

## **AC 2009-534: ABSTRACT: EFFECT OF A UNIVERSITY-OPERATED INTENSIVE ENGLISH PROGRAM (IEP) ON ENGINEERING STUDENT ACADEMIC SUCCESS**

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# **Effect of a university-operated Intensive English Program (IEP) on engineering student academic success**

## **Abstract**

An investigation into the effects of a university-level Intensive English Program (IEP) on academic success for engineering students attending an American-style university in the Middle East. At some universities, IEPs are used to improve English language proficiency for students not meeting a minimum required TOEFL score, but who are otherwise qualified for admission. In this study, students' overall GPA, major-specific GPA, graduation rate, and preferred learning methods were analyzed relative to enrollment in IEP. Analyses of variance were utilized to characterize the statistical significance of GPA differences between IEP attendees and non-attendees, and two-way cross tabulation (chi-square analysis) was used to determine the statistical significance of differences in graduation rate.

Results show that IEP yields a significant improvement in academic achievement for engineering students with a TOEFL score less than 500, but offers reduced or insignificant benefit to students in other TOEFL score categories and to non-engineering students. Effect of IEP was observed to differ by student gender: relatively higher gains in GPA for males who had earlier attended IEP than for females who had attended IEP. Preferred learning styles for engineering students were not shown to vary as a function of having previously participated in IEP.

## **Introduction**

The pursuit of university-level education in the English language is increasing in popularity, and a growing number of students are choosing to enroll in English-language universities located in countries where English is not a primary or official language. Within the Middle East, where the process of obtaining a visa to study in North American or Western Europe is perceived to be difficult or unlikely to yield favorable results, many students who desire an American-style and/or English-language education are choosing to enroll in a growing number of English-language, western universities in their home countries.

Some of these institutions are organized as branch campuses of established universities in the west (e.g., New York University Abu Dhabi; Virginia Commonwealth University in Qatar; George Mason University, Ras Al Khaimah; Texas A&M University at Qatar; Michigan State University Dubai; Cornell University – Qatar Campus; Rochester Institute of Technology Dubai; Georgetown University in Qatar; Northwestern University in Qatar; University of Wollongong in Dubai; Carnegie Mellon University in Qatar; New York Institute of Technology Bahrain; University of Exeter Dubai; Middlesex University Dubai; etc.).

Other of these universities are independent institutions that may be (or have been) affiliated, to varying degrees, with western universities for purposes of start-up consultation, curriculum advisory assistance, and accreditation review assistance (e.g., The British University in Dubai; American University of Beirut; American University of Cairo; King Abdulla University of Science and Technology (Saudi Arabia); American University of Sharjah; American University

in Kuwait; Lebanese American University; American University of Dubai; Masdar Institute of Science and Technology (Abu Dhabi); American University in the Emirates; etc.). Even among Middle Eastern universities that are not specifically oriented to follow western educational practices, English is generally the language of instruction for courses in engineering.

Some students who wish to pursue a university education in English do not have the English language communication abilities (and corresponding TOEFL scores) required by the institution to which they have applied. In such cases students are sometimes required to enroll in intensive language courses to prepare them for eventual admission to the university. The focus of an Intensive English Program (IEP) is to increase student proficiency in English speaking, reading, and writing, and ultimately, to help the student develop the communication skills (and TOEFL score) required for matriculation at the university as a degree-seeking student. IEPs are generally administered by the university that students wish to enroll in following their intensive English studies. Coursework taken by students during their time in IEP consists of classes meant to enhance ability in speaking English, understanding spoken English, improving writing skills in English, and increase reading comprehension in English. Students generally enroll in an IEP from one to three semesters, during which time they are full-time students, engaging in class activities five days per week, from six to eight hours per day. Courses are typically taught by instructors with a Master's degree in English as a Second Language, and students enrolling in IEP are not generally segregated by their intended major – students from all intended majors study together, and receive the same instructional curriculum.

While intensive English language programs do not generally offer university-level credit that can be applied towards degree programs, those completing IEP may be at an academic advantage when compared to students with a similar academic background but who do not attend an intensive language training program. By improving students' ability to communicate in the language of instruction, IEP-attending students can become better equipped to engage in the learning activities that lead to academic success, such as critical listening, taking notes, reading textbook materials, understanding class lectures, performing writing assignments, interacting with English-speaking peers in group assignments, and seeking assistance from English-speaking faculty outside of the classroom. Regardless of a student's field of study, an improved ability to understand and communicate in the language of instruction should allow that student to earn higher grades and have a better chance of graduating from the university than an otherwise equivalent student with lower language ability. Beyond communication-related benefits, the study skills and time management techniques employed and refined by students in IEP could yield advantages to IEP students (relative to students with comparable academic backgrounds but who did not attend IEP) in their degree-seeking academic pursuits. This means that a student who learns during IEP to focus their attention, take notes, use study tools, and manage time should be at a relative advantage when entering the university to pursue major studies when compared to a student with the same TOEFL score but who has not undergone the study skill development process implicit in IEP participation.

While there are many positive traits and skills that students can develop through IEP participation, there are some potential concerns associated with IEP implementation. These concerns include added program duration and expense, since university-operated IEPs are generally given for between one and three semesters, during which time students pay university

tuition. With an increase in the required duration and cost for completing a university degree, there is a risk that graduation rate could be lower for students who enrolled in IEP before their degree programs. It is also possible that the study methods, habits, and skills that students utilize and become accustomed to in IEP may be substantially different from the methods and skills predominantly required by degree-focused university academic programs. In the case of engineering students, for example, the quantitative and analytical skills that may be required for success in degree programs may not be improved much by language-oriented study methods taught in IEP. Were this the case, engineering students could be expected to experience relatively lower academic benefit from their participation in IEP compared to students in academic disciplines more closely related to the language arts and more dependent on reading and comprehension skills. Beyond this, it is possible that engineering students attending IEP could become so accustomed to IEP-style study behaviors that they could find it difficult to adapt to different techniques once beginning their academic programs.

A study of academic performance of engineering students relative to IEP attendance was undertaken in order to assess the magnitude of potential benefits that can be captured by students. An additional objective was to understand whether engineering students experience any discipline-specific benefit or detriment from IEP enrollment compared to non-engineering students. Through statistical comparisons of IEP attendees versus non-attendees, and engineers versus non-engineers (all with TOEFL scores in the same range), this study seeks to determine what effect IEP participation has on students' cumulative university GPA, cumulative major-specific GPA, and graduation rate for an American university located in the Middle East.

## **Methods**

### **A. Dataset**

The dataset utilized for the analyses described herein consists of student admissions and academic performance records from a US-accredited, American-style university located in the Middle East gulf region. Student application data includes: age, gender, nationality, TOEFL score, high school name and instructional style (e.g., British, American, Indian, Arabic, etc.), high school grades or senior-level test score, and term admitted to the university. The available TOEFL scores are expressed in terms of the Paper-Based Test score scale range of 310-677<sup>1</sup>.

Available university academic records include: major, status (e.g., active, graduate, or inactive), full-time vs. part-time, whether the student attended IEP, total number of credit hours earned, cumulative overall GPA, cumulative major-specific GPA, major-specific credit hours earned, and credit hours earned and GPA in certain other academic areas (e.g., history and humanities). A complete dataset was available for 6516 current and former students spanning 9 years. Personally-identifiable information was removed from the dataset to ensure student privacy.

Students were grouped by TOEFL score range during dataset analysis, comparing those who did attend IEP in a certain TOEFL score range to those who did not attend IEP in that same TOEFL score range. An increasing institutional TOEFL score cutoff point over time, below which students would generally be required to attend IEP, means that there are both IEP attendees and non-attendees with a variety of TOEFL scores. Additionally, some students with TOEFL scores

above the cutoff point may voluntarily elect to enroll in IEP in order to improve English language proficiency, and some students below the TOEFL score cutoff point have received waivers of the IEP requirement. For TOEFL score < 540, 1783 students in the dataset did not attend IEP and 1343 did attend IEP. For TOEFL score < 520, 896 students in the dataset did not attend IEP and 937 did attend IEP. For TOEFL score < 500, 25 students in the dataset did not attend IEP and 74 did attend IEP.

## B. Analytical Methods

For the analysis of the effect of IEP on students' cumulative GPA, the overall dataset was filtered to include students within a range of TOEFL scores centered on the TOEFL score cutoff point (i.e., 520) currently used to determine whether a candidate is permitted to directly matriculate or is first required to enroll in IEP to improve English language fluency; at the institution where the data was gathered, the TOEFL score cutoff point has previously been as low as 500, and further increases to the TOEFL score cutoff point beyond 520 have been considered. Many other institutions, both in the Middle East region and internationally, utilize TOEFL score cutoff points within this same range.

By limiting analysis to students that fall within a narrow range of TOEFL scores centered around the cutoff score, it is possible to separate the effect of IEP participation on student performance from the effect of TOEFL score on student performance; previous research has shown a general trend of increasing academic performance with increasing TOEFL score<sup>12</sup>. Since students with elevated TOEFL scores do not typically attend IEP, this would mean that any IEP versus no-IEP comparison that did not screen the population by TOEFL score would lead to a biased perception of superior academic performance by students who did not attend IEP – without screening this effect would be attributable to their generally higher TOEFL scores, not necessarily to an IEP effect. Comparing only students with a TOEFL score of less than 540 helps eliminate this bias, and to add further resolution to the investigation, sub-groups of these students were analyzed according to narrow TOEFL score ranges, starting with all students having a TOEFL score less than 500, and working upward in 10 point increments through a score of 539. In addition to comparisons of academic performance according to IEP attendance across a range of TOEFL scores, cumulative and major-specific GPA were also compared relative to students' gender. In order to determine whether differences in average GPA between students who did attend IEP and those who did not attend IEP were statistically significant, 2 (gender) by 2 (IEP attendance) analysis of variance (ANOVA) was applied within each of the different TOEFL score groups.

Under the assumption that improved English language proficiency, and thus enrollment in IEP, could be relatively more or less important to engineering students compared to students in other majors, an analysis of major-specific GPA was conducted for students in the TOEFL score range 520-539. This more narrowly-focused score range was selected for two reasons: (1) to separate effects of IEP participation from TOEFL score effects (as described above) while at the same time providing an adequately-sized (see Table 2) within each subject area, and (2) the TOEFL score cutoff point of 520 is becoming more common as a requirement for western-style universities in the Middle East region, and so the range 520-539 may be particularly meaningful from the standpoint of determining threshold minimums and likely academic effect of required IEP participation.

The major-specific analysis sought to determine, for example, whether IEP attendance was relatively more valuable to students in engineering or business (where a relatively greater amount of the academic workload presumably includes language-oriented activities). This major-specific GPA analysis was segmented by enrollment in engineering, business, or architecture. For this analysis ANOVA was used for each of the three academic sub-areas to determine the significance of effects related to gender, IEP attendance, and gender x IEP attendance.

To assess the impact of IEP attendance on graduation rate, the current academic status of students in the TOEFL score range 520-539 who entered the university from Fall 1997 – Spring 2002 was compared relative to IEP attendance, for students majoring in each of the four primary academic divisions on campus (i.e., engineering, business, architecture, and arts and sciences). Differences in graduation rates between those who did attend IEP and those who did not were compared by a chi-square analysis in order to determine whether differences were statistically significant ( $\alpha = 0.05$ ).

Learning method preferences were evaluated by administering a survey to a group students (n=402). A two-way cross tabulation and chi-square analysis were used to investigate the significance of statistical differences between IEP attendees and non-attendees in the types of study skills generally utilized, including variation of learning strategies by gender.

## Results

### Cumulative GPA Analysis

Table 1 – Cumulative GPA for students in different TOEFL score ranges as a function of participation in IEP.

TOEFL Score	Group 1: IEP				Group 2: No IEP				Difference		
	n	Overall	M	F	n	Overall	M	F	Overall	M	F
< 500	74	2.20	2.13	2.40	25	1.46	1.04	2.33	0.75	1.09	0.06
500-509	415	2.18	2.07	2.38	390	2.22	2.10	2.46	-0.05	-0.02	-0.08
510-519	448	2.37	2.33	2.44	481	2.22	2.12	2.39	0.15	0.21	0.05
520-529	233	2.29	2.24	2.42	419	2.30	2.19	2.50	-0.01	0.05	-0.08
530-539	173	2.30	2.27	2.39	468	2.38	2.25	2.60	-0.08	0.02	-0.21
Overall*	1343	2.28	2.22	2.41	1783	2.27	2.15	2.49	0.01	0.07	-0.08

\*NOTE: For the “Overall” TOEFL score range of less than 540, the average TOEFL score for Group 1 is 510, compared to 517 for Group 2. This is due to a greater number of students in lower TOEFL score categories among those who attend IEP. Thus, to ensure balanced comparisons incorporating closer average TOEFL scores (within 1 point) between those two attend IEP and those who do not, additional narrower score range categories have been provided.

A summary of average cumulative GPA for IEP vs. non-IEP students in several TOEFL score ranges is shown in Table 1. Two-by-two (gender x attended IEP) ANOVA were conducted for the entire TOEFL score < 540 population and also for each TOEFL score sub-group to determine the statistical significance of the differences in GPA between IEP attendees and non-attendees, between male and female students, and the interaction of IEP attendance and gender on cumulative GPA. For all students with TOEFL score < 540, the average cumulative GPA of 2.28 for IEP attendees is not significantly different from the 2.27 average cumulative GPA for non-attendees, with  $p=0.91$ . For all students with TOEFL score < 540, female students earned a cumulative GPA of 2.46, which is significantly ( $p<0.01$ ) higher than the 2.18 average for male students. The interaction of gender and IEP attendance on cumulative GPA is also significant ( $p=0.02$ ), meaning that the effect of IEP attendance differs for male and female students. An illustration of this significant difference is the 0.07 point increase in GPA experienced by male students who attend IEP (relative to male students who do not) compared to the 0.08 point decrease in GPA experienced by female students attending IEP (relative to female students who do not).

Within the narrower TOEFL score sub-groups, IEP attendance has a significant effect on cumulative GPA only in the <500 and 510-519 sub-groups, for which GPA was higher for students who had attended IEP, with  $p=0.02$  and  $p=0.01$ , respectively. In each of the other TOEFL score sub-groups (i.e., 500-509, 520-529, and 530-539) IEP attendance did not have a significant effect on cumulative GPA ( $p=0.38$ , 0.83, and 0.28, respectively).

Cumulative GPA is higher for females than males in each TOEFL score sub-group, and in each sub-group the difference is significant ( $p<0.01$ ). Academic outperformance by females has been reported at other universities in the Middle East region<sup>2</sup>.

IEP participation does not yield a significant cumulative GPA benefit for female students. Overall, female IEP-attending students have a cumulative GPA of 2.41 compared to 2.49 for non-attendees with similar TOEFL scores. This indicates that once they reach degree-seeking student status, females who attend IEP may fare worse, from a grade point average standpoint, than female students who did not attend IEP, although the difference does not reach the  $\alpha=0.05$  threshold of statistical significance (i.e., for the 'overall' group,  $p=0.11$ ). Within the TOEFL score range sub-groups, IEP participation by female students yields a higher cumulative GPA for only two of five groups (<500 and 510-519), but the differences in cumulative GPA for IEP attendees versus non-attendees only approach the level of statistical significance for the TOEFL score range 530-539 sub-group, where IEP attendees have a 0.21 lower cumulative GPA than non-attendees, with  $p=0.11$ . Thus, female IEP attendees enjoy no statistically significant benefit with respect to cumulative GPA when compared against female non-attendees, regardless of the TOEFL score segment analyzed, and in fact, for one female TOEFL score sub-group, the negative effect of IEP participation approaches significance.

For male students, IEP participation does not yield a significant cumulative GPA benefit when looking at the overall TOEFL score < 540 population; the 2.22 cumulative GPA for male IEP attendees is not significantly different from the 2.15 cumulative GPA for male non-attendees, with  $p=0.08$ . As mentioned above, the 0.07 cumulative GPA increase for males who attend IEP is significantly different from the 0.08 cumulative GPA decrease for females who attend IEP, but

when comparing the impact of IEP within each gender, the effect of IEP fails to reach the level of significance. For males, there are two TOEFL score sub-groups for which a significant, beneficial effect does exist. In the <500 and 510-519 TOEFL score groups, male students who attended IEP experienced a statistically significant ( $p < 0.01$ ) cumulative GPA increase of 1.09 and 0.21, respectively, relative to IEP non-attendees. The cumulative GPA differences of -0.02, 0.05, and 0.02 experienced for male IEP attendees within TOEFL score sub-groups 500-509, 520-529, and 530-539 are not statistically significant ( $p = 0.74, 0.60, \text{ and } 0.84$ , respectively). Thus, while male IEP attendees in some TOEFL score ranges experience a substantially and significantly increased cumulative GPA relative to non-attendees, there are other TOEFL score ranges for which IEP attendance has no impact on cumulative GPA.

As mentioned above, a significant interaction effect of gender and IEP attendance exists for students in the TOEFL score < 540 group, and through analyses of each TOEFL score sub-group, it appears that the source of this interaction effect primarily lies within students in the TOEFL score < 500 sub-group. A significant interaction ( $p = 0.04$ ) of gender with IEP attendance was present for the TOEFL Score < 500 group, but not for any other TOEFL score group. This interaction analysis determines whether the effect of IEP attendance on cumulative GPA differs depending on student gender, and for the <500 TOEFL score group it shows that the increase of 1.09 in cumulative GPA for males who attend IEP (compared to males to do not attend IEP) is significantly different from the 0.06 increase in cumulative GPA for females who attended IEP (relative to females who did not). In other words, this analysis shows that for students with a TOEFL score < 500, IEP is significantly more beneficial to males than females. In every other TOEFL score group the effect of IEP attendance on cumulative GPA is also more favorable for males than females, but in these other TOEFL score groups, the differences between gender are not statistically significant ( $p = 0.64, 0.13, 0.40, \text{ and } 0.19$  for 500-509, 510-519, 520-529, and 530-539, respectively).

### Cumulative GPA Discussion

Participation in an IEP failed to yield significant improvement in cumulative GPA for females, and for males in certain TOEFL score sub-groups. There are a variety of possible reasons why IEP attendance could lead to insignificant differences in cumulative GPA when compared to students who did not attend IEP. One explanation may be a non-absolute correlation between English language proficiency and academic performance. It may be that for some courses and in some academic programs, English proficiency is less important to earning a high GPA than other factors unrelated to a student's English communication skills or TOEFL score, for example mathematical reasoning (for math classes), artistic ability (for arts classes), or drawing and drafting skills (for architecture classes). According to this possibility, even if those who have attended IEP do have relatively stronger English language skills than non-attendees, it may be that these language skills do not translate into significantly higher cumulative GPA because they are not substantially related to the variables that affect GPA in certain courses.

Another possible reason that IEP attendees do not obtain significantly higher cumulative GPAs than non-attendees could be that students who did not attend IEP, who presumably have weaker English language skills, may find ways to work around their language deficiencies, such that IEP attendees have no unique advantage. Whether by studying extra hours, seeking outside tutoring,



or engaging in collaborative peer learning, there are methods by which IEP non-attendees could overcome relative language weaknesses to achieve an equivalent cumulative GPA as students who did attend IEP. IEP attendees may be more likely than non-attendees to be first-generation college students, and some studies have found difference in learning and study attitudes between first-generation and traditional college students that may also contribute to differences associated with student propensity to pursue independent learning<sup>3</sup>. These issues of learning outside of the classroom, and learning that is independent of English language proficiency, may be particularly relevant in an educational environment where many course instructors speak the same native language as students (i.e., Arabic), and may offer students outside-of-class assistance in their mother tongue. According to this explanation, even if IEP attendees have relatively stronger English language skills than non-attendees, the non-attendees are able to find other methods to circumvent their language deficiencies.

Besides explanations presupposing that IEP attendees do, in fact, possess superior English language abilities than non-attendees, there are explanations to the ‘no significant difference’ observation that acknowledge the possibility that IEP attendance may not actually yield substantial improvements in student English language ability. There are a variety of anecdotal complaints about the efficacy of an IEP in an environment where students continue to live, work, and primarily communicate in their native, non-English language. Among these is the concern that when IEP attendees continue to live in a non-English environment then the “Intensive” English Program may lose much of its intensity when compared against IEPs conducted in an English-speaking country. Also, during the hours that IEP students are in their English language classes, many of their peers speak the same native language, thus limiting the degree of true immersion. Compounding these informal and perhaps ancillary learning barriers is a growing concern among many in the Middle East that Arabic is being displaced by English, and a resulting policy of linguistic dualism<sup>4</sup> that may send students mixed messages about the importance of concerted study of English. Other reports from English language educators in the Middle East indicate a degree of negativity among students associated with learning and using English due to events of a political and military nature<sup>5</sup>. In cases such as IEP where English language learning is of primary concern, negative associations and cultural hesitations may be encountered and may persist in a way that non-IEP students do not experience.

Another concern sometimes expressed is that in some cases the primary focus of IEP students and programs are to improve student TOEFL scores rather than improving the underlying language abilities that the TOEFL test is meant to quantify. Instead of curriculum-teaching, item-teaching (or “Teaching to the test”) is instruction aimed at improving test-preparation, awareness of test tips and tricks, and increasing familiarity with the types of questions likely to be encountered in an examination environment<sup>6</sup>. Increasingly common in educational environments where student and program success is judged by whether students pass high stakes language examinations, it is possible that a generally-increasing emphasis on exam preparation<sup>7</sup> may, for some students, be at the expense of a more organic study approach that would yield longer-lasting language ability benefits. If the IEP attendees included in analysis were engaging in test preparation at the expense of language preparation, then it is possible that the TOEFL scores they received overstate their true language ability, particularly when compared to IEP non-attendees not engaging in intensive test preparation. Local effects related to overestimation of reading comprehension have been previously reported for the TOEFL<sup>1,8</sup>. Thus, allowing for the

possibility that increasing English language ability may, in fact, correlate to increasing academic performance in the form of higher cumulative GPA, the insignificant GPA differences between IEP and non-IEP students (or slightly lower performance exhibited by IEP attendees in certain TOEFL score groups) can be explained by the observation that while IEP may offer some academic or language benefit, that benefit does not translate into superior performance when IEP student performance is compared against the performance of non-IEP students who received the same TOEFL score without a focus on test-taking skills.

When considering overall program length, one must consider that since students are typically enrolled in the IEP program for one or two semesters prior to beginning pursuit of an undergraduate degree, the time required to earn this degree is substantially lengthened for those who spend time refining their English language ability prior to achieving degree-seeking status. This lengthening of the amount of time required to earn a degree may lead students to become ‘academically exhausted’ toward the end of their academic careers, and thus less willing to invest the time and interest required to obtain higher grades. A variation of this program length effect – reduced retention with increasing student age at the time of matriculation – has been observed among university students in the United States<sup>9</sup>.

The observed difference in IEP effect between males and females could be related to a range of factors, including differences in learning methods employed, differences in academic preparation prior to university studies, and possibly differences in student behavior during the IEP itself (e.g., because of cultural factors present in the Middle East region, female students in IEP could feel less comfortable in engaging in the expressive, active learning exercises that allow students to ‘make the most’ of IEP and harness the experience to receive future benefit). A survey of student learning method preferences, including differences by gender, is summarized in the “Learning Methods” section below.

### Major-Specific GPA Analysis

To refine understanding of which students IEP may be best suited for, comparisons were made of the IEP effect among students in different academic programs. Students in different academic fields may have varying demands on their English-language proficiency. For example, while students in engineering may rely more on quantitative skills, students studying business may rely more on reading comprehension and communication skills. Because of potentially differing needs for English language proficiency, it was hypothesized that attendance in IEP could have a varying impact on academic performance among students in different academic programs. The results of these analyses showed that while there is, in fact, variation in the effect of IEP attendance on major-specific GPA among students in different academic programs, the variation observed is contrary to the initial expectation that IEP attendance would be most beneficial for students studying in fields presumed to be more English language intensive.

Table 2 contains a summary of the major-specific GPA for students in the TOEFL score range of 520-539. This TOEFL score range was selected to help ensure the previously-discussed equivalence in average TOEFL score between IEP attendees and non-attendees, while still providing an adequate population size for analysis. For the three academic areas summarized (engineering, business, and architecture & design), average TOEFL score for students attending

IEP is 527 compared to 528 for those who did not attend IEP. The relative parity of these two TOEFL score averages indicates that IEP versus no IEP comparisons using the TOEFL score range selected should be free of the academic bias effects that could arise if average TOEFL score of each group were divergent. Additional motivation behind the TOEFL score 520-539 subset analysis is that at the university where this data was collected, a TOEFL score of 520 has recently been adopted as a threshold point above which students are not generally required to attend IEP, and further increases in the minimum TOEFL score required for direct admission are occasionally considered for future implementation. Thus, an analysis of the TOEFL range 520-539 investigates the possible benefit in major specific GPA that could be gained if students in this score range were required to attend IEP. Analysis within this TOEFL score range also assesses the relative merit of a fixed TOEFL score cutoff scheme compared to a more flexible system of individual evaluation of each student’s academic preparation in whole, as has been implemented at some universities with a large student body of international, non-native English speaking students<sup>10</sup>.

Table 2 – Major-specific GPA for students with TOEFL score 520-539 in different academic programs as a function of participation in IEP.

	Group 1: IEP			Group 2: No IEP			Difference		
	Eng.	Bus.	Arch.	Eng.	Bus.	Arch.	Eng.	Bus.	Arch.
Male	2.76	2.42	2.27	2.51	2.43	2.38	0.25	-0.01	-0.11
Female	2.52	2.61	2.74	2.78	2.64	2.66	-0.26	-0.03	0.08
<b>Overall</b>	<b>2.72</b>	<b>2.50</b>	<b>2.49</b>	<b>2.56</b>	<b>2.51</b>	<b>2.60</b>	<b>0.16</b>	<b>-0.01</b>	<b>-0.11</b>
n	117	55	22	183	181	94			

NOTE: “Eng.” Includes students majoring in civil engineering, computer science, chemical engineering, electrical engineering, computer engineering, and mechanical engineering. “Bus.” Includes students majoring in business administration, management information systems, finance, economics, and public administration. “Arch.” Includes students majoring in architecture, design management, interior design, multimedia design, visual communications.

A series of analyses of variance were performed on the data summarized in Table 2. Results from a one-way ANOVA help characterize the effect on major-specific GPA of gender and IEP attendance, and two-way ANOVA (gender by IEP attendance) is used to determine the joint effect of IEP attendance and gender on GPA. Comparing all students who attended IEP (i.e., all academic areas of Group 1 combined) to all students who did not attend IEP (i.e., all academic areas of Group 2 combined), the average major-specific GPA for IEP attendees was 2.63 versus 2.55 for non-attendees, a difference approaching, but not achieving, statistical significance (p=0.14).

With respect to major-specific GPA, females have significantly higher GPA (2.66) than their male counterparts (2.53), p=0.01. The interaction effect of gender by IEP attendance found a significant (p=0.04) interaction between gender and IEP attendance. This means that the major-specific GPA gain experienced by male IEP attendees (2.64 versus 2.50 for male non-attendees) is significantly different from the major-specific GPA decrease experienced by female IEP attendees (2.60 versus 2.68 for female non-attendees). Thus it is once again apparent that female

students have significantly higher academic performance than male students, that IEP attendance does not yield significantly improved academic performance when considering both genders together, but that a significant gender effect means that a significant difference exists in the impact on academic performance for males compared to females (i.e., a relative increase for male students and a relative decrease for female students).

The average major-specific GPA for engineering students in the 520-539 TOEFL score range (n=300) is 2.62, for business students (n=236) is 2.50, and for architecture students (n=116) is 2.58.

For engineering students, the major-specific GPA of IEP attendees is 2.72, which is not significantly different from the GPA of 2.56 for non-attendees ( $p=0.07$ ) at  $\alpha=.05$ . The major-specific GPA for male engineering students is 2.61, which is not significantly different ( $p=0.51$ ) from the 2.68 GPA for females. Comparing the relative effect of IEP between genders, two-way ANOVA analysis determined that the 0.25 point GPA increase for IEP attending male engineering students is significantly different from the 0.26 GPA decrease for IEP attending female students, with  $p=0.02$ . This indicates that for engineering students participation in IEP is relatively helpful for males and relatively harmful for females.

Among business students, ANOVA identified no significant difference in major-specific GPA for IEP attendees (2.50) compared to non-attendees (2.51), with  $p=0.95$ . However, a statistically significant ( $p<0.01$ ) difference in major GPA does exist when comparing males (2.43) to females (2.63). The interaction between gender and IEP attendance is not significant ( $p=0.92$ ) for business students, indicating that the effect of IEP attendance on major-specific GPA does not differ depending on gender.

Architecture students do not exhibit a statistically significant difference in major GPA based on IEP attendance ( $p=0.42$ ), meaning that the major specific GPA of 2.49 for IEP attendees is not significantly different from the 2.60 major-specific GPA for non-attendees. With respect to gender, the 2.34 major-specific GPA for male students is significantly lower ( $p<0.01$ ) than the 2.67 major-specific GPA for female architecture students. The interaction between IEP attendance and gender is non-significant ( $p=0.51$ ), meaning that just as with business students, the effect of IEP attendance on major-specific GPA does not differ depending on student gender.

### Major-Specific GPA Discussion

As shown in Table 2, the only academic area that experienced an overall gain in major-specific GPA through IEP attendance was engineering, but this improvement of 0.16 in major-specific GPA was not statistically significant. For business and architecture students, IEP attendees have lower major-specific GPAs, although again the differences are not statistically significant. That engineering students would be, relatively speaking, the most positively impacted by IEP attendance was contrary to expectations: it was anticipated that IEP attendance would yield proportionally greater benefits for students studying in areas thought to depend more on communication abilities. While it is possible that the importance of English language communication skills were over-estimated relative to the anticipated effect among business students, another contributing factor to the proportionally-greater overall improvement in major

GPA yielded by IEP attendance for engineering students in this 520-539 TOEFL score range may be partly explained by the relatively greater percentage of male students (for whom IEP is typically more beneficial) enrolled in engineering (82.7% are male) compared to business (62.5% are male). Since IEP attendance has been previously shown most beneficial to male students, academic areas that attract relatively larger percentages of male students will experience this ‘gender effect’, perhaps to a degree exceeding whatever ‘major effect’ may exist. Even considering this, however, it remains perplexing that IEP would not have a net beneficial effect for business students in this TOEFL score range. Explanations previously provided for the cumulative GPA analysis (and the general lack of GPA improvement attributable to IEP) may also apply for major-specific GPA, including English language proficiency being less important than other factors in determining GPA, the possibility of IEP students not actually obtaining relatively higher English language proficiency than their non-IEP counterparts, and the possibility that by focusing on TOEFL score improvement, IEP attendees receive a TOEFL score that exaggerates their underlying language ability.

With respect to students in the architecture area, it is possible that lower performance for students who have attended IEP could be related to total duration of university studies; whereas engineering students must earn a minimum of 140 credit hours to graduate, and business students are required to earn a minimum of 123 credit hours, architecture students must earn a minimum of 172 credit hours for a bachelor’s degree. Thus, when attendance in a one- or two-semester IEP program is added to the comparatively long five year academic program already required for all architecture students, it is possible that reduced academic performance could be related to the previously-described academic exhaustion.

### Graduation Rate Analysis

Table 3 – Graduation rate for students admitted to the university from Fall 1997 – Spring 2002 with TOEFL score 520-539 in different academic programs as a function of participation in IEP.

	Group 1: IEP					Group 2: No IEP				
	Eng.	Bus.	Arch.	Arts & Sci.	Overall	Eng.	Bus.	Arch.	Arts & Sci.	Overall
<b>n</b>	29	21	7	13	<b>70</b>	47	94	24	36	<b>201</b>
<b>Graduation Rate</b>	79.3	52.4	42.9	38.5	<b>60.0</b>	57.4	55.3	70.8	22.2	<b>51.7</b>

Table 3 summarizes the effect of IEP attendance on graduation rate for students who were admitted to the university between Fall 1997 and Spring 2002, with a TOEFL score 520-539. Non-graduating students include those who have withdrawn from the university, transferred to another institution, or who were, at the time the data was gathered, still pursuing their studies. Since the data set used indicates students’ final, or most recent, major area the effects of transferring between programs has not been considered.

A two-way cross tabulation and a chi-square analysis applied to the data summarized in Table 3 shows that the overall graduation rate of 60.0% for students who attended IEP is not significantly

different ( $p=0.25$ ) than the 51.7% graduation rate for students who did not attend IEP. For engineering students, the benefit (79.3% versus 57.4%) approaches the level of significance ( $p=0.07$ ). For students studying in business and architecture, the lower graduation rate experienced by students who had attended IEP is not significant, with  $p = 0.85$  and  $0.17$  respectively. Although the graduation rate for IEP-attending architecture students is substantially lower than for non-attending students (42.9% versus 70.8%), the small number of students limits the ability of even such a profound difference to be considered statistically significant. While limited conclusions can be drawn with such a small sample size, it is possible that architecture students are particularly vulnerable to the previously-described academic exhaustion effect because of their uniquely-long program duration, which would be made even longer by any time spent in IEP. The improved graduation rate exhibited by students in the college of arts and science is not statistically significant ( $p=0.26$ ).

While small population size prevents a chi-square analysis of gender effect within each academic area, an analysis of graduation rate with respect to gender for all students admitted to the university Fall 1997 – Spring 2002 with a TOEFL score 520-539 shows that the 70.1% graduation rate for female students is significantly higher ( $p<0.01$ ) than the 46.7% graduation rate for male students. Female students who attended IEP had a 70.6% graduation rate, which is not significantly different ( $p=0.96$ ) from the 70.0% graduation rate of female students who did not attend IEP. Although overall graduation rate is lower, the effect of IEP attendance on graduation rate was more substantial for male students, with 55.6 % of male IEP attendees graduating compared to 43.4% of non-attending males ( $p=0.13$ ).

### Graduation Rate Discussion

As previously exhibited in analyses of cumulative GPA and major-specific GPA, attendance in IEP has a significantly more favorable effect for male students than for female students. Similarly, the previously-demonstrated benefit experienced by IEP attending engineering students compared to engineering students who do not attend IEP is again manifest in a higher graduation rate. For business students, the graduation rate trends reported in Table 3 correlate to trends observed in the major-specific GPA summary contained in Table 2, which is that IEP attendance appears to have a slightly negative effect, if any, on student performance.

While the increases in major-specific GPA and graduation rate enjoyed by engineering students participating in IEP are substantial, there is one additional academic indicator available for engineering students that further complicates understanding of whether the net effect of IEP attendance is positive or negative. Unique to engineering students at the university is a requirement for a senior-level Comprehensive Assessment Examination (CAE) that includes specific technical questions from the student's major and general questions that relate to broader areas of engineering. An analysis of performance on the CAE was conducted for engineering students in the TOEFL score range of 520-539, with rate of passing the CAE being 37.5% for students attending IEP ( $n=24$ ) and 41.0% for students not attending IEP ( $n=39$ ). This difference is not statistically significant ( $p=0.78$ ). While this examination is written and administered in the English language, and would thus presumably favor students who have the stronger English language foundation that IEP aspires to provide, it is also possible that the technical focus of the examination (i.e., engineering problem solving) reduces the relative importance of English

proficiency, such that any language advantage that might exist for IEP attendees is of limited benefit in solving technical exam problems.

### Learning Methods Analysis and Discussion

Uniformly higher academic performance (cumulative GPA, major-specific GPA, and graduation rate) by females and a relatively better response to IEP for males (compared to no significant difference and/or decreased academic performance for females attending IEP) were two differences between males and females identified by the analyses reported herein. In order to explore possible reasons underlying these differences, a group of engineering students (n=432) were surveyed relative to their preferences in learning methods and attitudes towards education. One study of the utilization of the English language by natively Arabic-speaking students during their informal study found females to be more likely than male students to use spoken English<sup>11</sup>. To gauge potential differences in learning methods utilized by males and females, students were asked to indicate whether they regularly, (1) attend class lectures, (2) print notes provided by the instructor, (3) take their own handwritten notes during class lectures, (4) work together with other students on homework assignments, and (5) read textbooks. Student responses were compared for IEP attendees and non-attendees with TOEFL score < 540, and differences were analyzed by two-way crosstabulation (chi-squared analysis).

Of the five learning activities, females indicated significantly higher rates of printing notes provided by the instructor (73.6% of females, compared to 62.3% of males;  $p=0.03$ ) and taking their own handwritten notes during class lectures (81.1% of females, compared to 67.6% of males;  $p<0.01$ ). These elevated study habit tendencies may be reflections of the core reasons that female students experience greater academic achievement than male students. Differences between male and female students in attending class lectures, working together with other students on homework assignments, and reading textbooks were not statistically significant. Previous comparisons of academic performance by gender clearly illustrates that female students outperform males, and based on this it is reasonable to conclude that they spend more time, overall, studying and working on course assignments. In view of this, IEP may be particularly beneficial for male students because it represents a forced, in-class opportunity for those male students to strengthen English language skills, whereas female students may be better able to independently develop these same abilities (thus reducing any unique advantage that IEP may provide relative to non-attendance at IEP).

No statistically significant differences in student-reported learning methods were identified when comparing IEP attendees to non-attendees. However, when expanding analysis to include all students who completed the survey, regardless of TOEFL score, the 49.2% rate of regularly reading textbooks reported by students who had attended IEP was found to be significantly ( $p=0.01$ ) lower than the 62.2% rate reported by non-attendees. That IEP students are significantly less likely to engage in reading textbook materials may indicate that having participated in IEP does not allow students to fully overcome the language-based learning obstacles inherent to a low TOEFL score when enrolling at the university level.

## Conclusions

By comparing cumulative GPA, major-specific GPA, and graduation rate for students at an American-style university located in the Middle East gulf region, it was found that IEP does not result in significantly higher academic achievement (i.e., cumulative GPA, major-specific GPA, and graduation rate) for several student sub-groups with relatively low TOEFL scores, including female students, students with TOEFL scores above 520, and students studying in business or architecture majors. Substantial and statistically significant gains in GPA were, however, realized by students who had attended IEP with a TOEFL score of less than 500, for male students (in general), and for students enrolled in engineering fields.

Initial expectations were that IEP would be most helpful to students enrolled in academic programs that presumably rely on a strong foundation of English proficiency, and smaller gains in academic performance for technically-oriented students, such as engineers; these presumptions were not supported in an analysis of the effect of IEP attendance on major-specific GPA, which found GPA gains for engineering students, but lower GPAs for business and architecture students who had attended IEP. While the overall university-wide graduation rate was slightly higher for students who had attended IEP (and substantially higher for engineering students who had attended IEP), business and architecture students who attended IEP fared slightly worse than students in the same TOEFL score range that did not attend IEP. For none of the academic areas did graduation rate differences between IEP attendees and non-attendees reach statistically significant levels.

These results identify general trends that may be broadly applicable where significant numbers of non-native English speaking students are enrolled, including the growing number of western-style, English-language universities in the Middle East region. The broad applicability of this study's findings are supported by heterogeneity among the study population (i.e., native language spoken, high school style background, etc.) and the wide range of nationalities represented in the student data analyzed; 85 different nationalities are represented by the 6516 students included in the dataset, with no single nationality accounting for more than 17 percent of the students. Important trends identified that may be useful in program design and application at other institutions include: (1) the particular value of IEP for students with a TOEFL score below 500, (2) the enhanced importance of IEP for engineering students relative to students in other disciplines, (3) a significantly different academic response to IEP for males (i.e., generally beneficial) compared to females (i.e., seemingly harmful), and (4) the lack of significant differences in study methods utilized by students who had attended IEP compared to those who had not.

Additionally, by identifying groups who are potentially not well-served by the current IEP program (e.g., females, for whom non-attendance in IEP yields higher overall and major-specific GPA; and business and architecture students, for whom IEP attendance yields lower GPA and lower graduation rate), an opportunity is provided to explore, identify, and address potential IEP-related issues (such as program length, classroom participation hesitations, or learning methods employed) that may interact with student success benchmarks such as GPA and graduation rate.



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