Student Analytics and Research

SAReport

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FLORIDA STATE COLLEGE at Jacksonville™

Introduction

The student Grade Point Average (GPA) remains among the most widely recognized and frequently used measures of academic performance. However, the use of GPA goes well beyond the typically thought of administrative areas such as general college admissions, Standards of Academic Progress (SOAP), high school/college dual enrollment articulation (FLDOE, 2013), etc. In addition to these areas, both high school and college GPA have been widely studied across a range of fields and disciplines including Educational Psychology, Social Psychology, Educational Planning and Evaluation, Institutional Research (IR), and general Higher Education Research.

For research purposes in controlled experimental and quasi-experimental studies, GPA can be used as either a predictor (independent) or criterion (dependent or response) variable.[1] Other uses range from securing discounted student car insurance (Mott, 2014) to providing a handy measure for employers to make hiring decisions (Koeppel, 2006).

Origins of the use of GPA in U.S. higher education are rooted in the field of Institutional Research traceable back to at least the 18th century. According to Pierson (1983, p. 310), "the first grades issued at Yale (and possibly the first in the country) were given out in the year 1785" and these were later classified into four groups "supplemented by a system of grades running from 4 to 0." Pierson states

> *In this celebrated numerical system, the grade of 2 was the over-all passing mark…and by 1837 performances in individual courses were graded and given appropriate weighting. So the scale of 4, for all its deceptive simplicity, developed under the hand of the Yale faculty into a discriminating tool of a high degree of accuracy, coverage, and sophistication. And for a good one hundred years, 1817 – 1917, it disciplined Yale's students, challenged the ambitious, goaded the delinquent, and assured the moderate workers that they were safely on the road toward their degrees (p. 310).*

While technical specifics and details of modern GPA variations can quickly complicate its calculation,[2] conceptually, calculating GPA is straightforward requiring only three inputs: (1) course letter grades (e.g., A, B, C, etc.); (2) the number of semester or credit hours for each course (e.g., 3 credit hours); and (3) an appropriate grade conversion scale (e.g., A = 4, B = 3, C = 2, etc.).[3]

As there is no universally accepted or standardized methodology to calculate the GPA, the Florida State College at Jacksonville (2014 – 2015) catalog Glossary of Terms defines Grade Point Average as "A measure of the student's scholastic standing obtained by dividing the total number of grade points earned by the total number of credit hours attempted." Only grades of A, B, C, D, F, and FN are used in the computation of grade point average. Grades earned in college preparatory classes do not count in the computation of the grade point average. A "Grade Point" is further defined as "A numerical value assigned to each grade for the purpose of computing grade point average." The Grading Policies specified in the Academics section of the College catalog offers an example of GPA calculation similar to that shown in **Table 1**.

Table 1. Grade Point Average Example Data and Calculation

Course	Grade	Grade Points	Credit Hours Attempted	GPA Points	GPA Hours
ENC1101	B	3.0	3.0	9.0	3.0
MAT0028	A	4.0	4.0	0.0	0.0
AMH2010	C	2.0	3.0	6.0	3.0
CGS1060	D	1.0	3.0	3.0	3.0
	Total	10.0	13.0	18.0	9.0

Calculation: GPA = GPA Points/GPA Hours = 18.0/9.0 = 2.00

The example shows that, of the four courses attempted, only three count toward the calculation of the GPA because MAT0028 is a college preparatory course which, by definition, is not counted for GPA calculation purposes. Using this system, allows for several different kinds of GPA calculation including term or semester GPA, general education course GPA, and program completion GPA.[4] Award (or *Degree*) GPA is based upon courses contained within the official degree earned as stated on a student transcript. The balance of this *SAReport* will focus on results and comparisons related to program completion GPA for FSCJ students who were awarded an AA, AS, BS, or BAS degree in the past academic year (i.e. fall 2013 through summer 2014).[5]

Data and Demographics

The data set used in the present analysis contains both academic and demographic details for 5,107 graduates. In addition to standard student demographics for age, race, ethnicity, and gender, the set of academic variables in the data set also includes details about student high school background (e.g., graduation date, weighted and unweighted high school GPA, school name and location). Data are also included about each student's developmental course enrollment history (for reading, writing, and math), degree or award type, program of study, program basis of admission, and final degree or award GPA.

Analysis and Comparisons

Figure 1 displays the frequency distribution for all degree GPAs. The overall average of all (AA, AS, BS, BAS) GPAs in the data set is 3.16 (n = 5,107, σ = 0.45). The (red) distribution fit curve shows that the overall distribution appears somewhat normally

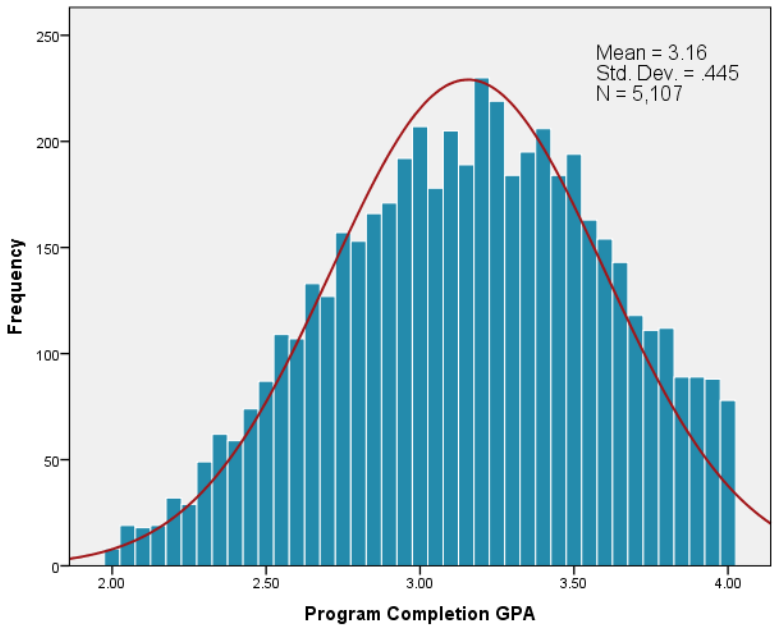

Figure 1. Frequency distribution for all award GPAs (AA, AS, BAS, BS)

distributed.[6] GPA comparisons can be made using both student demographic and academic variables in the data set. For example, **Table 2** contains a comparison of average (i.e. mean) GPA by student gender and award type. The overall average GPA for each award type is shown in the lowest (total) row (for each column) of the table. As shown, average GPA (for both males and females combined) is lowest for AA degree completers (3.11) compared to the other three awards. Females who earned BS degrees have the highest average award GPA, and males who earned an AA award have the lowest.

Table 2. GPA Comparisons by Student Gender and Award Type

	AA		AS		BAS		BS		Total	
	Mean	Valid N	Mean	Valid N	Mean	Valid N	Mean	Valid N	Mean	Valid N
female	3.13_{a}	2,159	3.31_{b}	624	3.24_{b}	175	3.27_{b}	214	3.18	3,172
male	3.07_{a}	1,315	3.20_{b}	372	3.18_{b}	187	$3.22_{a,b}$	60	3.11	1,934
total	3.11	3,474	3.27	996	3.21	362	3.26	274	3.16	5,106

Note--one student of unknown gender is excluded

1. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.

While **Table 2** answers certain questions pertaining to GPA differences (e.g., by award and gender), many other such comparisons can be performed. For example, questions may be raised about how college degree GPA may be associated with (or predicted by) other student demographic and/or academic characteristics, such as developmental enrollment history, high school GPA, high school graduation date, high school location (zip code, city, state, country), etc. Fortunately a variety of efficient statistical data mining procedures can help answer such questions quickly.[7] The results of such analyses revealed a significant relationship between unweighted high school GPA and college degree completion GPA. This was explored further using Ordinary Least Squares (OLS) linear regression. The scatter plot and regression analysis shown in **Figure 2** summarize the findings.

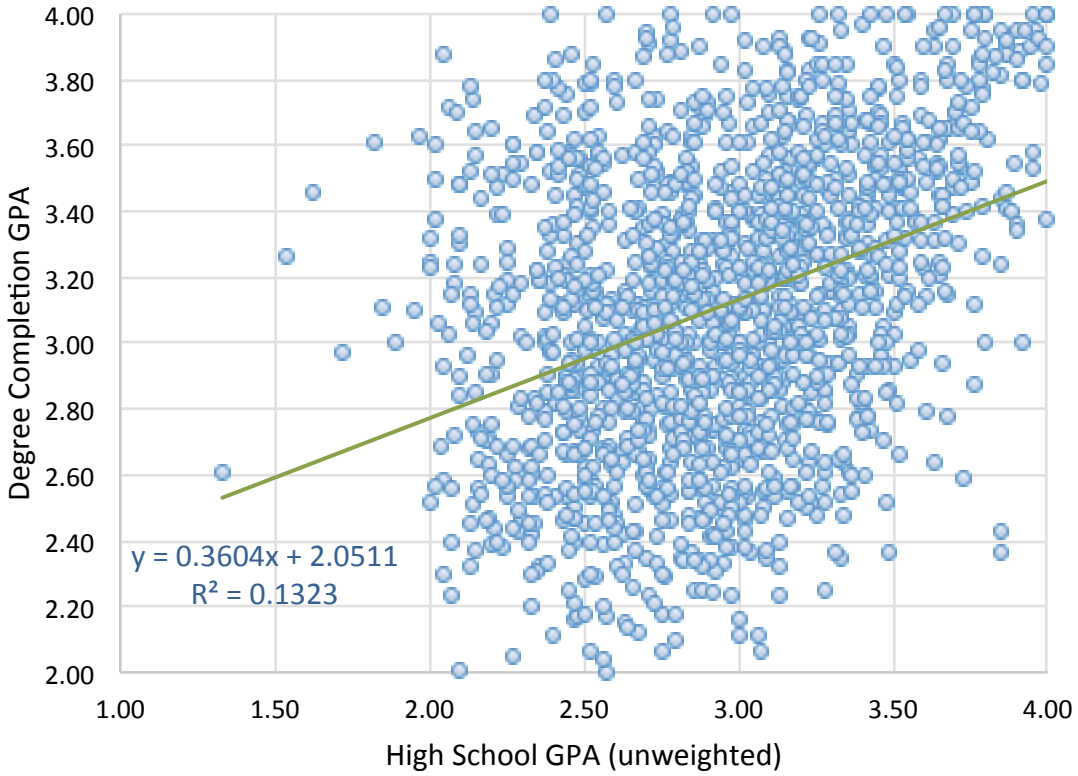

Figure 2. Scatterplot relationship and regression analysis of unweighted HS GPA and Degree GPA [8]

The regression equation can be used to estimate (or predict) a student's degree completion GPA (y) based on that student's unweighted high school GPA (x) using the OLS equation ($y = 0.3604x + 2.0511$). The R^2 value[9] expressed as a percentage indicates that approximately 13.2% of the *total* variation in degree completion GPA is explained by unweighted high school GPA. Based on this result, additional analysis revealed several (statistically significant) differences in the degree completion GPA of students based on their high school completion date. Students with high school graduation dates before 5/25/2002 *or* after 5/31/2012 had the highest relative proportions of top quartile (Q4) degree completion GPAs (i.e., GPAs above 3.50).[1] This is in comparison to students with high school graduation dates between 5/25/2002 and 5/31/2012 who had the most frequent degree completion GPAs in the lowest two quartiles (i.e., GPAs below the median). Understanding such relationships can prove useful in developing and planning student success initiatives for students, advisors, and others in academic, and degree completion planning, for both the lower (AA, AS) and upper (BS, BAS) division levels.

1 In descriptive statistics, the quartiles of a ranked set of data values are the three points (see also *Tukey's Hinges*) that divide the data set into four equal groups, each group comprising a quarter (25%) of the data. The first quartile (Q1 or 25th %-ile) is defined as the middle number between the smallest number (minimum value) and the median or middle value of the data set. The second quartile (Q2 or 50th %-ile) is the median of the data. The third quartile (Q3 or 75th %-ile) is the middle value between the median and the highest value (maximum value) of the data set. Specific quartile values in degree GPA (for both lower and upper level combined) are as follows: Q1≤ 2.84, Q2 ≤ 3.18, Q3 ≤ 3.50 (minimum = 2.00, maximum = 4.00).

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End Notes

[1] See, for example, Goldman & Slaughter, 1976; Bretz, 1989; Smittle, 1995; Jaeger & Eagan, 2009; Stater, 2009; Wang, 2009; MacCann et al, 2011; Howard, McLaughlin, & Knight, 2012; Komarraju, Ramsey, & Rinella, 2013

[2] Examples include considerations such as which courses are counted, how courses are counted (e.g., credit courses, honors courses, transfer courses, etc.), when courses are counted (e.g., each academic term, for multiple, terms, or a student's entire program), as well as, special considerations regarding GPA "weighting" using any combination of criteria. Finally, there are also numerous variations of GPA calculation by country worldwide.

[3] From a statistical perspective, calculation of the GPA effectively transforms an ordinal-level measure (grades) into a ratio-level measure (i.e., the GPA).

[4] For purposes of the current discussion an "award" means the same thing as "degree" (i.e., AA, AS, BAS, BS). For FLDOE reporting purposes, Chapter 3 of the Florida College System (FCS) Data Dictionary 2014-15 Student Data Base (SDB) defines several specific data elements related to GPA. These include Record Type 1 (DE1027) Term Institutional Hours for GPA and Record Type 1 (DE1031) Total Institutional Hours for GPA.

[5] Term codes include: 20141, 20142, and 20143. Note--13 of the Baccalaureate graduates also earned an AA or AS degree during the same time period. The AA/AS degree data for these 13 students is excluded from the data set.

[6] However, the distribution fails normality tests and is in fact negatively skewed (skewness = -.172) and platykurtic (kurtosis = - .633). This has much to do with graduation requirements of a 2.00 GPA minimum and the higher frequencies of GPAs in excess of 3.50.

[7] One such method is CHAID (Chi-squared Automatic Interaction Detection) analysis which enables a hierarchical (decision) tree view of a target variable—in this case GPA category—broken out by one or more statistically significant predictors. CHAID analysis of the current data set was used to predict GPA category using eleven (independent) predictors. These included (1) developmental course enrollment history, (2) unweighted high school GPA, (3) weighted high school GPA, (4) high school graduation date, (5) high school state, (6) student date of birth, (7) student race and ethnicity, (8) student gender, (9) college graduation term, (10) program of study, and (11) award type.

[8] The regression is statistically significant ($p < .0001$, $F = 239.38$, $n = 1{,}572$ student GPA pairs).

[9] R^2 is also known as the coefficient of determination.

Further Information

The comprehensive 2013-2014 Edition of the College Fact Book (FACTOR) is currently available on FSCJ's website at http://www.fscj.edu/discover-fscj/about-us/. The 2014-2015 Edition of FACTOR (scheduled for publication fall of 2015) will provide additional summaries, analyses, and comparisons. For additional information or research requests, please contact Student Analytics and Research.

Prepared by the Office of Institutional Effectiveness and Accreditation
Dr. Lynne Crosby - Associate Vice President, Institutional Effectiveness and Accreditation
Dr. Gregory V. Michalski - Director, Student Analytics and Research
Karen Stearns - Senior Research Analyst
Steve Kruszewski - Assistant Research Analyst