

CREATING A COST-EFFECTIVE SYSTEM FOR INDIVIDUALIZED STUDENT SUPPORT SERVICES

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ABSTRACT

This paper describes the creation and implementation of a systematic approach for characterizing the individual needs of at-risk first-time college Freshmen regarding tutoring, mentoring and other student services with the intent to increase cumulative GPA, semester GPA, rates of course completion, retention and graduation. Measures for intelligence and stamina, along with HS GPA were used to identify students who were most at risk to receive cost constrained student services. Characterization of the initial freshman student cohort indicated the utility of this approach.

INTRODUCTION

Public institutions of higher education are faced with a growing chorus of voices from legislatures, governing boards and the public calling for performance measures of effectiveness including course completion, time to degree, transfer rates, the number of degrees awarded, and/or the number of low-income and minority graduates [1] [9].

Faced with this push for performance-based-funding some institutions of higher education are seeking to improve student academic performance, academic progress towards graduation and retention. Consequently, increased attention has been given to efforts to understand the precursors to student success, including both academic performance and student persistence. In the current study we examined the creation of a low-cost, simple, systematic approach for characterizing each individual student and a set of research-based principles for customized mentoring, tutoring and advising.

LITERATURE REVIEW

Many hundreds of studies have investigated the topic of predicting academic success. Early researchers proposed that the precursors to academic success included personal characteristics such as willpower as well as intelligence. [17] [13].

As early as 1916 the Binet-Simon intelligence scale gained wide acceptance as a suitable measure of intelligence and as an effective predictor of student success [15]. Research linking intelligence and academic performance progressed rapidly. Uniquely developed for higher education the SAT and ACT tests were created to predict student aptitude for post secondary education. Recently collegiate aptitude tests, ACT and SAT, have been shown to be strongly correlated with general measures of intelligence [6]

Periodic reviews of the research literature linking personality to academic performance noted the scattered nature of the literature and the lack of an overarching theoretical model [3]. However, recent meta-analyses by Richardson, Abraham and Bond [12] and Poropat [11] found statistically significant relationships between academic success and the five factors of personality, i.e. agreeableness, conscientiousness, emotional stability (neuroticism), extraversion and openness. In particular, both of these recent studies, found conscientiousness to be the most significant correlate with collegiate academic success.

Doumen, Broeckmans and Masui [4] investigated the relationships between self-study time and course grade while accounting for the effects of student characteristics, affective-motivational processes (academic self-efficacy, learning goal orientation and action-state orientation) and cognitive learning activities. Their results indicated that in a lower division macro-economics course self-study time did predict course grade while controlling for all other variables measured.

In addition to examining the relationship between the five personality factors and academic success, the meta-analysis conducted by Richardson, et al [12] reviewed over 400 studies linking academic success to a variety of other variables summarized in the table below.

A. Personal characteristics that are either fixed or stable at the collegiate level	B. Personal characteristics that are subject to influence by situation and context
<ul style="list-style-type: none"> • identity (age, gender) • intelligence (SAT, ACT, A Level Pts, IQ) • additional personality factors (need for cognition, emotional intelligence) • academic history (HS GPA) • socioeconomic status 	<ul style="list-style-type: none"> • motivation (12 factors) • self regulation (11 factors) • learning approach (3 factors) • contextual factors (8 factors)

Based on their comprehensive analysis Richardson, et al provided a set of potentially effective interventions for improving college-level academic success including 1. Elevate goal setting, 2. Increase effort regulation, 3. Reduce test anxiety, 4. Reduce procrastination and 4. Enhance self efficacy. When considered in light of other research findings these recommended interventions can be tailored to specific students and/or specific circumstances.

The discussion provided above reviews the literature regarding correlations between a variety of factors and academic achievement; however we are also interested in other performance measures including persistence or retention.

DeBerard, Spielmans and Julka [2] examined the impact of 10 factors on both academic achievement (Year One GPA) and retention (continued enrollment) of 204 college undergraduates sampled from introductory psychology and sociology courses. Predictor variables included gender, HS GPA, SAT, Smoking, Drinking, Physical Health, Mental Health, Social Support, Acceptance-focused Coping and Escape-avoidance Coping. All predictor variables except Mental Health were significantly correlated to Year One GPA, while only a single predictor variable, HS GPA was significantly correlated with retention. A multiple linear regression prediction model for academic achievement accounted for 56% of the variance in Year One GPA, including significant coefficients for HS GPA, SAT, Smoking, Mental Health Composite, Social Support and Acceptance-focused Coping. A logistics regression prediction equation for retention was not statistically significant.

Another study examining both academic performance (credit completion) and persistence (retention) [16] found that the lack of academic motivation (amotivation) was a significant negative predictor of both first year credits (academic performance), as well as persistence (retention). “For persisting in a program or obtaining credits in the first year, it does not seem to matter what type of motivation you have, as long as you have enough motivation.” Their findings suggested that both retention and academic performance can be impacted by either autonomous or controlled academic motivation, as long as there is adequate motivation. They noted that amotivation is “related to low feelings of self efficacy.”

The relationships found between various learning strategies (relating and structuring, critical processing, analyzing, memorizing, concrete processing, self regulation, external regulation, lack of regulation) and academic performance and persistence were not as clear cut. Lack of regulation was found to have a marginal negative impact on persistence, while academic success was significantly related to both lack of regulation (negative) and regulating and structuring (positive). These results indicate that academic performance can be impacted by focusing interventions on students’ efforts to understand content relationships and efforts to direct their learning efforts (set goals).

Mattern and Shaw [7] also studied precursors for both academic achievement and retention. They used single ANOVA to distinguish differences of means for a variety of student characteristics including Gender, Ethnicity, First Language, HS GPA, SATCR, SATM, SATW, Num SAT Reports, Math Skills Help, Writing Skills Help, Cumulative GPA and Retention. Student academic self beliefs regarding Math and English abilities were found to be correlated with academic performance and retention.

One recent study [8] found that students who were manipulated to view willpower as non-limited through survey items such as “Sometimes it is energizing to be fully absorbed with a demanding task” outperformed students who were influenced to view willpower as limited with items such as “working on a strenuous mental task can make you feel tired such that you need a break before accomplishing a new task.” Their results indicated that students influenced to believe that willpower could be sustained were better able to perform difficult cognitive tasks over a longer period of time.

The research studies reviewed above combine to suggest that collegiate level academic performance and retention are influenced by a variety of factors including intelligence, conscientiousness, gender, past academic performance, socioeconomic status and a variety of malleable factors including goal setting, effort regulation, test anxiety, procrastination and self efficacy.

Recently, Duckworth, Peterson, Matthews and Kelly [5] introduced the psychological factor of GRIT to the literature of academic achievement.

“Why do some individuals accomplish more than others of equal intelligence? In addition to cognitive ability, a list of attributes of high-achieving individuals would likely include creativity, vigor, emotional intelligence, charisma, self-confidence, emotional stability, physical attractiveness and other positive qualities. A priori, some traits seem more crucial than others for particular vocations. . . . However, some traits might be essential to success no matter the domain. We suggest that one personal quality is shared by the most prominent leaders in every field: grit. We define grit as perseverance and passion for long-term goals. Grit entails working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress.”

Duckworth, et al also provided a validated 12 item GRIT scale for measuring individual grit. These authors provided evidence that grit correlates highly with conscientiousness, and to a lesser degree with all factors from the five factors model reviewed above. Their analyses indicated that grittiness, as measured by the GRIT scale, was significantly related to both educational achievement, as measured by highest degree completed, and age. In addition, controlling for SAT scores (intelligence), grittier students were found to have statistically higher GPAs. They noted, “. . . among relatively intelligent individuals, those who are less bright than their peers compensate by working harder and with more determination.” Duckworth and her colleagues found that grit, over and above conscientiousness, was the best predictor of completion of the rigorous required summer program in a study of entering West Point students. Grit was also found to be highly correlated with self control as measured by the Brief Self-Control Scale (BSCS) [14]. The Grit scale provides another measure of student personality which is strongly correlated to both conscientiousness and self control.

Another study [10] reported the impacts of a mentoring program focused on Latino students. Outcome measures included first year GPA and retention, along with psychosocial variables: academic motivation, belonging, depression, obstacles, self-efficacy, stress, support and university motivation. The significant results of this study indicated that mentored students were less depressed and less stressed but achieved lower GPAs than students who were not mentored. The authors noted that prior studies indicated that students who show improvements regarding depression and stress are likely to achieve higher future GPAs. Mentored students did not retain at a higher rate than non-mentored students. This study highlighted the complex relationships between psychosocial characteristics, GPA and retention.

Based on this research literature we created an academic diagnostic system for characterizing the unique performance profile for every incoming Freshman student. Based on the literature cited above we predicted that incoming student academic performance and retention would be improved if we provided targeted mentoring and tutoring based on student characteristics including gender, socioeconomic status, HS GPA, GRIT Score and Composite ACT.

We conducted difference of means tests for HS GPA, ACT and GRIT Score across all demographic variables to identify significant differences that existed based on demographics. Demographic characteristics of the incoming Fall 2013 Freshman sample, along with difference of means tests for differences in HS GPA, GRIT Score and ACT (T-test and ANOVA) are summarized in the table below.

Demographic	Results of Difference of Means Testing for HS GPA, ACT and GRIT
Gender	No significant differences for male and female students
Ethnicity	No significant differences for Latino, White and Other students
First Gen in College	First in their family to attend college had significantly lower ACT scores
Home State	No significant differences between In-state and Out-of-state students
Academic Major	Bus majors had significantly higher ACT scores than CIS majors, while CIS majors had significantly higher GRIT Scores than bus majors
Socioeconomic St	No significant differences based on socioeconomic status
Athlete	Athletes had significantly higher HS GPAs when compared to non-athletes.

In an effort to confirm the utility of HS GPA, GRIT Score and ACT as independent predictors of future academic performance and retention we conducted correlation analysis on HS GPA, GRIT and ACT.

The correlation matrix below suggests that these three variables were not highly correlated and were all likely to provide useful information regarding future academic performance and/or retention.

	GPA	ACT	GRIT
GPA	1		
ACT	0.210731	1	
GRIT	0.321336	-0.07821	1

DESCRIPTION OF THE ACADEMIC SUPPORT SYSTEM

At-risk Incoming freshmen students were characterized based on HS GPA, ACT and GRIT. For simplicity and to conserve limited resources demographic variables (gender, ethnicity, first generation status and socioeconomic status) were not used to make differential tutoring, mentoring or advising assignments. As the resources available to support this type of mentoring approach expand it may be appropriate to look carefully at mentor/mentee matching regarding demographic variables.

High school GPA, ACT and GRIT were categorized as either low, or not low (Ave/High), where low was defined to be more than one standard deviation below the mean of the incoming student population. These two states, low or not low, defined across three variables (GPA, ACT and GRIT) produced a three dimensional matrix with eight cells.

Student service plans for each of the eight student groups were designed based upon a number of guiding principles.

1. Low grittiness, independent of intelligence, is associated with low stamina and perseverance. Students with low grittiness tend to give up easily and are easily discouraged and/or distracted; they may have low self efficacy which may be improved by trained mentors who provide external validation, support, motivation and encouragement.
2. Low intelligence, independent of grittiness, is overcome by repetition, time on task and academic support through regimented tutoring; these students may need to move through the curriculum at a slower pace.
3. Low HS GPA is unlikely to be independent of both intelligence and grittiness, and is often associated with poor academic habits and skills such as poor goal setting, low self regulation, test anxiety and procrastination which skills can be improved by regimented tutoring.

The table below summarizes the eight cells along with the treatment plan for each group of students. Note that cell #8 identified students who would be provided tutoring if requested, while groups 1-7 were proactively contacted to receive appropriate student services.

As shown in the summary table below rather than using a one size fits all approach, this diagnostic approach allocated scarce student support resources where they were needed most. It was anticipated that each student at risk would receive targeted services that matched the unique circumstances of the student. Note that students in group 7 with low grittiness, but not low ACT and HS GPA could potentially benefit from mentoring regarding self efficacy, self belief and amotivation, but otherwise were likely to succeed without intervention.

Diagnostics				Treatment Plan				
#	HS GPA	ACT	GRIT	Num	Tutor-ing	Mentor-ing	Goal setting, Effort Regulation, Test Anxiety, Procrastination	Self Efficacy, Self Belief, Amotivation
1	Low	Low	Low	1	Yes	Yes	Yes	Yes
2	Low	Low	Ave/High	1	Yes	Yes	Yes	No
3	Low	Ave/High	Low	2	Yes	Yes	Yes	Yes
4	Low	Ave/High	Ave/High	6	Yes	No	Yes	No
5	Ave/High	Low	Low	0	Yes	Yes	No	Yes
6	Ave/High	Low	Ave/High	8	Yes	No	Yes	No
7	Ave/High	Ave/High	Low	6	No	Yes	No	Yes
8	Ave/High	Ave/High	Ave/High	34	No	No	No	No
Total in Sample				58				

Phinney et al [10] noted that for mentoring to be effective the mentors must receive appropriate training. In the approach herein described mentors and tutors received training to provide the required services. The table below summarizes the training/service required for both mentors and tutors.

Description	Training Required	Mentors/Tutors
Groups 1, 3, 5 and 7	Have the capability to provide personal coaching to build self efficacy, self beliefs to respond to amotivation and to build personal relationships of trust and support	Mentors
Group 1 - 6	Have the capability to provide tutoring of course specific academic material	Tutors
Groups 1, 2, 3, 4 and 5	Have the capability to provide role modeling and advice regarding successful academic habits, i.e. goal setting, effort regulation, test anxiety and procrastination	Tutors

All tutors were hired based on their personal academic success as measured by cumulative GPA and faculty recommendations along with excellence in specific courses/disciplines and a willingness to be a tutor. All tutors received training about working with each student to maximize their academic habits leading to success. Tutors were trained to share personal academic habits that supported their own academic success as they tutored students regarding specific course content.

Mentors, on the other hand, were selected based on aptitudes for listening, empathy and the capacity to strengthen the self efficacy of the mentored students. Training was provided to highlight the objectives of the mentoring relationships. Training materials were developed in collaboration with doctorally qualified experts in educational psychology to provide effective methods for supporting, coaching and encouraging students who otherwise might give up on themselves.

Students in groups 1-7 who received targeted tutoring and/or mentoring, along with the tutors and mentors will be surveyed at the end of each semester to evaluate the success of this diagnostic student services program. In addition the retention and academic success of these students will be monitored to evaluate the success of this approach.

A copy of the complete paper, including the list of references is available from the first author.