C+	5%
	D - D+	0%
	F	0%
Grade in Eng154	Didn't report	5%
	A - A+	51%
	B - B+	35%
	C - C+	8.3%
	D - D+	0%
	F	0%
English proficiency (self rated)	Didn't report	5%
	Excellent	8.3%
	Good	25%
	Average	43.3%
	Below average	15%
	Poor	1.7%
Level of difficulty (self rated)	Didn't report	6.7%
	Hard	50%
	Average	41.7%
	Easy	6.7%
Self rated performance	Didn't report	1.7%
	Excellent	6.7%
	Good	13.3%
	Average	51.7%
	Below average	26.7%
	Poor	1.7%
	Didn't report	0%

Finally, participants were asked to rate their own English comprehension abilities, rate the assessment material, and rate their experience answering the assessment material questions.

3.3 Assessment Material

To measure the English reading proficiency of the participants, a reading passage followed by a total of 13 multiple-choice reading comprehension questions were included in the assessment material. All of the assessment items were selected from the TOEFL test (Test of English as Foreign Language).

One point was given for each correct answer except for the last question which is worth three points, resulting in a maximum score of 15 points. The questions in the test were categorized as:

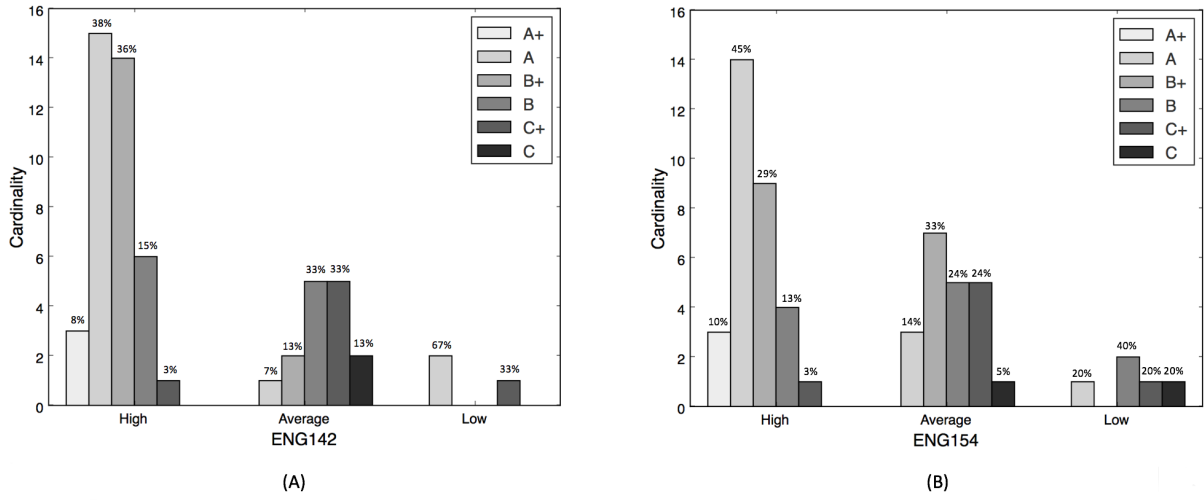


Figure 1: by grades students obtained for the two English courses during the preparatory year. High refers to A and A+ grades, Average refers to B and B+ grades, and Low refers to C and C+ grades.

4 RESULTS

4.1 Research question 1: What is the relationship between the English language proficiency and the academic performance of students in software engineering course?

To investigate the relationship between the English language proficiency and the students academic performance in the Software Engineering (SWE) course, we conducted a correlation analysis. The correlation of the English assessment score with different components of the Software Engineering course assessment material was collected. The results are listed in Table 2.

To interpret the value of the Pearson correlation r , Cohen [5] suggests the guidelines listed in Table 3. Accordingly, an r value that satisfies $0.3 \leq r \leq 0.49$ indicates a medium strength. Generally, the correlation analysis shows a significant but moderate positive relationship between the English language proficiency and the academic performance of the software engineering students.

Based on the student grades in the each of the English courses they took during the preparatory year (ENG142 and ENG154), we partition the students into three groups: High, Average, and Low. The High group includes students with grades A+ and A. The Average group includes students with grades B+ and B. The Low group includes students with grades C+ and C (C was the lowest grade). We examine the distribution of the SWE grades in each group in Figure 1.

Figure 1(A) shows the analysis for the first English course (ENG142). The highest SWE grade is among students in the High group is A+. The highest SWE grade is A among students in the Average group and the Low group. Moreover, the minimum SWE grade achieved in the High group is C+ and the mode is B. The minimum for the Average and Low groups are C and C+ respectively. The mode for the Average group is B and C+, and the mode for the Low group is A.

Table 2: Correlation of the English assessment score with different components of the Software Engineering course assessment material.

Measure	Mid 1	Mid 2	Final	Grade	Q1	Q2	Q3
r	0.42	0.41	0.19	0.40	0.28	0.39	0.28
Sig. (2-tailed)	0.001	0.001	0.15	0.002			
ρ	0.41	0.45	0.25	0.41	0.26	0.40	0.30
Sig. (2-tailed)	0.001	0.000	0.057	0.001			

Table 3: Relationship strengths between variables using the correlation coefficient r as suggested in [5].

Correlation range	Suggested strength
$0.1 \leq r \leq 0.29, -0.1 \geq r \geq -0.29$	low
$0.3 \leq r \leq 0.49, -0.3 \geq r \geq -0.49$	medium
$0.5 \leq r \leq 1.0, -0.5 \geq r \geq -1.0$	high

We performed similar analysis in Figure 1(B) for the ENG154 course. The results suggest that the highest grades achieved are A+ in the High group and A in the Average and Low groups. The minimum grades achieved for the High, Average, and Low groups are C+, C, and C respectively. Finally, the the mode for the High group is A. The mode for the Average group is B+ and the mode for the Low group is B.

Table 4: Descriptive statistics for educational background on and SWE grades.

Background	SWE Grade					Reading Assessment					GPA				
	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
Public school	33	B+	1.2	A+	C+	33	6.9	3.06	2	13	32	4.22	0.4	4.78	3.34
Private	13	B+	1.1	A	C	13	8.2	2.77	5	14	11	3.75	0.4	4.25	3.05
Both	13	B+	1.4	A	C	13	6.4	1.6	4	9	11	3.95	0.3	4.65	3.5

4.2 Research question 2: What is the relationship between the students English language proficiency and their overall academic performance?

A correlation analysis was used to identify the relationship between the students English language proficiency and their overall academic performance measured by their GPAs. The students language proficiency was measured using three values: the students' reading assessment score, their scores in the ENG142 course, and their scores in the ENG154 course. The results of the analysis suggest a low strength correlation ($r = 0.17$, $r = 0.19$, and $r = 0.28$).

4.3 Research question 3: What is the relationship between the students academic background and their academic performance in software engineering course and their overall academic performance?

In Table 4, we present the descriptive statistical results of the effect of the students educational backgrounds on their academic performance in the SWE course. Additionally, we investigate its effect on the reading assessment test used in this study and on the overall academic performance of the students (using the GPA value).

Interestingly, the results show that the student backgrounds do not impact their SWE course grades. However, the results show that the students who studied in private schools have better scores in the English reading assessment test. Students with mixed backgrounds (studied grade school in both public and private schools), do not seem to achieve better scores in the reading assessment test. A closer look at the data shows that 77% of those students did not start studying English until fourth grade or middle school. This may explain the similarity between the results of those students and students who studied in public schools.

How does a student educational background impact her overall academic performance measured by GPA? Table 4 shows that the average GPA is higher for students who attended public schools. Does this suggest that learning English in primary school has no impact on a student's proficiency of the language? This calls for further investigations.

4.4 Research question 4: What is the relationship between a student self-perception of English ability and her English language proficiency?

At the end of the reading assessment test, students were asked to rate their English comprehension abilities. The analysis of the student responses reveals a significant correlation between the students English self-perception of English ability and their reading assessment scores ($r = 0.58$).

Students were also asked to assign a level of difficulty to the reading assessment material. Using the responses, we analyzed the relationship between the assessment material level of difficulty assigned by the students and their scores. The results suggests a positive correlation ($r = 0.28$). That is, students who reported higher difficulty levels of the assessment material scored higher in the assessment material and vice versa.

Finally, students were asked to rate their performance on answering the reading assessment questions. A moderate negative correlation is found between the easiness of the assessment material questions (rated by students) and their score ($r = 0.21$). That is, students who believed did well in answering the assessment questions achieved lower scores.

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6 CONCLUDING REMARKS

Given the abstract and informative nature of scientific education, students are expected to encounter unfamiliar terminology and new technical concepts. This demands for students language skills as well as the other academic skills such as critical thinking and problem solving.

This work investigated the possible interplay between the English reading proficiency and the academic performance of software engineering students. The results show a moderate significant correlation between the two. However, this work has several limitations. First, it is limited to a single software engineering course and a single institution. It will be interesting to examine students across different semesters and to include more than one institution. Second, the English assessment material used in this study focuses only on the reading abilities of the students. A more generalized assessment test can be used to provide a more precise measure. Finally, this research uses simple correlation and statistic analyses. Future research could employ data mining techniques.

Table 5: Descriptive statistics for educational background on GPA and

Background	ENG142					ENG152				
	N	Median	Mode	Min	Max	N	Median	Mode	Min	Max
Public school	32	A - A+	A - A+	C - C+	A - A+	32	A - A+	A - A+	C - C+	A - A+
Private	11	A - A+	A - A+	B - B+	A - A+	11	A - A+	A - A+	C - C+	A - A+
Both	13	A - A+	A - A+	C - C+	A - A+	13	B - B+	B - B+	B - B+	A - A+

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