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South Carolina
Commission on Higher Education
Access | Affordability | Excellence

March 4, 2021

To: Chair Wes Hayes, and Members, Commission on Higher Education

From: Chair Charles Munns, and Members, Committee on Academic Affairs and Licensing

Cambridge International

Background

South *Carolina Code of Laws, 1976* as amended, §59-29-190, prescribes requirements for acceptance of students' advanced placement scores "in each post-secondary public college in South Carolina in the manner specified by the Commission on Higher Education in conjunction with the State Board of Education." Accordingly, the Commission adopted and revised policies from 1985 through 2016, including the addition of International Baccalaureate policy in 2007, comprising the *Policy for the Award of Credit for AP and IB*.

At the November 29, 2018 ACAP meeting, *Cambridge Assessment International Education* ("*Cambridge International*," "*CI*") representatives introduced *Cambridge International* as a potential advanced placement option for adoption by CHE. *Cambridge International* is a learner-centered not-for-profit division of the University of Cambridge providing an instructional system aligning "curriculum, teaching & learning, and assessment, serving grades K–12." To help explain how *CI* could serve South Carolina students better, representatives invited Aiken County School District educators to present findings since the district's adoption, attesting to student success with AICE, the Advanced International Certificate of Education Diploma. In addition, *Cambridge International* provided specific evidence from Florida of interventions for underserved students, including improvements in high school graduation rates, college and career readiness, and post-secondary attendance. As a result of committee discussion, staff convened an *ad hoc* committee in 2019 (September and December) and early 2020 for further study, including review of CI materials and exams by institutional faculty who provided favorable feedback. Members included chief academic and enrollment management officers, representatives from the South Carolina Department of Education (SCDE), and from *Cambridge International*. Participants reviewed adoption in a number of states and current recognition by other SC state education agencies, including the SCDE (see South Carolina Uniform Grading Policy 2019) and the Education Oversight Committee (see 2018-2019 Accountability Manual).

Ad hoc committee members agreed to prepare a draft for adoption based on the *CHE International Baccalaureate* policy template (see attachment).

At the June 9, 2020 ACAP meeting, committee members discussed the recommendation, possible amendments, and the Cambridge assessments' potential to suggests students' postsecondary success.

Advocates provided background information and affirmed support. The Cambridge International representative responded to questions with available information. Upon discussion, the committee tabled consideration to request and review additional data. During fall 2020, the CI representative and Commission staff provided August 2020 data to inquiring committee members of CI student success at Florida State University. Committee members reviewed findings with their faculty and academic officers and discussed data and remaining questions with Commission staff.

At the November 19, 2020 ACAP meeting, the committee discussed the findings, policy developments in other states, and received updates from Aiken County School District and Cambridge International representatives. Upon remaining discussion, the committee voted unanimously to favorably commend Cambridge International, with the provision for Commission consideration and approval should an institution seek a minimum threshold for granting credit that is higher than the minimum in Commission policy.

Scoring

A Cambridge International summary to explain its scoring system in relation to AP and IB:

1. The Cambridge International *AS* Level and the IB *Standard* Level vary. For example, the *AS* Level recommends 180 student contact/learning hours, while the IB *Standard* Level stops at 150. At the *A* Level, Cambridge requires 360 hours; the IB *Higher* Level stops at 240.

2. There is considerable research showing that Cambridge International *AS* Level students are performing as well as AP students when looking at GPA, persistence, and completion, and better than IB students (see attached full article). For a compilation of US research, please see this blog post from our head of research in the UK.

3. High schools in the US are limited in their ability to offer Cambridge International *A* levels given the four-year structure. Only in rare instances are high schools able to offer the *A* level—over 80% of the Cambridge courses/exams in the US are at the *AS* level. The students earning the AICE diploma are doing so primarily through the *AS* Level courses. Discounting the *AS* level in policy will render US students unable to have their exceptional skills recognized, including current and future South Carolina students.

4. The majority of US Cambridge International students over the past 15 years have attended higher education institutions in the Florida state university system and were awarded credit by exam on *AS* levels at a grade of e or higher. If the Florida institutions, including the state flagship institutions, were not seeing these students succeed in their first year on the subsequent courses, the state university system would have called for a review and changed their credit policies. The Florida statute requires a policy review every five (5) years to ensure appropriateness. The policy still receives significant support from the state's technical experts.

5. Several states in the region have either recently adopted or renewed (long-standing) policies for *Cambridge International* exams, specifically and deliberately including the *AS* Level: Florida, Mississippi, Virginia, and the University of North Carolina system. The state of Washington passed legislation requiring policy for *AS* and *A* Levels in the last year, and the North Carolina Community College System has policy in draft form at the e/E. These policies do encompass their state flagship institutions. These policies were adopted not just to recognize the knowledge and skills

Cambridge International students have demonstrated, but to also support state goals in recruiting and enrolling talented students very likely to succeed. As a result of the policy difference, SC institutions would likely not be a favorable destination for out-of-state Cambridge International students; and it will greatly disadvantage current and new Cambridge International students from SC secondary schools.

Accordingly, the draft proposes scores of E or higher on any AS and A level Cambridge Assessment International Education course examination.

International Baccalaureate Score

For Advanced Placement tests, a minimum score of three is awarded credit (rf. SC §59-29-190; CHE Policy). For International Baccalaureate Higher Level exams, a minimum score of four is awarded credit. Statute requires a minimum score of three to be awarded, which is specific for AP exams. The IB minimum score of four on Higher Level exams is broadly recognized as on par with the AP score of three and as such does not contradict statute. This confirmation is proposed in the policy draft for clarification only, and represents no change to Commission AP or IB policy.

February 12, 2021 CAAL Summary

At the February 12, 2021 Committee on Academic Affairs and Licensing meeting, CAAL, commission staff, and the Cambridge International representative discussed the proposed update. The committee spoke of program efficacy where adopted in-state to date (e.g., Aiken County School District); program potential to broaden opportunities for college readiness in rural state regions; and benefits for the state seeking to strengthen in-state and in-bound recruitment postsecondary. The committee moved and withdrew an amendment to the motion to require Cambridge International to produce a new annual report to advise of changes to the curriculum after policy adoption. Instead, the committee agreed that Cambridge may provide to Commission staff the annual report it provides the South Carolina Department of Education at present. Upon remaining discussion, the proposed update to policy.

Recommendation

The Committee on Academic Affairs and Licensing recommends the Commission approve Cambridge Assessment International Education.

Attachment

South Carolina Commission on Higher Education
Policies on Advanced Placement, ~~and~~ International Baccalaureate, and Cambridge Assessment International Education Credit Awards

Advanced Placement Credit Award Policy

Each public institution of higher education shall give credit in appropriate courses for scores of three or higher on pertinent Advanced Placement examinations.

As used above, the phrase "appropriate courses" means those courses offered by the institutions which parallel the content covered by the AP exam. The phrase "pertinent examination" means those examinations whose content parallels that of the institutional course.

1. In no instance shall an institution be required to award more than six to eight credits in any one discipline area.

2. For purposes of this policy, history is defined as consisting of two disciplines: American History and non-American History.

3. Because of the major overlap in course content between the two English AP exams, English Language and Composition and English Literature and Composition, the awarding of AP credit in English should be treated separately from that of other disciplines as follows:

    a. if a student receives a score of "3" or "4" on either English AP exam, credit would be awarded for English Composition I (ENG 101)[1] or an introductory composition equivalent;

    b. if a student receives a score of "3" or "4" on each English AP exam, or a "3" on one and a "4" on the other, credit would be awarded for English Composition I and II (ENG 101 and 102) or their introductory composition equivalents;

    c. if a student receives a score of "5" on either or both English AP exams, credit would be awarded for both English Composition I and II (ENG 101 and 102) or their introductory composition equivalents.

4. Because of the interdisciplinary nature of the AP Seminar and Research courses, institutions are encouraged to award general elective credit for scores of 3 or higher on those AP exams; however, if the institution offers a comparable course, credit may be awarded for that course.

[1] This document uses the South Carolina Technical College System's course titles.

International Baccalaureate Credit Award Policy

Each public institution of higher education shall give credit in appropriate courses for scores of four or higher on any higher-level IB course examination.

The amount of college course credit awarded for a higher-level IB course will be equivalent to the credit hour value of the college course for which the IB credit is being accepted.

~~The Policies on Advanced Placement and International Baccalaureate Credit Awards shall be referenced in the institution's academic catalogue and made available to the public on the institution's website.~~

N.B. An IB minimum score of four on higher-level exams is broadly recognized as equivalent with an AP score of three, and therefore supports statutory intent.

Advanced Placement Policy initially approved by CHE July 1985
Revision approved by CHE January 1995
Revision approved by CHE May 5, 2016

International Baccalaureate Policy initially approved by CHE October 4, 2007
Revision approved by CHE May 5, 2016

Draft language proposal based on CHE IB policy:

Cambridge Assessment International Education Credit AICE Award Policy

Each public institution of higher education shall give credit in appropriate Cambridge International courses for scores of E or higher on a Cambridge International Advanced AS and A Level examination.

The amount of college course credit awarded for a ~~higher-level~~ Cambridge Assessment International Education AS and A Level examination ~~course~~ will be equivalent to the credit hour value of the college course for which the Cambridge Assessment International Education credit is being accepted.

Institutions shall provide justification for each case where the minimum threshold for granting credit is above the minimum indicated above. Such justifications must be approved by the Commission.

The Policies on Advanced Placement, ~~and~~ International Baccalaureate Credit Awards, and Cambridge Assessment International Education shall be referenced in the institution's academic catalogue and made available to the public on the institution's website.

Success in the US:

Are Cambridge International Assessments Good Preparation for University Study?

By Stuart Shaw and Clare Bailey

Introduction

This article focuses on the research being conducted by University of Cambridge International Examinations (Cambridge) to ensure that its international assessments prepare students as well as Advanced Placement and International Baccalaureate for continued studies in colleges and universities. The primary purpose of the research is to highlight the predictive validity of Cambridge examinations and other students' characteristics to predict preparedness for and continued academic success at US universities. Predictive validity is a measurement of how well a test predicts future performance and entails the comparison of test scores with some other measure for the same candidates taken some time after the test (see Anastasi 1988, Alderson, et al. 1995). For tests that are used for university selection purposes it is vital to demonstrate predictive validity.

The research reported here uses data collected from three years' worth of students enrolled at Florida State University (FL). The data include information about each student's performance at high school, ethnicity, gender, and first-year Grade Point Average (GPA). Multilevel modelling has been applied to the data using the statistical software package MLwiN to investigate the relationships between the variables, and in particular to determine which are the best indicators of academic success at university while taking into account the effects of individual high schools.

High School Acceleration Programs

Advanced Placement (AP) has been a staple in US education for more than 50 years. Designed to promote excellence in secondary education, the program desires to allow motivated students to work at their optimum capability. Nearly 1 million US students now take at least one AP exam during their secondary careers. As Harvard (MA), Yale (CT) and Princeton (NJ) Universities were active participants in the study that led to the creation of AP, the acceptance of this credential is nearly universal among American universities.

In the late 1960s the International Baccalaureate (IB) was founded. While initially established as a single program for internationally mobile students, the program has flourished throughout the world, but nowhere greater than in the United States. By 2005 over 1,000 secondary schools in North America offered the IB curriculum. The IB had to work diligently to have US universities provide recognition similar to that provided to AP.

Cambridge provides international qualifications for five to 19-year-olds. While Cambridge has been offering examinations for 150 years, it is relatively new in offering its curriculum in the United States. The four-year Cambridge curriculum and exams leading to an Advanced International Certificate of Education (AICE) Diploma were introduced in Florida's Bay High School a little more than 15 years ago. Cambridge is experiencing the same curve of recognition as IB experienced in the 1970s and 1980s.

The Cambridge Acceleration Program

Cambridge offers the International General Certificate of Secondary Education (IGCSE), which is a two-year qualification aimed at 14- to 16-year-olds. Cambridge IGCSE encourages learner-centered and inquiry-based approaches to learning. It has been designed to develop learners' skills in creative thinking, inquiry and problem-solving, giving learners a sound preparatory basis for the next stage in their education. More than 70 subjects are available for study, and schools may offer any combination of these subjects. In some IGCSE subjects, there are two course levels, known as the Core Curriculum and the Extended Curriculum. The Extended Curriculum includes the material from the Core Curriculum, as well as additional, more advanced material.

Cambridge also offers the international Advanced Subsidiary (AS)/ Advanced (A) Level which is a two-year international qualification aimed at the 16–18 age range and is intended to follow the IGCSE. The A-Level courses are designed to be flexible, and can be structured in a variety of ways:

Option 1: Candidates can take all papers of the Cambridge International A Level course in the same examination session, usually at the end of the second year of study.

Option 2: Candidates can take a "staged" assessment route—taking the Cambridge International AS Level in one examination session and completing the final Cambridge International A Level at a subsequent session. (The staged assessment route is not possible in all subjects. For example, the outcomes awarded for Cambridge International AS Level language syllabi cannot be carried forward to Cambridge International A Level).

Given the increase in the number of applications for admission to colleges and universities for the limited number of seats in freshmen classes, students and universities in the US must consider all available indicators for success in higher education.

Option 3: Candidates can take the Cambridge International AS Level only, either at the end of a one-year or two-year course. The Cambridge International AS Level syllabus content is half a Cambridge International A Level program.

Cambridge awards a Cambridge AICE Diploma to students who have passed a prescribed number of subject examinations at A level and/or the AS level. To qualify for a Cambridge AICE Diploma, students must pass at least one examination from each of three subject groups to include mathematics and sciences, languages (both foreign and first), and arts and humanities. In the US, Cambridge International AS and A level examinations are sometimes referred to as "Cambridge AICE" or "AICE" examinations. Students passing AS and A level examinations may be awarded entry-level or intermediary-level university course credit by examination or advanced standing at US colleges and universities.

For the benefit of readers who may not be familiar with the UK secondary school and university system, we include a tabulated comparison of secondary education in the UK and the US as an appendix on page 16.

High School Indicators for Success

Given the increase in the number of applications for admission to colleges and universities for the limited number of seats in freshmen classes, students and universities in the US must consider all available indicators of success in higher education. There are many ways students can gain recognition to contribute towards their university application. The standard high school exam in the US is the SAT (formerly known as the Scholastic Aptitude Test) although in some states an alternative, the ACT (American College Testing), is more popular. (Concordance tables are published to find equivalences so that SAT scores can be used for the minority of students who take the ACT). In this article we are studying students in Florida, where the majority take the SAT exam. Although standardized test scores have varying significance in the admission decisions of all students who qualify for admission at universities in the US, all potential US university students must submit results of college entrance exams, either SAT or ACT, in order for an application to be considered complete in many universities. In addition to this, students can choose to take other exams, such as those that are part of the IB, the AP or Cambridge's International A level program, AICE.

The College Board encourages universities to use SAT and high school grades when making admission decisions. However, high school grades are not necessarily a good means of comparing students' experiences and achievements at university. This is because high school grades reflect the standards and quality of a particular school or schooling system. These standards differ according to school area or region (e.g., urban or rural) and even individual schools. Moreover, inter-school effects are not always reflected in high school grades (Burton and Ramist 2001).

The primary purpose of the SAT is to measure a student's potential for academic success in college. In this context, a number of studies that attest to the predictive validity of the SAT have been undertaken. (For a useful summary relating to the predictive utility of SAT, ACT and high school GPA (HSGPA) as indicators of university success see Cohn, et al. 2004).

Cohn, Manion and Morrison (2004) used SAT scores, HSGPA and high school class rank to determine how well these predict college GPA. Data were collected from 521 students enrolled on Principles of Economics at the University of South Carolina in 2000 and 2001. They examined the frequency distribution of key variables and regression analysis (no multilevel model), with students grouped according to gender and race. It was found that having a SAT score of more than 1,100 (out of a possible 1600) and a class rank of more than 70 gave a predicted college GPA of around 3.0.

A large-scale national validity study of the revised SAT (incorporating an additional section in writing and minor changes in content to the verbal and mathematics sections) was undertaken by Kobrin, Patterson, Shaw, Mattern, and Barbuti (College Board, 2008). Their studies were based

on data from 150,000 students entering 110 US four-year colleges and universities in the fall 2006 and completing their first year of college in May/June 2007. The writing section was shown to be the single most predictive section of the test for all students. The analyses also found the writing section to be the most predictive across all minority groups. The studies also revealed that:

- SAT is a strong predictor of how students perform in their first year at university
- SAT is a stronger predictor than high school grades for all minority groups (African American, Hispanic, American Indian, and Asian)
- the recently added writing section is the most predictive of the three SAT sections.

Culpepper and Davenport (2009) studied a sample of 32,103 first-year students who were enrolled in one of 30 colleges or universities in 1995. They compared the attainment of students from different racial/ethnic backgrounds, and found that an African-American student with the same HSGPA, SAT or ACT score as a white student was likely to have a lower college GPA.

However, not all studies have produced evidence that the SAT identifies the students most likely to succeed at university. Lenning (1975) carried out three studies to determine whether ACT was as good a predictor of college grades as SAT for highly-selective institutions. Although only three such institutions were studied, they found that ACT scores could be at least as predictive, and likely more predictive, of college grades at highly selective institutions than SAT scores.

Noble and Sawyer (1987) considered the ACT scores and HSGPA for students enrolled at 233 institutions across 2812 courses in October 1985. They computed regression statistics for each course. They found that including HSGPA gave a stronger prediction of college GPA.

Noble (1991) conducted a study of 30 colleges, mainly located in central and southern US, with a higher than representative proportion of public colleges. It was found that ACT is a reasonable predictor of college success, and that including HSGPA improves the predictive validity.

A study by Betts and Morrell (1999) also indicated that HSGPA (as well as SAT scores) are significant predictors of university GPA.

Methodology and Analysis

This study takes a case study approach using data from Florida State University (FSU). Denscombe (2003) describes the key characteristics of case study research: spotlight on one instance; in-depth study; focus on relationships and process; natural setting; and multiple sources and methods. (For detailed explanations and discussions of case study research, see Denscombe, 2003; Bell, 2005; Cohen, Manion and Morrison, 2007; and Sharp, 2009).

FSU is a publicly-supported institution located in the state capital of Tallahassee. FSU is a comprehensive, national graduate research university with 40,255 students, 8,557 of whom are graduate students. FSU is home to the National High Magnetic Field Laboratory and the arts program—dance, film, music, and theatre—is widely regarded within the US. Recently FSU added a College of Engineering and a College of Medicine. It also has a College of Law.

Research Hypotheses

The four principal hypotheses tested in this study may be stated in the following way:

Hypothesis 1: Students who follow either the AP or IB or the Cambridge AICE or no credit program achieve differentially on first-year university GPA (given the same SAT scores).

Hypothesis 2: The differences in first-year university GPA between males and females vary for students who follow each of the four programs (given the same SAT scores).

Hypothesis 3: The differences in first-year university GPA between student ethnic groups vary for students who follow each of the four programs (given the same SAT scores).

Hypothesis 4: The differences in first-year university GPA between student ethnic groups and between genders vary for students who follow each of the four programs (given the same SAT scores).

Data and Measurement Issues

The SAT score (total SAT score, SAT-Tot) has been used as the choice of measure for the high school performance. A point worthy of note is when students take the SAT. If students take the SAT late junior year or early senior year, then any additional acceleration program, may have an effect on their score.

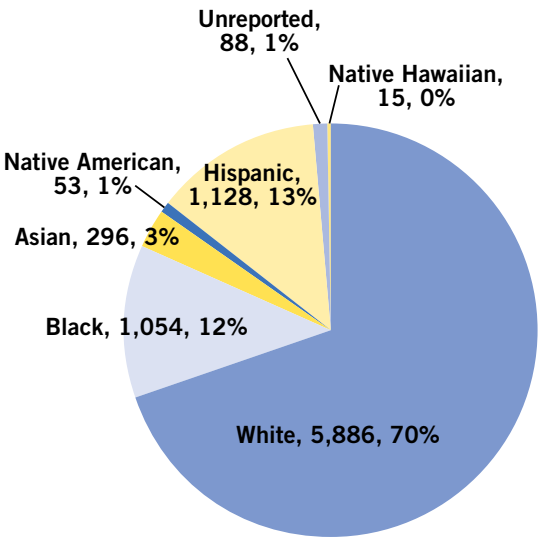
The concept of tertiary level academic success used here is determined by the persistence of a student within the university with a specific GPA. The definition of university GPA employed is based on the accumulation of all previous semesters' work.

Recognizing how groups of individuals can be nested can help build a more realistic picture, giving insight into where and how effects are happening, and this is what multilevel modelling aims to do…

To fit the multilevel models we used data based on records of more than 8,500 students who entered FSU during the academic years 2007–2008, 2008–2009 and 2009–2010.

Four datasets representing secondary educational programs were obtained from enrollment and admission staff at the university. The largest data set (n = 6,382) contained information on students with only the SAT (or ACT) score (hereafter referred to as having "no credit"). The three other data sets contained information on students with Cambridge AICE credit (n = 144), with AP credit (n = 1,188) and IB credit (n = 806). Figure 1 shows student data in terms of relative proportions by race.

Figure 1: Proportion of Students by Race



Column headings for each of the four datasets include: FSU student number, year enrolled, race, gender, FSU GPA, high school GPA, SAT verbal, SAT math, SAT total, ACT (if applicable), high school attended, type of exam program followed (if applicable). The explanatory variables are set out in Table 1.

The four data sets were combined into an overall matrix. The structure of the data, which contain students from (i.e., "nested within") a number of high schools, suggests the use of multilevel models. The multilevel software package MLwiN (Version 2.02 Rasbash, et al. 2005) was therefore used.

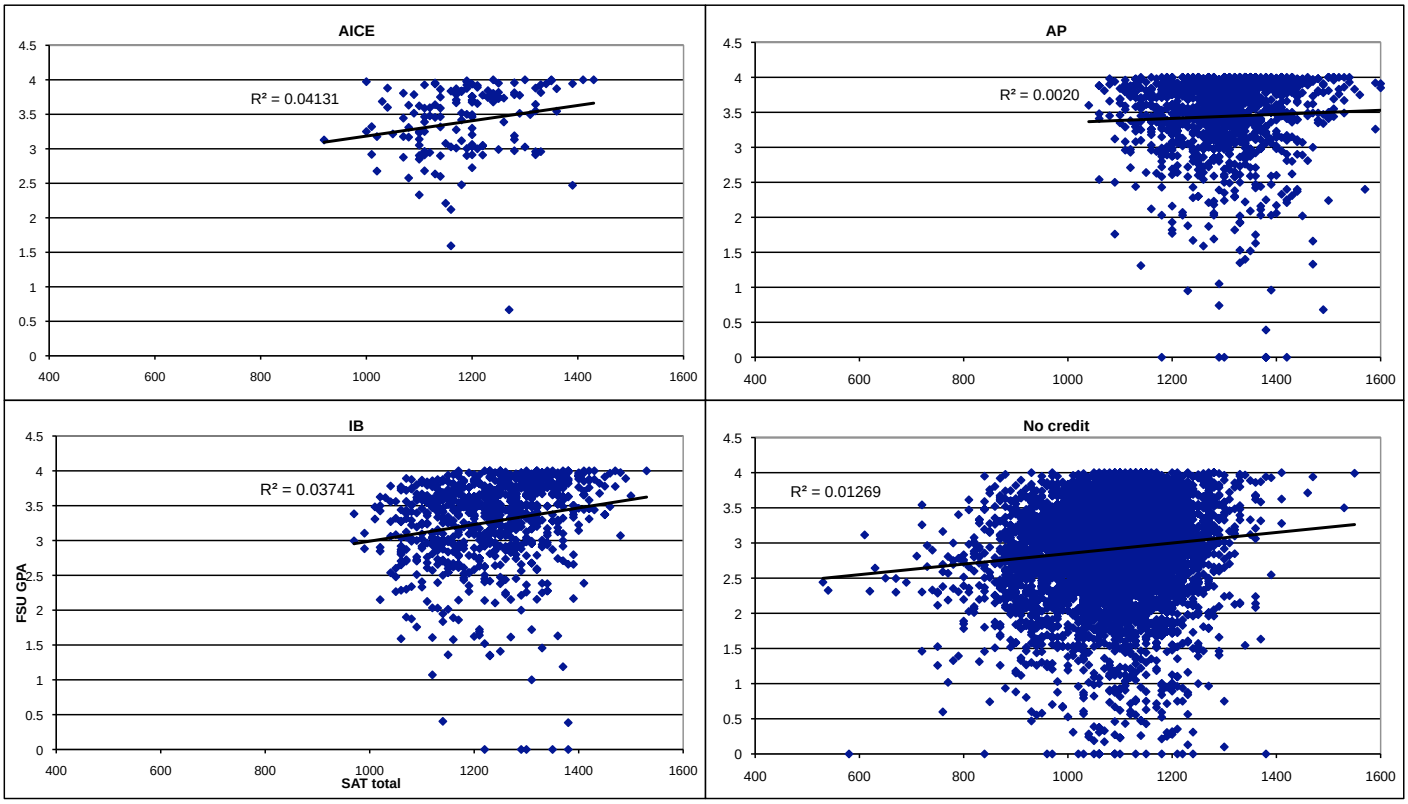
Table 1: Explanatory Variables Definition

Generic data requirements	
Variable	**Explanation**
FSU student number	Unique student identifier
Race	1 = white, 2 = black, 3 = Asian, 4 = Native American, 5 = Hispanic, 6 = unreported, 7 = Native Hawaiian/ other Pacific Islander
Gender	M = male, F = female
FSU GPA	Possible values from 0 to 4
High school GPA	Possible values from 0 to 4 (or in some cases more than 4)
Matriculation year	Year first enrolled at FSU
SAT verbal	SAT score for critical reading component
SAT math	SAT score for math component
SAT total	Total SAT score
ACT composite	ACT score
High school code	Local high school identifier
Type of credit	Exam program followed – Cambridge AICE, AP, IB or no credit
Credit hours	Number of hours credit gained on a college course

Multilevel Modelling

Multilevel modelling is a way of finding a line of regression through different groups, nests or hierarchies of data (unlike standard multiple regression techniques which assume that the observations are independent, which is not the case here). Multilevel modelling takes account of the context in which a variable exists. It is often used in sociological applications because individuals are affected by or defined by the groups they belong to. For example, patients receiving the same treatment for the same condition at different hospitals may experience different patient outcomes; students in different classes or in different schools may obtain different exam results. Recognizing how groups of individuals can be nested can help build a more realistic picture, giving insight into where and how effects are happening, and this is what multilevel modelling aims to do (see Goldstein 2011 or Bryman and Hardy 2009 for a more detailed description of multilevel modelling).

Figure 2: Scatter plots of the four datasets for each type of exam program, showing SAT-Tot (x-axis) against FSU GPA (y-axis) and the line of regression and r^2 value.



Not using a multilevel model as a result of failing to recognize hierarchical structures makes it more likely that a significant difference is reported when in fact the difference is non-significant (i.e., a false positive or type 1 error); standard errors of regression coefficients will be underestimated, leading to an overstatement of statistical significance.

As the outcome variable (FSU GPA scores—first-year examination marks) is continuous, the model fitted was:

$$y_{ij} = \beta_{0ij}x_0 + \beta_1 x_{ij}$$
$$\beta_{0ij} = v_{0j} + \varepsilon_{0ij}$$

where y_{ij} is the predicted outcome variable (FSU GPA score) for individual *i* in high school *j*, β_{0ij} is a constant, β_1 is the independent contribution of the predictor variable to the dependent variable, x_{ij} is a predictor variable, v_{0j} is high school level residual error and ε_{0ij} is individual level residual error.

Multilevel models have been used in several predictive studies to take into account the hierarchical structure of educational assessment data. For example, Bell and Dexter (2000) used multilevel modelling to investigate the comparability of IGCSE and GCSE (the UK equivalent of IGCSE) and suggested that a wide between-school variation can make results misleading. However, this is the first study to our knowledge that uses multilevel modelling to compare the predictive validity of different types of high school exam programs in the US.

Figure 2 shows the total SAT scores and the FSU GPA for each student in the dataset according to the exam program followed. It can be seen that there are a number of outliers at the FSU GPA level—students who perform well in their SAT score but who do not do so well in their first year of college. In every case where students exhibit a zero score for their GPA it was noted that these were new students yet to receive a GPA. According to university admission staff, any instances of low GPA scores are representative of underperforming students experiencing academic difficulties. It may be assumed, therefore, that these are special cases which a model could not reasonably predict. Consequently, any student with a GPA of less than 1.0 was excluded from the data set. It should also be noted that most of the student GPAs shown in Figure 2 fall within the two–four range (though this range is wider for "no credit" students). The SAT scores for students with no credit are considerably lower than those of the other three groups.

According to university admissions staff, any instances of low GPA scores are representative of underperforming students experiencing academic difficulties. It may be assumed, therefore, that these are special cases which a model could not reasonably predict.

Findings

In each of the tables that follow, regression coefficients are statistically significant if they equal twice or more the value of the standard error (shown in brackets). Statistically significant effects are shown in bold type. It should be noted that throughout the analysis school effects appeared to be much smaller than individual-level effects, in other words, there is no statistical difference between schools.

Hypothesis 1: Educational Program

Using the refined dataset (excluding FSU GPA scores less than 1.0 and with the 488, or 5.7 percent of candidates missing SAT-Tot scores replaced with equivalent ACT) the model investigates the factors associated with the course of program study (Table 2a).

Table 2a: Effect of Educational Program on FSU GPA

Base – Cambridge AICE	Regression Coefficient (Standard Error)
AP	0.061 (0.060)
IB	-0.105 (0.063)
no credit	**-0.478 (0.058)**

A student taking Cambridge AICE is predicted to get, on average, 0.478 higher on their FSU GPA than a student taking no extra exam program. There is some evidence that a student taking Cambridge AICE is predicted to get higher in their FSU GPA than a student taking IB, but because of the smaller sample size of the Cambridge AICE cohort, it is difficult to be certain about this.

The same analysis is performed, but compares the performance of students who have equivalent SAT scores. This is known as 'controlling for SAT score' and gives a more reliable picture as it enables us to focus on the only factors that are affecting the outcome.

Controlling for total SAT score we can see that, given equivalent SAT scores, the Cambridge AICE exam is associated with, on average, 0.142 higher on their FSU GPA than the IB, and 0.389 higher than having no extra credit (Table 2b).

Table 2b: Effect of Educational Program (given equivalent SAT scores) on FSU GPA

Base – Cambridge AICE	Regression Coefficient (Standard Error)
AP with SAT	-0.026 (0.058)
IB with SAT	-0.142 (0.060)
no credit with SAT	**-0.389 (0.056)**

Hypothesis 2: Gender

Table 3a shows that, compared to having no extra credit, the Cambridge AICE is associated with on average 0.465 higher FSU GPA, controlling for the effects of gender. There is some evidence to say that a male having Cambridge AICE does slightly better, on average, than a male with IB.

Table 3a: Effect of Gender on FSU GPA

Base – Cambridge AICE, male	Regression Coefficient (Standard Error)
AP	0.091 (0.060)
IB	-0.095 (0.063)
no credit	**-0.465 (0.058)**

Considering the effect of gender and equivalent SAT scores on FSU GPA Table 3b shows that the Cambridge AICE is associated with, on average, 0.354 higher GPA than no credit, controlling for gender and given equivalent SAT scores. It is also associated with, on average, 0.139 higher GPA than the IB, after controlling for gender and given equivalent SAT scores.

Table 3b: Effect of Gender (given equivalent SAT scores) on FSU GPA

Base – Cambridge AICE, male	Regression Coefficient (Standard Error)
AP	-0.0096 (0.057)
IB	-0.139 (0.059)
no credit	**-0.354 (0.055)**

Controlling for gender and SAT score closes the gap in FSU GPA between males and females for all groups of exam program.

Hypothesis 3: Race

Table 4a shows that black students perform, on average 0.305 points lower on their FSU GPA than white students, after controlling for examination program.

Controlling for race and SAT score (Table 4b), we see that black students perform on average 0.25 points less well on their FSU GPA compared with white students, which is better (a smaller gap in performance) than when SAT score is not controlled for.

Table 4a: Effect of Race on FSU GPA

Base – Cambridge AICE, white	Regression Coefficient (Standard Error)
AP	0.072 (0.057)
IB	-0.090 (0.059)
no credit	**-0.433 (0.055)**
Black	**-0.305 (0.020)**
Asian	**-0.115 (0.033)**
Native American	0.083 (0.077)
Hispanic	**-0.060 (0.019)**
Unreported	-0.041 (0.060)
Hawaiian	-0.030 (0.144)

Cambridge AICE students get, on average, 0.12 higher on FSU GPA than IB students, after controlling for race and SAT score, which is now significant. Asian and Hispanic students also do less poorly compared to white students, given equivalent SAT score, than if SAT score is not considered.

Table 4b: Effect of Race (given the same SAT scores) on FSU GPA

Base – Cambridge AICE, white	Regression Coefficient (Standard Error)
AP	0.005 (0.056)
IB	**-0.120 (0.058)**
no credit	**-0.377 (0.054)**
Black	**-0.250 (0.021)**
Asian	**-0.109 (0.033)**
Native American	0.101 (0.077)
Hispanic	**-0.048 (0.019)**
Unreported	-0.054 (0.060)
Hawaiian	-0.014 (0.143)

Controlling for SAT score closes the gap in FSU GPA for all groups except IB.

Hypothesis 4: Gender and Race

This model shows that black students have an FSU GPA that is on average 0.319 points lower than that of white students after controlling for gender (Table 5a), which is a slightly larger gap than when gender is not considered.

Controlling for gender means Hispanics have a slightly smaller FSU GPA.

Table 5a: Effect of Gender and Race on FSU GPA

Base – Cambridge AICE, white, male	Regression Coefficient (Standard Error)
AP	0.104 (0.056)
IB	**-0.080 (0.059)**
no credit	**-0.417 (0.054)**
Black	**-0.319 (0.020)**
Asian	**-0.100 (0.033)**
Native American	0.072 (0.076)
Hispanic	**-0.062 (0.019)**
Unreported	-0.044 (0.059)
Hawaiian	-0.061 (0.142)

Controlling for gender, race and SAT score we see that black students have an FSU GPA that is 0.249 points lower than white students, which is a smaller gap in performance compared to when SAT score is not controlled for (Table 5b). Cambridge AICE students achieve, on average, 0.118 higher on FSU GPA than IB students, after controlling for race, gender and SAT score. There is also a smaller gap in performance between Asian and Hispanic students compared to white students, given equivalent SAT score and after controlling for gender, than if SAT score is not considered.

Table 5b: Effect of Gender and Race (given the same SAT scores) on FSU GPA

Base – Cambridge AICE, white	Regression Coefficient (Standard Error)
AP	0.021 (0.055)
IB	**-0.118 (0.057)**
no credit	**-0.343 (0.053)**
Black	**-0.249 (0.020)**
Asian	**-0.091 (0.033)**
Native American	0.092 (0.075)
Hispanic	**-0.047 (0.019)**
Unreported	-0.060 (0.059)
Hawaiian	-0.044 (0.141)

The foregoing analysis has enabled researchers to test a number of hypotheses. The models show that following an examination program results in, on average, a better GPA than not following any extra credit.

Discussion

The study has explored the link between high school quality (in terms of the educational program followed) to first-year university academic achievement using data supplied by FSU. The primary purpose of the research has been to highlight the predictive power of Cambridge AICE, and other students' characteristics in terms of preparing students for university and predicting freshman student performance at university.

The foregoing analysis has enabled researchers to test a number of hypotheses. The models show that following an examination program results in, on average, a better GPA than not following any extra credit.

In particular, the study has revealed that:

- there is no evidence of any statistical difference between Cambridge AICE and AP students on all of the tests carried out
- after controlling for SAT score, Cambridge AICE students achieve a higher GPA, on average, than IB students and students having no extra credit
- after controlling for gender and SAT score, Cambridge AICE students achieve a higher GPA, on average, than IB students and students having no extra credit
- after controlling for race and SAT score, white students achieve a higher GPA than black, Asian and Hispanic students. Cambridge AICE students achieve a higher GPA, on average, than IB students and students having no extra credit
- after controlling for gender, race and SAT score, Cambridge AICE students achieve a higher GPA, on average, than IB students and students having no extra credit.

Study Limitations

The focus of the research has been a case study. Although a case study methodology is not without its criticism (being a bounded investigation which suggests that outcomes are not readily generalizable), "compared to other methods, the strength of the case study method is its ability to examine, in-depth, a 'case' within its 'real-life' context" (Yin 2006, 111). Its adoption, therefore, is justified as a mode of situated inquiry, favoring uniqueness over generalizability.

The size of the data set was large—more than 8,500 students. This means the significance we can attach to the findings is increased. Even where the subsets were small—for example, of Cambridge AICE students there were 144—they were still sufficiently large for the analyses to be carried out. There were some subsets that were small, for example Native American and Hawaiian, which increases the risk of Type II errors. (This is the error of failing to observe a difference when in truth there is one—a false negative).

A common challenge in studies of this type is controlling for selection bias. The choice of educational program is not necessarily random. High schools have different characteristics and in mixed Cambridge/non-Cambridge high schools students may have a choice. Students also may choose a high school based on its use of program. It is not clear what determines the choice of acceleration mechanism. Is choice of educational program influenced by type of high school, extrinsic and intrinsic motivational aspects, institutional ethos, affective characteristics, parental status, socioeconomic constraints? Clearly information of this kind would enhance our understanding of future predictive validity findings.

Future Work

Further multilevel modelling work will include investigation of other variables that may explain student performance. One such measure of success relates to university enrollment status (as of the second fall after high school graduation), as well as university retention, that is, re-enrollment in a second year at the same institution (Robbins, et al. 2006). Other measures for consideration might include class type (whether Cambridge students do better with certain types of classes) or if certain behavioral measures, such as engagement

It is not clear what determines the choice of acceleration mechanism. Is choice of educational program influenced by type of high school, extrinsic and intrinsic motivational aspects, institutional ethos, affective characteristics, parental status, socioeconomic constraints?

with research or study abroad, may be enhanced. Apart from the freshman year cumulative GPA measure of achievement, other university performance outcomes could be explored, for example, four-year cumulative GPA scores; freshman year attrition rates; and four-year graduation rates. Additionally, it would be informative to compare SAT critical reading and SAT mathematics scores in the above analyses, as there is some evidence that one is a better predictor of college success than the other.

All of the variables used for the above analyses come from university admission records. Student transcripts from the administrative archives of the university provide information about university career (type and number of exam passed, frequency of study, credit hours, etc.) and data relating to some characteristics of the high schools attended (type of school, final grades). However, a questionnaire given to students when they enter university would enable the collection of additional information on the students' characteristics such as reasons for choice of educational program and familial socioeconomic status.

A valuable, longitudinal exercise would be to track an entire cohort of Cambridge students from one particular high school through to final year of study. Questionnaire surveys together with interviews throughout the duration of an AICE program of study could be undertaken in order to determine extent of workload, attitudes to course/assessment and teachers'/students' perceptions of the course. This would be accompanied by follow-up interviews with students at university, the findings from which could be triangulated with GPA scores achieved at the end of the first year of undergraduate study and also at graduation.

Given the smaller numbers in the AICE, AP and IB groups, the case study nature of the research and the possible presence of unknown confounding variables between groups it would be unwise to draw conclusions about the relative predictive strength of the three acceleration programs. Further work will be required to collect more data from FSU and other US universities. Cambridge has already obtained considerably smaller datasets from the universities of Maryland, Virginia and Michigan and the process of data collection is expected to continue over time.

Acknowledgements

We would like to thank John Barnhill (assistant vice president for enrollment, Florida State University) and Megan Benson (director, enrollment management operations office of admissions and records, Florida State University) for providing us with the university data and for their assistance and advice during the project. Thanks also to Sherry Reach (Cambridge US regional manager) and Bill Kolb (Cambridge US recognitions consultant) for their invaluable contributions throughout the course of this work.

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Appendix: Comparison of Secondary Education in the UK and the US*

	UK				US			
AGE	**TYPE OF INSTITUTION**	**YEAR**	**MAIN EXAMINATION**	**COMMENTS**	**TYPE OF INSTITUTION**	**GRADE**	**MAIN SUBJECTS/ EXAMINATION**	**COMMENTS**
14-15	SCHOOL	10		First year of GCSE/IGCSE course	HIGH SCHOOL	9	5 core subjects plus electives	• Students gain a Diploma in G12. • Credits for core and elective studies. • Minimum number of credits needed; in Florida 24 • Many G11/12 pupils on Advanced Placement (AP) or Dual Enrolment (DE) as part of the credits • SAT taken in G11 and again in G12 if not good enough
15-16	"	11	GCSE/IGCSE (6-11 subjects)	Vocational courses also possible	"	10	5 core subjects plus electives	
16-17	SIXTH FORM or COLLEGE	12	AS (4-5 subjects)	Entry based on good grades in 4/5+ GCSEs/ IGCSEs	"	11	5 core subjects plus electives	
17-18	"	13	A2 (3 subjects)	The 'best' three AS subjects	"	12	3 core subjects plus electives	
18-19	UNIVERSITY	FIRST	First Year	Entry based on AS/A2 grades or points equivalent.	COLLEGE	FRESHMAN	LIBERAL STUDIES	• Entry based on High School grades converted into GPA plus SAT score (plus in Florida community service). • They apply before receiving their Diploma • Offer based on minimum GPA plus SAT scores in G12 • ~20% of students go to college
19-20	"	SECOND		"	"	SOPHOMORE	ASSOCIATE DEGREE	
20-21	"	THIRD	BACHELOR DEGREE	"	"	JUNIOR		
21-22	"	ONE	POST GRADUATE	Entry based on good first degree	"	SENIOR	BACHELOR DEGREE	

* IGCSE is the international counterpart of GCSE. As with GCSE, IGCSE is also available to candidates in the UK

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