

The Effectiveness of Remedial Mathematics Courses in Light of Student Decision to Enroll at a Private University in Lebanon.

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Remedial math courses were evaluated along two strategic features; enrollment and student academic achievement. Findings show that those students who had more than one remedial math course were inclined to enroll than enroll. The finding also suggest, that achievement in remedial courses appeared to reflect parallel academic levels with the first regular mathematics courses and students' cumulative GPA. The results are significant to the extent that remedial mathematics courses maybe a hindrance to the strategic development of the university and that they may not be evidence to subsistent intellectual and academic development of students. This study is illuminative given that few studies have emerged to understand non-regular programs in Lebanese universities in the or Middle East. The formative model presented in this study could be generalizable to studying the effectiveness and worthiness of programs in different parts of the World, and thus a standard used across universities.

Key Words: Remedial math, program effectiveness, formative evaluation

INTRODUCTION

Prior to matriculation into colleges and universities students pass through a rigorous set of school, national, standard and finally university entrance exams. These testing benchmarks provide some understanding of how students perform against some pre-established cut-off measures. Admissions to a college or a university use these exams along school grade point average, rank in class and other personal, aptitude measures, to either admit or reject students. Those admitted are selected to matriculate in a regular program to a university; others are placed or recommended to take remedial courses prior to enrollment into the program of choice (Breland, Maxey, Gernand, Tammie & Trapani, 2002). Remedial programs are very popular in many American-style Lebanese universities as they are gateway subjects into regular programs.

A large number of North American colleges and universities offer remedial programs, as reported by the National Council of Educational Statistics (NCES, 1996), almost 100% of all community colleges offer remedial courses and 78% of all four-year higher education Institutions. This picture replicates itself in other parts of the world; particularly in institutions This picture replicates itself in other places around the world; particularly in

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Lebanon, where a robust growth of newly established American-style universities seeking American accreditation and quality assurance has demanded for greater accountable measures in the design, development and assessment of remedial programs by international and American accreditation bodies. As Bers (1987) suggested that there is a substantial demand and need for remedial courses for program evaluation studies in higher education. Thus, this study will focus on a formative evaluation of mathematics remedial programs and will assess the effectiveness and success of the math remedial courses in the enrollment and retention of students. The significance of this study is that it is the first in its kind in the Middle East and in Lebanon, in the hope that other studies replicate the approach and method that they become penetrative and better available for accreditation agencies and general public, and a standard for formative evaluation of programs.

Differences between North American and Middle Eastern remedial programs can be identified through the basic structure of these programs and historical-contextual circumstances. In North American context, remedial programs offer courses on voluntary basis. In most of European universities, remedial programs do not exist; however, remedial or developmental programs in different parts of the world as in Lebanon are mandatory for several reasons that have some historical. Lebanese schools established by colonial powers, have been French, then adopted by local Catholic establishments and run by the Maronite sect. These schools have had a Francophone character, such that subjects as mathematics and science are taught in French. Students desiring to acquire an American style of education, have to go through a rigorous set of mathematics entrance exams. The scores on the entrance exams as well as the high school grade point average and other criteria used for the evaluation for admittance to the university. Students are placed in the remedial courses based on entrance exam scores rather than an aggregate score of all admission criteria (i.e. grade point average, rank, standardized tests, or national exams). Once assigned to a remedial course, passing the course is mandatory prior to matriculation. Students will not be able to enroll, if unsuccessfully passed the assigned i.e., placed remedial courses. These programs are not voluntary but mandatory for partial and non-credit fulfillment of degree programs. Remedial courses are offered upon matriculation and extend from one semester to a year.

Remedial programs have raised controversy among parents and students. As faculty and student advisors our informal discussion with them; both parents and students feel they are paying for the same education twice and students feel they are wasting, one full academic year in remedial courses. Many of them complain that their performance is tied down by the mathematics entrance exam is given in English, which is different from the medium of instruction they learn the subject. Some believe that they are repeating the mathematics in a different language. However, higher education policy makers and academic administrators contend that the courses as English and mathematics serve as gatekeeper subjects, and they tend to sieve students out of some careers as in the sciences and engineering (Stage & Kloosterman, 1995; Kull, 1999). Academic administrators also suggest that remedial courses play a role in preparing students for material they do poorly or they have missed (Ottley, 1968). Some academicians consider that complains

by parents are some what lacking empirical verification. Hoyt & Sorensen (2001) for instance, argue that students from high school are rather under prepared, face low levels of academic preparation, generously overrated in high school, and not to par with the academic rigor expected at college. The opposing argument between academic administrators and faculty on one hand, parents and students on the other, calls for assessment models that evaluate the worthiness and effectiveness of the remedial programs in higher education. Mainly, to answer the question of what are they really accomplishing in terms of the objectives and in preparing students for the regular academic program. In addition, evaluation of remedial programs should also answer questions to the strategic development of higher education institutes in that remedial should not be an obstacle to retention or lack of enrollment. If prospective students are expected to take more remedial courses than is expected, they are more likely to choose another university to enroll which offers less remedial courses. A formative evaluation model will help answer concerns made by parents, academic faculty and policy makers as a measure of effectiveness of the remedial programs.

Research has shown mixed results concerning the effectiveness of mathematics remedial programs. Richardson, Fisk, et. al. (1983) argue that remediation does not advance students into college academic programs, and students who have a number of remedial courses to take, are discouraged to continue or drop-out all together. Those who complete a long list of remedial courses tend to be more motivated students and succeed in the regular program of study. Early studies found that mathematics remedial did not improve college mathematical abilities through regular college course work or that it did not fulfill the objectives it tended to achieve in English (Lawson, 1959; Ottley, 1968). For instance, a National study of Developmental Education in the US (Boylan, Bonham, et. al., 1992) found that dropout rates in remedial courses were highest in mathematics. The National Council for Educational Statistics study corroborated these results to suggest that 74% successfully completed remedial mathematics courses. Saxon & Boylan (2001). and Kulik, Kulik, et. al. (1983) corroborates these results; the latter conducted a meta-analysis of research and evaluative findings from over 100 studies examined the impact of remediation on the GPAs. They found that those who went through the remedial program in mathematics had higher GPAs than those who were recommended but did not take the remedial courses. According to Adelman (1995), the mathematical grounding of many remedial college students is so deficient that a high failure rate exists *even* in the remedial classes. In the same study, those who completed the remedial courses had slightly higher and non-significant core curricular English courses compared to those who did not go through the remedial program. Johnson & Kuennen (2004) showed that remedial courses taken before subject-curriculum, had students perform better on these courses than those who took the courses concurrently. Empirical evidence in the US suggest that remedial programs in colleges indicate success in degree attainment due to remedial and placement preparation and college support programs (Cabrera & La Nasa, 2001; McCabe 2000 cited in Brothen & Wambach, 2004). It is also argued that students in remedial programs are more likely to persist in college than those who were not required to take courses (Bettinger & Long, 2005). Similarly, Schoenecker, Bollman, et al., 1998) compared those enrollees who did not complete

recommended remedial courses, were less apt to continue with the program of study. Even those who do enroll in calculus courses, without the remedial courses, 40% fail these courses (Wieschenberg, 1994). Richardson, Fisk et. al. (1983) argue that students who do enroll in regular courses without the remedial prerequisites often force faculty to water-down the curriculum so as to accommodate for low achievers. Current research has drawn the pros and cons of remedial programs, but still the question of policy and effective remedial programs is still lacking and stipulated rather than formalized rigorously or empirically. The lack of studies and its consequence on remedial programs, says considerably little about what they “really” accomplish especially that many universities have been established in the 1980s in Lebanon have reached their "maturation cycles" thus, seeking better mechanisms to self-assess the performance of their students, educational services and type of students they graduate in the international arena.

Another important reason for evaluating remedial programs in higher education, stems from the need of parents and students to relinquish the financial burden precipitated by remedial courses. Still evaluative studies have not received enough attention from private or public universities in Lebanon and the Middle East. The authors are not aware of one study that evaluates “pre-university programs” in the Middle East. Even in the US research about the effectiveness of remedial education programs has typically been sporadic, under funded, and inconclusive (Bers, 1985). For instance, a study of 116 two- and four- year colleges and universities revealed that only a small percentage conducted any systematic evaluation of their remedial education programs (Weissman, Bulakowski, & Jumisco, 1997). Research literature as that presented by Roueche and Snow (1977) cited in Bers (1987) reviewed programs of 139 public community colleges and 134 universities found that these universities related the success of remedial programs to student completion of the program i.e., retention. In addition, they found that student success was a function of faculty and staff involvement and caring of students to persist in programs. More recently, Zhai & Skerl (2001) conducted a comprehensive study on the effectiveness of remedial courses at a four-year institute in the US and found that remedial courses were effective in that they increase the success in regular courses and subsequently in the retention, and high graduation rates. There is currently questionable practice as to what makes the best remedial program. Keeping in mind there is no empirical and formative based evaluation studies that provide models to identify and examine the success of remedial programs in the Lebanon and the Middle East.

With this in mind, this evaluative/research, paper suggests a basic model and approach to evaluating remedial programs in Lebanese universities and elsewhere. This model has two basic components established along strategic principles and issues that address the effectiveness of remedial programs and whether they are achieving their purpose in helping students advance in higher education, the model considers increased *enrollment and better performance in subsequent mathematics courses and overall academic progress*. The three modules can formally upraise, remedial programs at colleges and universities. As modules have been theoretically substantiated (see above literature review), they become guiding sets that critically examine the effectiveness of remedial

programs. Our hope is that the evaluative/research approach establishes standards and guidelines that emphasize performance indicators for institutional researchers and researchers alike for studying remedial programs around the world.

Research Questions

A number of research questions answered through this evaluative study. Questions as to what extent do remedial mathematics courses taken, hinder students from enrolling at the university? Second, to what extent those assigned in remedial courses enroll at the university remain or dropout all together i.e, those that take more than one remedial course are they more apt to stay or leave the university? Third are remedial courses effective in preparing students for their required college-level mathematics course? Fourth, do the mathematics remedial courses reflect generally a better overall academic performance i.e, grade point average (GPA)? Particularly, those who go through remedial courses do they have an overall better performance in degree courses than similar students who do not? With the expansion of the higher educational system in Lebanon, this study, therefore, provides an operative, logical model and a benchmark in the formative evaluation of remedial programs in higher education.

Case Study

It is not unusual for a newly established (or well-established) university to review and evaluate its remedial programs and policies after a reasonable start-up and maturation period for the programs and policies. This periodic review and evaluation is common in private universities, but almost standard practice at universities seeking accreditation. The private catholic university at which this study was conducted was founded in Lebanon, in the mid-eighties. The structure of this university is based on the American-credit system of education. Since the 1990s, the university has witnessed growth in the number of students applying and enrolling; that encouraged the university administration to branch out to other regions in Lebanon in order to provide higher education to rural populations. At present, the university has over 5000 students who are mostly enrolled in undergraduate majors with the majority registered in the Faculty of Business Administration and Economics. This relatively quick and quite sizable expansion of the student body; unfortunately, was not due to or accompanied by formal strategic planning or program review and evaluation. Consequently, in the 2006/2007 academic years, the university's road map for strategic development committee attempted to study different aspects of the university programs and services that were substantial in understanding the university's services

Mathematics Requirements at a Private University in Lebanon

Students at this private university take a number of mathematics courses before they enroll into their regular programs. A cutoff score is established by each faculty which determines the placement criteria in remedial courses. These scores with other admissions' criteria used with high school output variables as high school grade point

average (GPA) and rank in class for admission to the university. The science and engineering students in addition to taking a mathematics entrance exam, students take two science subject matter exams depending on the major of choice. The placement in the remedial depends on the aggregated score in the math and science exams. Once students receive admissions, they are placed in remedial mathematics course depending on their entrance exam score in the mathematics component. The weighted score in the mathematics and science entrance exams dictate placement in the mathematics remedial course (see Table 2). There are three types of remedial given to students based on the major admitted to and not all majors require students to take mathematics remedial courses. The type of mathematics remedial courses summarized in Table 1 shows the type of mathematics remedial course required is based on pre-established cut-off scores. At most, students take three math remedial courses depending on the major they choose.

Table 1: Remedial for Mathematics Courses Placement Criteria

Major	Remedial	Remedial	Remedial	Pass
	21-26	27-35	36-45	+ 46
Business Computing	MAT xx1 (Removed as of 2005/2006) MAT 1xx MAT 1x5	MAT 1xx MAT 1x5	MAT 1x5	
Computer Science	MAT 1xx MAT 1x1 MAT 11x	MAT 1x1 MAT 11x	MAT 11x	
Arts & Design	MAT xx1 (Removed as of 2005/2006) MAT 1xx	MAT 1xx	MAT 1xx	
Architecture	MAT 1xx MAT 1x1 MAT 11x	MAT 1x1 MAT 11x	MAT 11x	
Business Administration	MAT xx1 (Removed as of 2005/2006) MAT 1xx MAT 1x5	MAT 1xx MAT 1x5	MAT 1x5	
Sciences and Engineering ¹	-----	-----	-----	-----
Humanities	16-21	22-27	28-33	+ 34
	MAT xx1 (Removed) MAT 1xx	MAT 1xx	MAT 1xx	

¹ See Table 2

Table 2: Weighted scores on the placement mathematics, physics, and chemistry exams

Grade Percent	Subject	Coefficient	Weight
100	Mathematics	100	1
100	Chemistry	10	0.1
100	Physics or Biology (physics for Engineering and Physics students only)	40	0.4
Total		150	1.5
40-53 Accepted with two mathematics remedial (MAT 1x1 & MAT 112)			
54-67 Accepted with one mathematics remedial (MAT 1x1)			

METHODOLOGY

Several subgroups and cohort groups obtained from the student enrollment database from the university's Administrative Computer Centre. Data obtained for students for both those who enrolled and the none-enrollees to the university. Data accrued for the 0-level courses; 100-level courses, and the first mathematics course and grade point average from 2001 to 2006. Data pertaining to those who did not enroll included their entrance exam scores, and the type and number of mathematics remedial courses that were required. The basic design crossed the number of remedial courses with a number of variables that helped answer the research questions. In the first analysis for instance, those enrollees with those non-enrollees were compared, to determine whether those who choose to enroll at the university had higher or lower number of mathematics remedial courses than those who did not. Second, to find out whether the number of remedial courses taken by students was related to student retention variable i.e., attrition and retention; third, to determine the effectiveness of the mathematics remedial course, if they have a direct impact on subsequent courses and general academic performance. Student enrollees classified into cohort groups were those who had zero remedial, one remedial, two remedial, and three remedial courses. Lastly, based on the average grades on the remedial mathematics course three cohort groups of remedial students were classified as low achievers, middle achievers and high achievers as to cross these levels with their cumulative GPA and the first mathematics course grades in that order.

Sample

All students accepted who either enrolled or did not enroll to the university were selected for the study. The sample size came to 8587 who applied to the university from 2000/2001 to 2005/2006 academic years. Substantive reorganisation and restructuring of the data was performed to establish a multifarious cohort and subgroups. Rejected and graduate students applying to the university were not included in the sample data.

Statistics

A chi-square statistics were used to compare student enrollment status between those who took 1, 2, 3 and no remedial courses. A correlation analysis run to determine the level of association between the entrance exam scores, remedial grades, grade on their first mathematics course and cumulative grade point average. T-value tests, one-way Analysis of Variance (ANOVA), post-hoc analyses were used to detect course performance differences between those who had three or less remedial courses; on regular college-level mathematics students and cumulative GPA in that order.

RESULTS

The first analysis determined whether placement in the number of remedial courses had an effect in determining the level of non-enrollment into the university. A count was calculated for the number of students in remedial courses, and crossed with enrollment status (whether they enrolled, or did not enroll at the university).

Table 3 reports the percentages of the non-enrollee and enrollee classifications. The results indicated a significant difference between non-enrollees and enrollees ($\chi^2(3, 8587) = 106.86, p < .0001$). Surprisingly, none enrollees had at least one remedial math course to take than those who matriculated at the university. This differences appears for those who take one remedial course with a percentage of 22.4% (none enrollees) compared to 4.55% (matriculated). In the second analysis, we reclassified the number of remedial courses into those who took one or more mathematics remedial courses with those who took no remedial courses and crossed it with enrollment status (enrolled/not enrolled). A significant Chi-square was found ($\chi^2(1, 8587) = 35.23, p < 0.001$), for those who were not required to take mathematics remedial courses enrolled at a higher percentage 59.9%, compared to 52.1% who did not enroll. However, those who had one or more math remedial course to take had higher odds of not enrolling at the university compared to those who enrolled (40.1%). In general, math remedial courses in general hinder students from enrolling at the university.

The third analysis determined the impact of remedial math courses on student performance in their first mathematics course and cumulative GPA. The design crossed the number of mathematics remedial course (i.e., zero and one or more remedial courses) by their first math course in the regular program and cumulative GPA for the enrollee cohort group. A significant difference was found between those who did not take remedial courses and those who took one or more on the first math courses ($t(df=4917)=9.17, p<0.0001$). A t-value test conducted to study the same effects of the number of remedial course on cumulative GPA. The differences on the mean for those who took no remedial courses was higher than those who took one or more on cumulative GPA ($t(df=6447)=25.25, p<0.00001$, the means are reported on Table 4. A significant

and high positive correlation appeared for the average remedial grade and first math course at $r=0.85$, $p<0.0001$). In addition, a high correlation found between the average grade of the mathematics remedial course and cumulative GPA ($r=0.393$, $p<.001$). In general, the results show that those who have not taken remedial courses have had a

Table 3: Frequencies and percentages for enrollees and non-enrollees in none remedial and remedial mathematics courses

		Number of Remedial Courses				
		0	1	2	3	
Did not Enroll	Number	898	387	364	76	1725
	Row %	52.1%	22.4%	21.1%	4.4%	100.0%
	Column %	17.9%	18.7%	27.7%	38.8%	20.1%
	Percent of the Total	10.5%	4.5%	4.2%	.9%	20.1%
Enrolled	Number	4113	1678	951	120	6862
	Row %	59.9%	4.5%	13.9%	1.7%	100.0%
	Column %	82.1%	81.3%	72.3%	61.2%	79.9%
	Percent of the Total	47.9%	19.5%	11.1%	1.4%	79.9%
Total	Number	5011	2065	1315	196	8587
	Row %	8.4%	24.0%	15.3%	2.3%	100.0%
	Column %	100.0%	100.0%	100.0%	100.0%	100.0%
	Percent of the Total	58.4%	24.0%	15.3%	2.3%	100.0%

Table 4: Means on the first math course and cumulative GPA by those who took no remedial courses and those who took more than one remedial course

	No Remedial Courses			More than One Remedial Courses		
	N	Mean	SD	N	Mean	SD
First Math Course	2241	2.31	1.23	2678	1.98	1.22
Cumulative GPA	3825	2.70	0.64	2624	2.30	0.6

higher cumulative GPA, however, those who had one or more remedial mathematics course had a higher average than those who had no mathematics remedial course.

The sixth analysis investigated whether one, two, or three mathematics remedial courses had any direct affect on their performance in the first math and their cumulative GPA. Four cohort groups were created for those who enrolled into zero, one remedial, two remedial, and three remedial courses then ran a one way ANOVA to see if any differences existed between the four groups. A high significant difference was found ($F(3,4915)=65.28$, $p<0.0001$) on the first math course. A Scheffe' post-hoc analysis between the four groups showed differences among all combinatorial groups. The highest mean was for those who took three remedial courses, followed by those who took none, two and lastly one remedial course. On the GPA, a significant difference was

Table 5: Means of the remedial courses

	No Remedial	One Remedial	Two Remedial	Three Remedial
	Mean(SD) N			
First Math Course	2.31(1.23) 2241	1.79(1.31) 1610	2.22(1.02) 948	2.64(0.97) 4919
Cumulative GPA	2.70(0.64) 3825	2.30(0.63) 1560	2.29(0.54) 938	2.27(0.49) 120

Table 6: Means and F-Ratio of the average grade level crossed by the first math and cumulative GPA

	First Math Course	Cumulative GPA
	Mean (SD) N	
Low Achievers	0.95 (1.0) 1130	2.08(0.60) 1080
Middle Achievers	2.4 (0.56) 947	2.34 (0.51) 941
High Achievers	3.29 (0.55) 601	2.66 (0.53) 597
	F(df)	
	1988.89 (2,2675)**	219.15 (2, 2615)

found ($F(3,6445)=212.83$, $p<0.0001$), the Scheffe' post-hoc analyses reports a no

significant difference between those who took one and two, one and three, and two and three remedial courses. However, a significant difference appeared between those who took no remedial courses with those who took one, two, and three respectively. The results in general indicate that the more remedial mathematics courses students take, impacts their performance in the first math course, in the regular curriculum. However, those who took no remedial courses had higher cumulative GPA than those who took one, two, or three remedial courses. The higher the number of remedial courses students take the lower the cumulative GPA.

A high and significant positive correlation between the average remedial grade and the first math course appeared, as well as the correlation between average remedial grade and cumulative GPA, indicate that a relation may exist between the course content of the math remedial courses in the first math course. It may also say that remedial courses have little effects on other courses in the regular program and that remedials have merely “short-term returns” rather than a sustainable affect on the intellectual development of the typical college student. So in order to determine what may be already prevalent in our data but not evident was to investigate the levels of achievement on these remedial courses on the first mathematics course and cumulative GPA crossed with remedial grade average. Three cohort groups were created, those who received a grade less than a C (low achievers), a group who received a grade between C and B (middle achievers), and a third group who received a B and above (high achievers) on the average of the remedial course(s). A separate one-way ANOVA was run on the first math course and on the cumulative GPA. Table 6 reports the means and the F-ratios. A Scheffe’ post-hoc analysis produced a significant difference between all combinatorial groups with higher mean ratings for those whose averages on the mathematics remedial courses were high achievers, followed by the middle achievers and lastly the low achievers. The high achieving students had the highest first math course and cumulative GPA average. Conversely, those who received lower grades on the remedial courses had the lowest grades on the first math and cumulative GPA, respectively.

DISCUSSION

In the review of the literature, we found few studies that examine the effectiveness of remedial programs. Particularly, we found not one study that assessed remedial courses in relation to enrollment into a program. In this paper we proposed a model to asses the effectiveness of remedial programs. We also examined this model in a sequential and modular approach. Although research and methods have been spurious and partial, Bers (1985) suggest that colleges and universities have had made little lead in establishing an applicable, appropriate and concurrent formative evaluation model for the evaluation of remedial programs. This model was coursed at a private university in Lebanon, in the hope that such model is recognizable and easily applicable for programs along lines of strategic development. It is our hope that this becomes a standard module for replication and a benchmark for remedial program indicators in Lebanon, and the Middle East and around the world.

One of the major finding presented in this study is the relation between the number of math remedial courses students were placed in, and whether they enroll or do not into a university. Thus, it would be advantageous for future studies to understand whether remedial courses act as obstacle or an opportunity to enroll or continue in regular programs. The results also show that remedial courses have direct relation with students remaining or leaving a university i.e., retention. Particularly those who had one remedial math course were more inclined to dropout than stay enrolled. In a large US study by Boylan, Bonham, et. al. (1992) found that dropout rates in remedial courses were highest in math which created problems and difficulty in interpreting the dropout rates in regular programs. Grubb's (1998), data from the City University of New York (CUNY) system indicated the attrition rate was close to 40% in remedial courses. The National Council of Educational Statistics in review of community colleges in the US pointed to a 74% retention rates in remedial math. Grubb (1998) said that high dropout rate in remedial courses was one of the major problems in evaluating the effectiveness of remediation; however, this limitation is a reflection of what this study presents that remedial courses had a direct relation between students attrition and retention. Perhaps, these students found that their first remedial was so challenging that they could not foresee themselves making it through regular program in college and decided to dropout rather go through a rigorous academic program.

The third and more important finding as to whether math remedial courses generally improve student performance in mathematics and other subjects. These remedial courses have consequential affects in furthering the intellectual development of students as they are probably recognized to have substantial number of benefits that outweigh the costs as in general skills employment and occupational attainment. But if remedial programs are to place some sort of barrier in student enrolling, they only provide improvement in mathematics courses, then it might be easier to say that the benefits are extremely localized and thus only serve students, in the short run, as the first mathematics courses that they take in college (Yoram, Siadat and Hagedorn, 2000). In a large US study by Boylan, Bonham, et. al. (1992), they surveyed students from 150 colleges in the US and found that those who passed their mathematics remedial courses performed at an acceptable level in their first college-level courses. The findings in this study showed that students who took two or more mathematics remedial courses performed better on their first course, than those who took one or none at all. Particularly, those who took three remedial courses were to benefit the most as they scored higher than those students who had no remedial courses. However, on the cumulative GPA students who took three remedial courses had the lowest cumulative GPA, followed by those who took, two, one, and zero in order. Thus, this particular finding is significant in that the level of academic achievement among those who enroll with out remedial courses appears to be the highest. Even if students so poorly prepared, remedial courses i.e. programs have done little to improve the overall performance in college. As Weissman, Bulakowski and Jumisko (1997) indicated that the purpose of remedial courses to gain skills necessary to complete in regular program in college- our results showed that the more remedial courses students take the lower the cumulative GPA. These results also corroborated with Weissman, Silk and Bulakowski (1997), who found that the average GPA for the remedial students was

not as high as that of college-ready students. This is significant because these courses show that they may be not doing what they set out to do and thus fail to be effective in providing extensive and comprehensive academic preparation for entering college students in a private university in Lebanon.

In our final analysis, we attempted to investigate whether success in courses was related to the more logical and evident factor as educational achievement. By establishing three groups; low, middle and high achievers, it was found that those low achievers on remedial courses performed poorly in the first course in the regular program and on their cumulative GPA. Similarly, those who were high achievers in remedial math courses the high achievers in the first mathematics course and on their cumulative GPA. This finding corroborates that of Weissman, Bulakowski et. al. (1997), who found those students who performed well above the average grade in remedial courses, did not perform to par with those who did not take mathematics remedial courses. Remedial students do tend to do poorer than those who do not go through such programs and those who do not perform higher than those who did not go through remedial courses. These findings are substantial and informative in that those students who are high achievers tend to perform well anyway, irrespective if they take remedial courses or not. It could be concluded that remedial mathematics courses, are effective in promoting academic success.

Many universities in the Middle East have opted to make substantial restructuring to the concept of remedial programs. Particularly, because many universities follow the American-based credit system where the instruction takes place in language other than native language, these programs conceptualized along preparatory rather than what is considered as remedial. Thus a shift in the paradigm from what is considered missing in the educational matter to that of refurbishing student preparation. The more recent development has been to create what maybe considered as a hybrid and very popular bridge programs. These programs are even wide-ranging because they include other subjects as in the sciences, computer skills, study skills and other content area. We know little of bridge programs in the Middle East, but only in that, they will prepare students to compete along American standards. The model for assessing remedial courses is generalizable to any program, thus it would be easy to apply to bridge programs as a formative evaluation and indicator to the success or failure of the programs in higher education.

CONCLUDING REMARKS

The results of this study indicate that students with more remedial mathematics courses place little barriers to enrolling students to a private university in Lebanon. Those who were assigned three remedial mathematics courses almost 62% enrolled compared to 38% who did not enroll. Those who had one remedial course were more inclined to dropout than stay at the university. In terms of effectiveness, those who enrolled and were not required to take remedial courses performed higher than those who had one or more remedial courses on their first math course. However, analyzing those who took one or more remedial course, we found that those who took three remedial courses have

shown to garnered a higher grade than those who did not take remedial courses in their beginning mathematics course. However, this result can't be generalized to how students did in other courses in their regular program. In fact, those who did not take remedial were prone to have a higher grade point average than those who did.

RECOMMENDATIONS

We hope other like studies improve remedial courses, not only in terms of strategies and methods, but questions how are these courses being taught, who is teaching them, what is the long term results as to have a total picture of these courses as a way to get a summative evaluation, and fuller understanding of the programs. Second, the creation of institutional collaboration with local, regional, and North American colleges and universities to allow best practice and ideas to be shared and replicated. As this study has shown that lower achievers are the apparently low achieving all through their college academic experience; then remediation should not only stress on subjects as English and math, but on overall academic training in study skills and learning methods. Apparently, some of the hybrid program recently developed in a number of Middle Eastern universities is probably heading on the right track in infusing learning skills courses, as enhanced and engaged learning through technologies through different techniques and research skills.

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