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All for the Success of College Algebra

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Abstract
An extensive support system placed at Texas A&M International University (TAMIU) for the success of students taking College Algebra course is quintessential, since this is the first mathematics course taken by those who were admitted or plan to seek admission to TAMIU. Additional focus has been given as this course is taken by the majority of students to meet the core mathematics requirement in the state of Texas. Apart from sections being taught by experienced faculty, the University Learning Center (ULC) provides walk-in tutoring for students, and each section has been assigned a supplemental instruction leader who provides additional sessions beyond the classroom teaching, on a weekly basis. The ALEKS software provides an online homework system. Furthermore, a marathon review session is planned for the final exam, an opportunity geared towards procrastinators. This paper elaborates on the extent of the involvement required for the success of this course.

Keywords: ALEKS, College Algebra, Teaching, Mathematics, ViTAS, SI, Tutoring, DFW, Online

Introduction

At Texas A&M International University (TAMIU), the offering of college algebra has developed to 13-18 sections and enrollment in Fall 2012 has reached an unprecedented number of 612 students. TAMIU invests enormous amount of assets and resources from funded grants to make this success possible in the course. Thanks to the collective efforts of faculty and administration, TAMIU was able to achieve DFWI (aggregate of all students received grades of D, F, W, and those incompletes) rates at a minimum of 33.00 % for the last few years, an endeavor that started back in Fall 2008. Next, some discussions pertaining to success in college courses will be presented to make these efforts relevant.

College students must learn certain requirements that are expected for success in certain social situations that academic context demands. Social situations, however, do not reward students on an intellectual level, contrary to certain institutions' beliefs. The students' learning has been dominated by the "grade point average" perspective where high grades in assignments and assessments are considered most important [3]. It is also believed that there must be a solid mathematical knowledge base in order for students to further pursue degrees in Science, Technology, Engineering, and Mathematics (STEM) disciplines. The current US administration has given a great push towards the teaching of STEM disciplines. Therefore, more emphasis should be placed on mathematical teaching through various learning methods. It was strongly believed that instructors should encourage students to pursue mathematical degrees and that instructors should strive for excellence when teaching such a vital subject [7].

Different factors regularly affect student life on campus. A questionnaire concluded that students from different majors described their experiences on campus to be very different environments. Therefore, students from different studies have different needs to better fit their environment and majors [1]. College applications have been declining over the years. College administrators now have to brainstorm creative ways to get students to apply to their colleges. Therefore, the recruitment strategies need to be formulated to ensure enrollment and retention [2]. The relationship between the students' academic environment and their success has been studied. The researchers came to the conclusion that students' perceptions greatly influenced their study approach. The students' perception of the learning environment predicted the learning outcomes of the university as a whole [3]. Educators believe that a stronger student-educator relationship leads to a higher success rate for the student. The greater the student-educator contact, in and outside the classroom, the higher the satisfaction and development of the student. Based on these findings, some universities give incentives to students who pursued the strengthening of their relationship with their educators [4]. A research study was done to see what characteristics both students and faculty thought were necessary for optimizing the learning experience. Out of this, the students thought that the instructor should be

interesting, eloquent, and readily available. The faculty thought that the instructors should be intellectually challenging and motivating with high standards [5]. A study was conducted to target and find the difference between classroom behaviors based on gender. However, the study showed that there is no difference in classroom participation between the two genders. The study also demonstrated that there was no difference in the way the instructors viewed the students of different genders. Rather student participation varied on an individual basis [6].

Data and Analysis

Besides, the opinions collected for the preceding section, it was widely believed that the pace is relatively fast in college mathematics courses. Assignments help students to better understand what is going on in class. The computer assisted projects provide a much needed hands-on approach to these course activities if they are all carefully coordinated to help students grasp the many natural connections among this discipline. The only way students can learn mathematics is by doing it. Homework, in mathematics classes, is assigned to help students understand certain concepts and to help them build certain skills, thereby, understand the process, not the specific problem for the certain topic. These were all part of thinking went into this endeavor.

Table 1 depicts how these efforts have made this investment worthwhile since Fall 2010. Empty cells mean that there were no students enrolled in the categories. Diversity of these offerings has been extended to local high schools thanks to most part from the state of Texas House bill for HB-1 dual credit Initiative enacted in 2006 providing students to earn the equivalent of up to 12 hours of college credit while in their high school. There were instances, where high school students signed in for TAMIU sections to earn concurrence credits. Accordingly, offering of courses has extended to two nearby school districts, United Independent School District (UISD) (two high schools) and Laredo Independent School District (LISD) (one high school) in Spring 2011 and Spring 2012, respectively. Students in these ISDs have been provided supporting instruction (plan) during the days when classes meet, with their in-house school teachers along while they are enrolled in college courses. Early College High School (ECHS), a collaboration of between TAMIU and LISD that began in 2006, admits those high school freshmen who will later enroll in core courses offered by TAMIU as university freshmen. The success of this visionary program was imagined and funded by the Bill and Melinda Gates Foundation. Early College High School provides the dual-enrollment in College Algebra for students at their appropriate levels to meet mathematics core requirement in the curriculum.

Table 1. Diversity of student enrollments from Fall 2010 to Spring 2013

	TAMIU		UISD			LISD		
	Classroom	Online	UHS†	JBAHS*	Total	ECHS	JWNHS±	Total

Spring 2013	233 (5)‡	14 (1)	70 (3)	43 (2)	113 (5)	38 (2)	19 (1)§	57 (3)
Fall 2012	565 (11)	13 (1)	---	---	---	33 (1)	---	33 (1)
Spring 2012	288 (8)	---	99 (4)	48 (2)	147 (6)	45 (1)	---	45 (1)
Fall 2011	527 (14)	---	---	---	---	33 (1)	---	33 (1)
Spring 2011	370 (13)	---	50 (1)√	52 (1)√	102 (2)√	26 (1)	---	26 (1)
Fall 2010	571 (15)	---	---	---	---	35 (1)	---	35 (1)
Total	2543 (66)	28 (2)	215 (8)	141 (5)	356 (13)	210 (7)	19 (1)	229 (8)

± JWNHS-Joseph W. Nixon High School and VMTMS-Vidal M. Treviño Magnet School, † UHS-United High School, * JBAHS- John B. Alexander High School, ‡ Numbers in parentheses denote the number of sections offered, § These students enrolled in TAMIU online offering, √ These HB-1 courses were offered at TAMIU, --- No students enrolled in these categories

There are several factors to be credited for these accomplishments beyond excellent instructions provided by TAMIU faculty. The University Learning Center (ULC) provides walk-in tutorials and is open for tutoring 11 hours 4 days a week, 7 hours on Thursday and 4 hours on Sunday. Each of the courses has been assigned with a SI (Supplemental Instruction) leader who attends the classes weekly and provides follow-up sessions with supplemental instruction and reviews for exams and homework assistance. ALEKS software became part of instructional materials for students provided assessment tools, and unlimited hours of problem solving experience. In addition, before every final exam, a marathon review session is held usually from 3:00 pm to 8:30 pm covering a set of 60-80 review questions. This Fall the number of students attending this review session reached about 288. A Virtual Teaching Assistant System (ViTAS) is on the other hand, a web based homework grading system provides students, an interactive learning environment outside the class [12]. Using ViTAS, students are able to submit homework online, engage in anonymous homework peer review process and discussion with their peers. Some instructors that taught college algebra courses have been provided with the opportunity of using ViTAS for their students starting back in Summer 2011. This is a Minority Science and Engineering Improvement Program (MSEIP) Project funded by US Department of Education.

What is ALEKS?

Assessment and LEarning in Knowledge Spaces (ALEKS) is a web-based, artificially intelligent assessment and learning system. ALEKS uses adaptive questioning to quickly and accurately determine exactly what a student knows and doesn't know in a course.

ALEKS then instructs the student on the topics he or she is most ready to learn. As a student works through a course, ALEKS periodically reassesses the student to ensure that topics learned are also retained. ALEKS courses are very complete in their topic coverage and it avoids multiple-choice questions. Students who show a high level of mastery of an ALEKS course will be successful in the actual course they are taking. ALEKS also provides the advantages of one-on-one instruction, 24/7, from virtually any web-based computer [8]. ALEKS software is used to provide assignments, homework, and exams, and most importantly, earned hours of practice problems as they advance in the course, as stipulated in the common course syllabus.

For the required curriculum, the first eight chapters from the College Algebra textbook [9] and assessments from the ALEKS 18-week software [8] provided adequate learning guidance for students as well as for instructors. Students are evaluated according to the grading distribution in Figure 1.

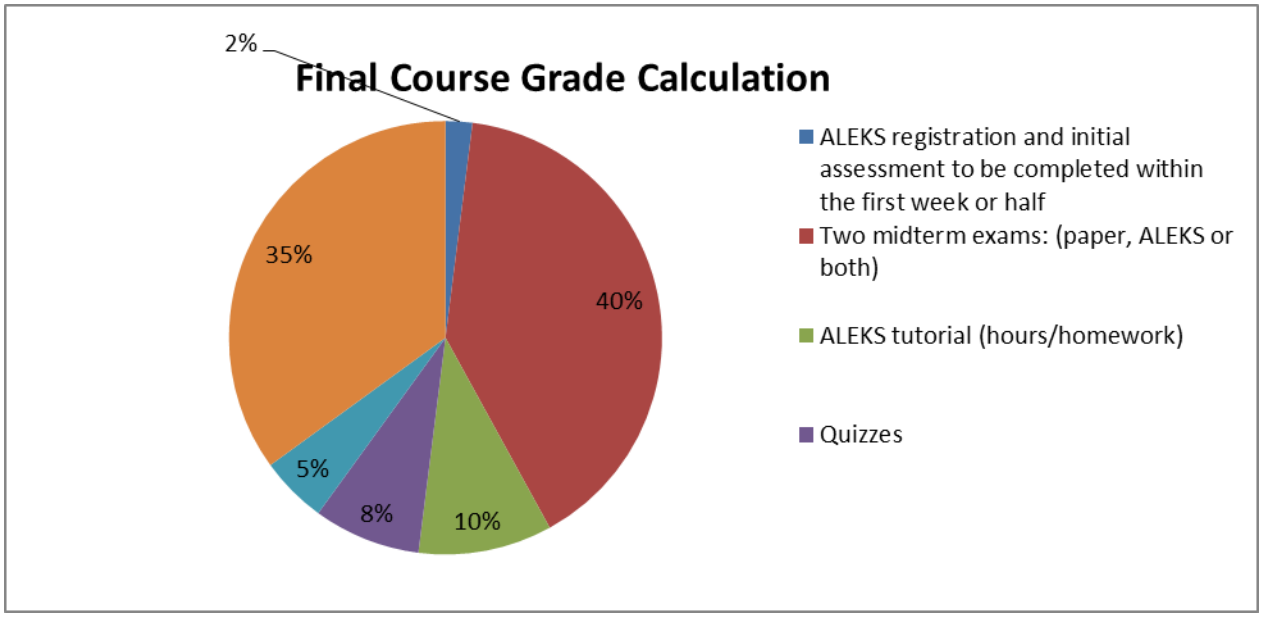

Figure 1. Current final course grade calculation

ULC

The primary function of ULC is to develop, implement, and evaluate services specifically designed to enhance learning. ULC provides tutoring in most subjects other than writing and strives to make a positive difference in the lives of the students, staff and community. Another important function of ULC is to serve as a professional resource agency for assistance in the critical area of the University's recruitment and retention efforts. Further, the ULC also assists the University by working directly with local schools and students to help them prepare for University level work. The ULC serves as a place where first year

college students to graduate/professional school students, become more efficient and effective learners [11].

Final Examination must be comprehensive and given on the day specified for all students enrolled in the sections which is a unique feature of this endeavor. The design and structure of these courses have already been well documented [10]. A snapshot of what took place in Fall 2012 is presented to bear a testimony of the extent of these efforts undertaken through several discussions, Table 2, Figures 2a, 2b, 2c, 3, and 4 to follow. Analysis for those who benefitted from SI instructions, marathon review session, and tutoring provided by ULC, and ViTAS assisted assignment submission that is sponsored by the Department of Engineering, Mathematics, and Physics are summarized below:

1) ULC assisted (SI and/or Tutored) vs. non-ULC assisted students
    a. Participation of students in SI and/or tutoring groups
    b. Comparison of students' GPA in SI and/or tutoring groups
    c. DFWI rates for students in SI and/or tutoring groups
2) Marathon vs. non-marathon review session attended
3) ViTAS vs. non-ViTAS assisted students

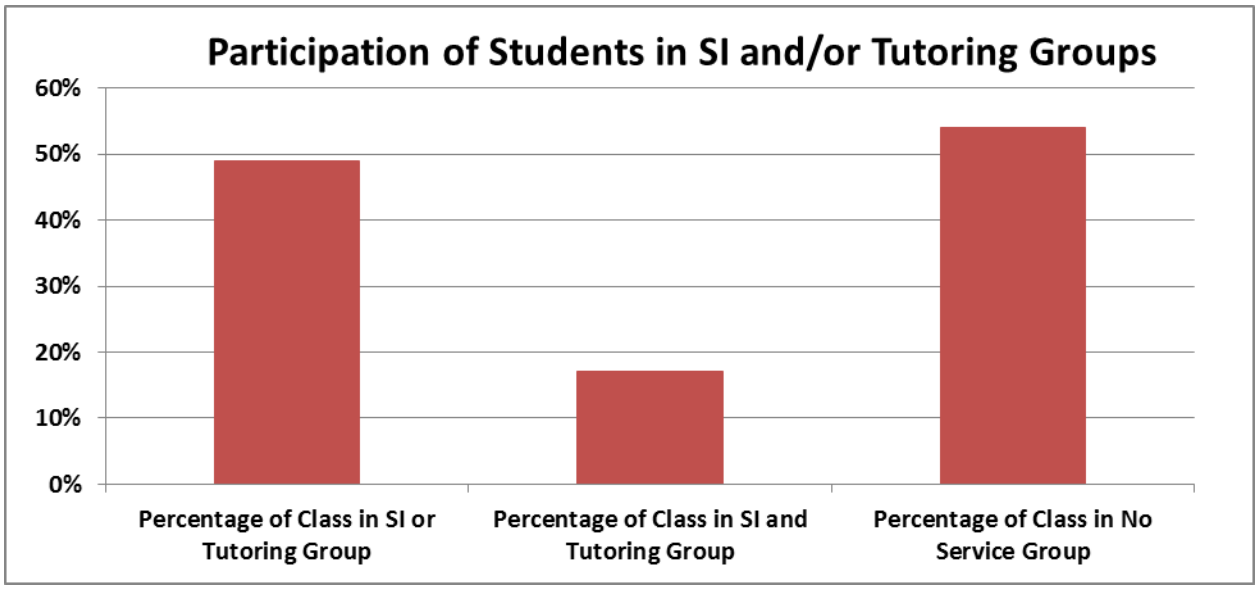

Figure 2a. Participation of students in SI and/or tutoring groups in Fall 2012

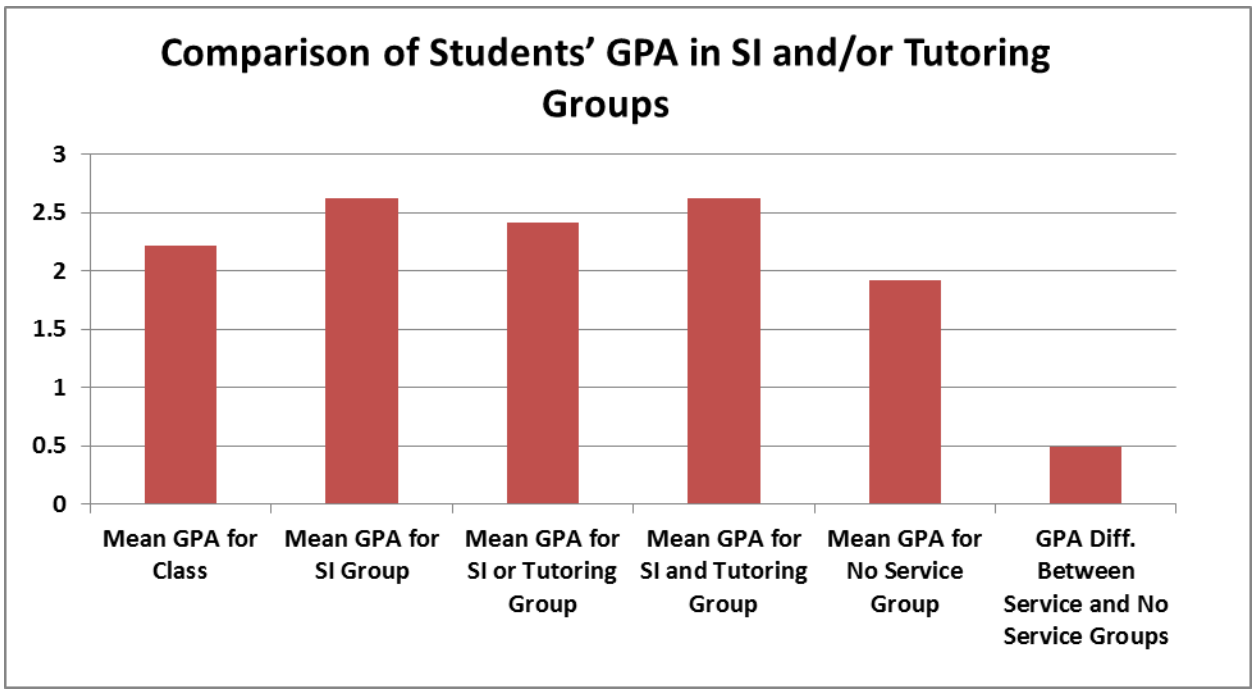

Figure 2b. Comparison of students' GPA in SI and/or tutoring groups in Fall 2012

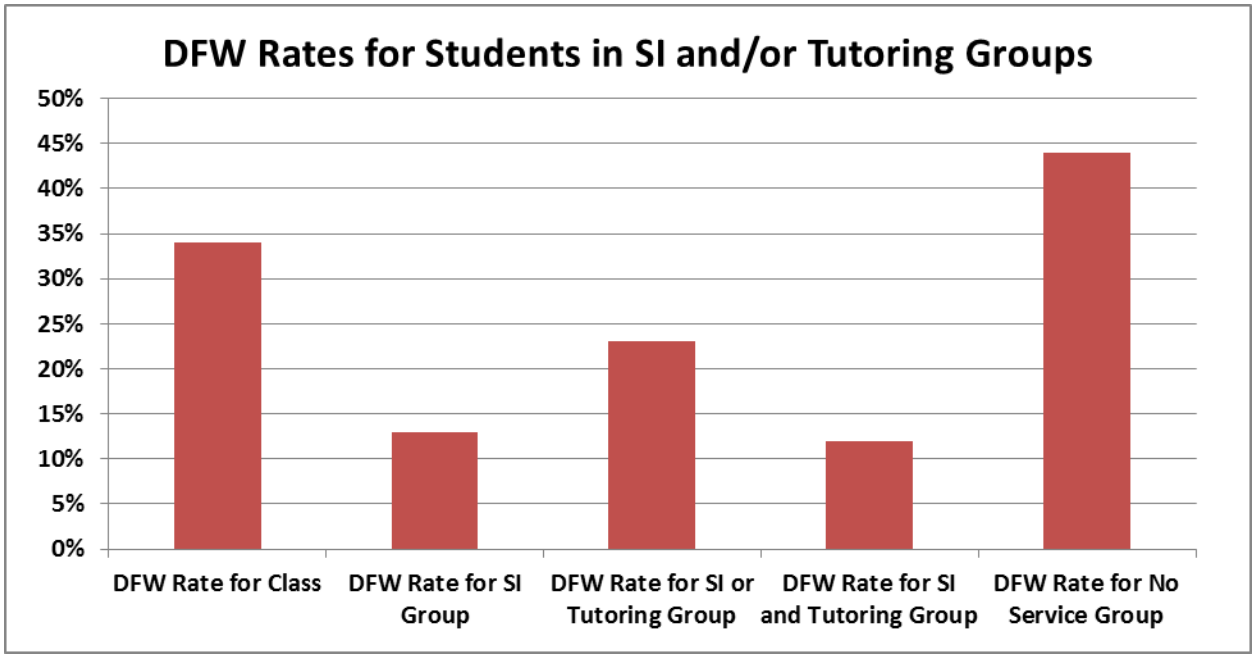

Figure 2c. DFW rates for students in SI and/or tutoring groups in Fall 2012

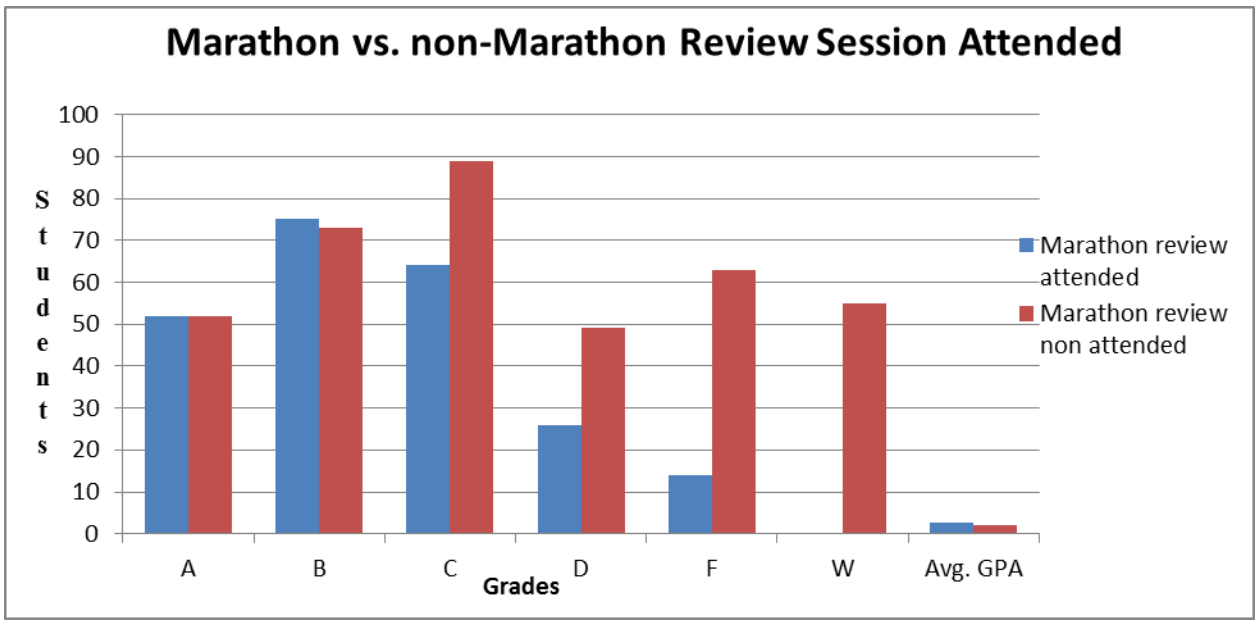

Figure 3. Grade distribution for students attended marathon review session in Fall 2012

A comparison of grade distributions for students who attended the marathon review session (held a day before the final exam) and those that did not attend is provided in Figure 3. This does not reflect the extent of this involvement necessarily. However, analysis showed that there is an aggregate gain of 0.53 GPA for those who attended the marathon session in Fall 2012. It can be concluded that the marathon session assisted some students to elevate their grades; thus, achieving the objectives of the session as originally anticipated. In the same token, we can argue that there seem to be a reduction of D's, F's and W's (DFWI's) for those attended the marathon review session.

Only students in two sections of College Algebra have participated in the ViTAS assisted assignment submission system in Fall 2012. Students in these sections have the opportunity to do their homework at their convenience and submit them online from anywhere in the world. From Figure 4, it can be concluded that this has assisted to improve the aggregate of A, B, and C grades and most importantly, DFWI rates in Fall 2012.

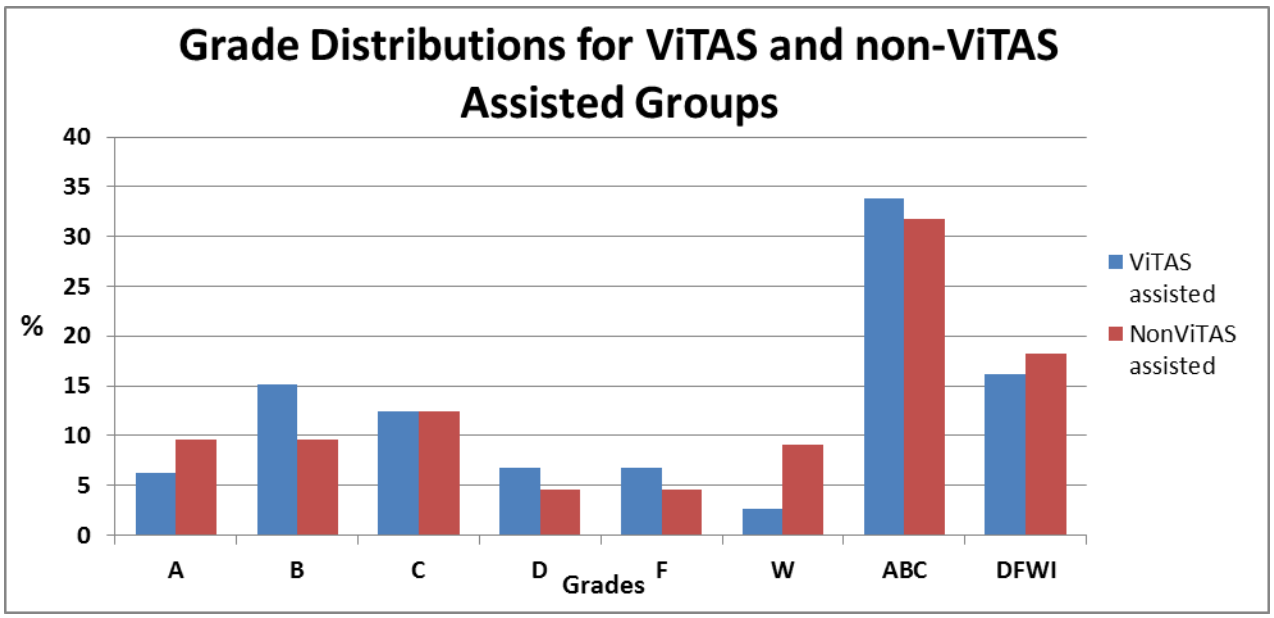

Figure 4. Grade distributions for ViTAS and non-ViTAS assisted groups in Fall 2012

Finally, it is worthy to be noted that this experiment has been paying off. Table 3 summarizes DRWI rates that fell dramatically from Fall 2008 (to Fall 2012).

Table 2. DFWI rates for all Math 1314, College Algebra sections taught since Fall 2008

	2008	2009			2010			2011			2012		
	Fall	Spring	Summer+	Fall	Spring	Summer+	Fall	Spring	Summer+	Fall	Spring	Summer+	Fall
Total Enrolled	469	308	90	565	418	130	591	497	176	560	480	128	611
DFWI Count	259	151	42	226	121	40	208	156	34	168	152	17	206
% DFWI	55.22	49.03	46.67	40.00	28.95	30.77	35.19	31.39	19.32	30.00	31.67	13.28	33.72

+ Summer = both Summer I and II combined

Enrollments in the courses are in an upward trend and success rates are maintained despite emergence of some economic realities for students paying for courses since 2009.

Conclusions

All indications show that this endeavor that began in Fall 2008 has been making a steady progress as initially anticipated. Circumstances could change; however, progress can still be made as the opportunities are available for students to solicit learning. A collective effort of faculty and staff will not leave any stone unturned to make sure successes in these courses are achieved and maintained in the future.

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