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Predictors of Successful Completion of the International Baccalaureate Diploma Program

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by

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Abstract

The International Baccalaureate Diploma Program (IB DP) is an Accelerated College Credit (ACC) option that allows students to access high-rigor coursework, increase college readiness, and gain college credit in high school. This study used quantitative research methods to understand the academic and non-academic factors that predict a student's likelihood of completing the IB DP. A binomial logistic regression was used to answer the research question: of the students who were designated as IB students at the beginning of Grade 11, what factors predicted successful completion of the International Baccalaureate Diploma Program? The results revealed that academic preparedness before entering the program had the strongest predictors for successful completion of the IB DP, suggesting that academic skills and abilities before entering the program are the best predictor for completion. The study also revealed that early preparation measures did not predict successful completion, suggesting that quality of education prior to entering the program is more important for success in the program than quantity of programing or coursework. Finally, the study found that there is still a persistent gap in equity by gender and ethnicity/race in IB DP participation, despite the fact that the program was implemented in schools to offer a rigorous academic opportunity to diverse groups of students.

I dedicate this work to my children,

Hailey, Kelsee, Aidan, Liam, Emory, and Hadley,

who have given me the strength and inspiration to keep going during my 20th mile.

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CHAPTER ONE

Introduction

College readiness continues to be a factor impacting high school students who have postsecondary aspirations. For American students to be able to compete with students from the rest of the world, more than just basic high school skills are required. While workforce needs continue to grow, the current college attainment rates are not keeping up and about a third of American students place into remedial education when they enter their first year in college (United States (US) Department of Education, 2018). It has been argued that there is a need to focus on college and career preparation for American students to remain competitive in an increasingly global economy.

In 1973, 72% of the American workforce included individuals with a high school diploma or less. However, by 2008, those with a high school diploma or less had fallen to 41% in response to 59% of jobs requiring some form of postsecondary education. It is further estimated that the number of jobs requiring postsecondary education will grow to 65% by 2020, with 11% requiring a master's degree or higher, 24% requiring a bachelor's degree, 12% requiring an associate's degree, and 18% requiring a postsecondary or industry credential (National Forum on Education Statistics, 2015).

A college degree has the potential for earnings up to 66% more than those with only a high school diploma, which can translate to over $1 million more than an individual without a postsecondary education (US Department of Education, 2015). Yet, for those from economically disadvantaged families or those who are the first in their family to attend college, there is an underrepresentation in postsecondary attainment, which results in an even larger income gap (US Department of Education, 2015).

While America once was considered a leader in college completion, it now ranks 12th in the world (US Department of Education, 2018). Attending college or obtaining a postsecondary credential requires students to consider many factors, such as the direct (tuition) and indirect costs (forgone earnings while in college) (Oreopoulos & Petronijevic, 2013). College is becoming more expensive, with tuition at four-year colleges more than doubling in the last three decades (US Department of Education, 2015). For students who begin their postsecondary education, but fail to complete it, the cost of the education becomes even more burdensome.

To ensure that American students are able to receive the secondary education they need to be successful in college and obtain a postsecondary degree or credential, schools have begun to focus on college and career readiness (CCR) to increase the likelihood that students will be prepared for and complete their postsecondary education. College and career readiness is defined by Conley (2012) as a student who "can qualify for and succeed in entry-level, credit-bearing college courses leading to a baccalaureate or certificate, or career pathway-oriented training programs without the need for remedial or developmental coursework" (p. 1). To improve the chances of students entering postsecondary education without remediation, K-12 educational systems have adopted many strategies, including defining CCR standards, designing career pathways, enacting CCR legislation and accountability requirements, and implementing CCR programs and initiatives (National Forum on Education Statistics, 2015).

One strategy that is gaining acceptance is accelerated college credit (ACC), which allows students to earn postsecondary credit while enrolled in high school (US Department of Education, 2016). Researchers have shown that earning college credits in

high schools can lead to improved academic outcomes, including: higher grades in high school; increased likelihood of postsecondary enrollment after high school; higher persistence rates in postsecondary education; greater credit accumulation in postsecondary education; preparation for the academic rigors of postsecondary education; college and career readiness skills; improved student motivation; and reduced rates of remediation in postsecondary education (Glancy et al., 2014; Kilgore & Wagner, 2017; Pierson, Hodara, Luke, Regional Educational Laboratory Northwest (ED), Education Northwest, & National Center for Education Evaluation and Regional Assistance (ED), 2017; US Department of Education, 2016). In essence, ACC options provide students with more rigor in high school and ultimately greater levels of preparation for postsecondary education.

Accelerated college credit options for high school students are typically grouped into four categories: International Baccalaureate (IB) programs; Advanced Placement (AP) courses; dual credit courses (high school and college credit are achieved simultaneously and the courses are taken in the high school); and dual enrollment courses (high school and college credit are achieved simultaneously and the courses are taken at a college or online through a college) (Pierson et al., 2017). In contrast to the three options whereby students select individual courses for which college credit may be earned, the IB program is unique among these four options in that it is a comprehensive program whereby students enter and proceed through the program as a cohort and follow a structured curriculum.

The International Baccalaureate Program (IB) is an internationally recognized program that increases rigor in secondary schools in order to prepare students for

postsecondary education (Hill, 2012). The program offers students the opportunity to prepare for college and earn college credit while in high school. International Baccalaureate students tend to perform better than their non-IB peers once in college (Kilgore & Wagner, 2017; Pierson et al., 2017). Additionally, researchers have shown that IB students are more likely to enroll in college, persist in college, and receive higher grade point averages (GPA) and placement scores in high school, increasing their college preparation (Conley, McGaughy, Davis-Molin, Farkas, & Fukuda, 2014; Conley & Ward, 2009; Kilgore & Wagner, 2017; Panich, 2001; Pierson et al., 2017).

Statement of the Problem

In the western state where this study was conducted, the IB program has been adopted as a viable ACC option in two general formats. Some individual schools have elected to offer IB for the students who are zoned to attend the school. In these situations, the schools have incurred the IB costs and extend the program to students enrolled in their schools. In contrast, there are two high schools where IB is offered at schools designated by the school district as either a *magnet* or *signature academy* school. These two high schools, which are located in two different urban school districts, are both located in economically disadvantaged communities and have histories of low academic achievement. School district leaders made the intentional decision to offer the IB program in these schools for two related reasons. The first was to offer a rigorous academic program to students who have been underserved academically; the second was to attract students from more advantaged neighborhoods for the purpose of diversifying the school by offering a prestigious program. The IB program in these districts is an open

access program that is available to any student who applies, regardless of their zone location.

Although the IB program follows the same curriculum in all of the schools where it is offered, the outcomes of the two formats (i.e., school-based vs. district-designated) are notably different. There is a much higher rate of students who complete all of the IB requirements for a diploma at the school-based IB programs than the district-designated programs (R. Reid, personal communication, March 20, 2019). A cursory review revealed that the school-based programs tended to be located in more affluent neighborhoods with higher overall educational attainment. Additionally, the process for inclusion in IB at the school-based programs was more selective than at the district-designated schools.

The lower completion rate at district-designated high schools should be interpreted within the context of district goals, however. The IB program was offered to enrich schools that had been underserved academically. The program was also offered as a means of raising expectations, diversifying the student body, and creating academic role models for the entire school. As such, the IB program was intended to provide a benefit to individual students as well as the collective student body. At the same time, completion rates at the two schools for the timeframe of this study was only 44%.

Given the resources involved in offering the IB program at these two district-designated school, understanding the factors that may predict academic success (i.e., completion of the IB DP program) can help district leaders make future decisions.

Purpose of the Study

The purpose of this study was to explore the academic and non-academic variables that may predict success in completing the International Baccalaureate Diploma Program (IB DP). This study explored traditional academic predictors such as GPA, course enrollment patterns, and ACT scores. Additionally, the study explored enrichment program predictors, such as enrollment in a middle school that offered the International Baccalaureate Middle Years Program (IB MYP), Gifted and Talented Education (GATE) enrollment, and participation in school-based athletics. The study also explored differences in gender and race/ethnicity to ascertain if there were any significant predictions amongst these demographic categories for successful IB DP completion.

Research Question

The research question that guided this study was: Of the students who are designated as IB students at the beginning of Grade 11, what factors predict successful completion of the International Baccalaureate Diploma Program?

Methodology

This research study was conducted using quantitative research methods to analyze the data. Binomial logistic regression allowed for a regression equation to be produced that estimated the probability that a student would fall into one of two categories: IB DP completer or IB DP non-completer. To complete the IB DP, students needed to score at least 24 points between all IB exams and complete all courses, the Extended Essay (EE), and the Creativity, Activity, Service (CAS) portfolio (International Baccalaureate, 2020). Descriptive statistics were also used to describe the data set and the characteristics of the study group.

Continuous independent variables for this study included students' cumulative GPA at the end of Grade 10, credit attainment by the end of Grade 10, course patterns (number of courses taken in honors and AP) by the end of Grade 10, and ACT scores. Categorical independent variables for the study included participation in school-based athletics, GATE enrollment, exposure to IB MYP in middle school, gender, and race/ethnicity. Existing school records were utilized for the purposes of this study. The categorical dependent variable for this study was the outcome of the International Baccalaureate Diploma Program, either completed or not completed.

For this study, two IB DP populations from two urban schools in two different school districts were used. Any student who was enrolled in the IB DP at the beginning of Grade 11 in the academic years 2015-2016, 2016-2017, or 2017-2018 and graduated in either 2017, 2018, or 2019 were part of the study group. Data used were pre-existing data that had already been collected as part of student enrollment procedures and record keeping in the districts. The data were provided by staff members of the school districts from pre-existing data sources that were in the official records.

Significance of the Study

This study can provide insight into how factors such as GPA, credit attainment, course patterns, ACT test scores, exposure to enrichment activities in middle and high school, and socioeconomic factors might predict successful completion of rigorous secondary coursework. Findings may also inform how this western state can increase career and college ready students, and ultimately increase postsecondary attainment rates. By knowing the predictors for successful completion of the IB DP, school leaders can make important policy decisions to implement strategies before Grade 10 to help students

succeed. Additionally, the study can help leaders to make recruitment and selection decisions.

By increasing career and college readiness skills for students in this western state, the state population can hope to be more competitive on a national level. Research like this study is needed in order to help this western state secondary school leaders understand what predictors may impact student success and help students to prepare for the rigorous demands of postsecondary education.

Delimitations

This study was confined to two high schools within two urban school districts in a western state. International Baccalaureate Diploma Program students from the classes graduating in 2017, 2018, and 2019 were used, with any students enrolled in the IB DP as of the beginning of Grade 11 considered as an IB DP student. Students who were not enrolled in the IB DP at the beginning of Grade 11 were not included. Only data variables discussed in the methodology section were used.

Limitations

Potential limitations in all quantitative work can include the following: "population case is a study where members have unequal chances of taking part in the study, the population is selected in clusters such as schools, or some data is missing for some cases" (Gonard, 2008, p. xxiv). The study group for this research was limited to two urban school populations in a western state. Only pre-existing data collected by the two school districts were collected and analyzed. Therefore, data cannot be generalized to an entire population and does not represent all IB DP students. Additionally, data do not reflect the entire high school completion experience, but rather attempts to represent a

student population upon entering the program rather than at the completion of the program.

Definition of Terms

Accelerated College Credit (ACC) Options. The process through which secondary school students can enroll in and earn postsecondary credit while enrolled in high school.

Advanced Placement (AP). Coursework that allows students to obtain college credits in high school by taking college-level coursework and passing an assessment.

American College Test (ACT). A standardized assessment used to gauge a students' college readiness and prediction for success at the postsecondary level. Graduation requirement in the western state, taken during Grade 11.

Creativity, Activity, Service (CAS). A series of activities that an IB DP student must engage in and reflect upon in order to achieve the diploma.

Dual Credit Courses. Courses where high school and college credits are both achieved simultaneously and the courses are taken at the high school.

Dual Enrollment Courses. Courses taken through a college where students earn both high school and college credits simultaneously.

Extended Essay (EE). An extended research essay that students in the IB DP must complete in order to achieve the diploma.

International Baccalaureate Career Program (IB CP). One of the four programs in the IB continuum that focuses on rigorous coursework designed to prepare students for the work force. Students who participate are in Grades 10 through 12.

International Baccalaureate Diploma Program (IB DP). An accelerated college credit option that provides students with the opportunity to take highly rigorous coursework and

earn college credit through successful completion of exams. This is a holistic program, rather than just single courses. Students participate in the program in Grades 11 and 12.

International Baccalaureate Middle Years Program (IB MYP). This is one of the four programs in the IB continuum that focuses on rigorous coursework designed to prepare students for the IB CP or IB DP. It is designed for Grades 6 through 10.

International Baccalaureate Primary Years Program (IB PYP). This is the first in the IB program continuum and designed for pre-K through Grade 5.

Learning Outcomes. There are 7 learning outcomes that are used in the community service (Service Learning or Service) components of the IB MYP, IB CP, and IB DP. Those outcomes are: identifying strengths, demonstrate challenges, demonstrate how to initiate and plan, show commitment and perseverance, demonstrate collaboration, engagement with global issues, and consider ethical choices and actions.

Open Access Program. For this study, this is defined as a program that is not restricted to certain students. Any student may apply to the program.

Service Learning. Community service that students in the IB CP and IB MYP engage in as part of the program requirements.

Theory of Knowledge (TOK). A required course sequence for all IB DP students. The course focuses on critical thinking and analytical skills and questions the nature of knowledge.

Summary

This dissertation includes five chapters. Chapter One has focused on an introduction to the study and provides background for the study. Also included were the research question, the purpose of the study, methodology for data collection and analysis,

definitions for key terms, and delimitations and limitations of the study. Chapter Two includes a literature review for accelerated college credit options, including Advanced Placement, International Baccalaureate, dual credit, and dual enrollment options. It provides the background of the International Baccalaureate, which is the focus of this research, and a discussion of the components of the program. It also includes the research associated with academic predictors of success (GPA, credit attainment, course patters, and standardized test scores), research associated with enrichment activities and academic success (exposure to IB MYP, GATE enrollment, and school-based athletics), and research associated with demographic variables and academic achievement (race/ethnicity and gender). Chapter Three provides an in-depth discussion of the methodology, including research design, study group, variables, and data collection and analysis. Chapter Four will include a discussion of the findings of the study. Finally, Chapter Five provides a discussion of the findings, implications for practice, recommendations for future research, and conclusions of the study.

CHAPTER TWO

Literature Review

The purpose of this study was to explore the academic and non-academic variables that may predict success in completing the International Baccalaureate Diploma Program (IB DP). This chapter is divided into four sections. The first section provides an overview of accelerated college credit (ACC) options as a form of college readiness in secondary schools in the United States (US). This is followed by the history and research associated with the IB program. Next, other college readiness efforts will be discussed. The final section will include a discussion of various indicators of academic success.

Accelerated College Credit Options

The US used to be one of the leaders in college completion throughout the world; however, American students are now ranked twelfth in the world for college degree attainment (US Department of Education, 2018). For American students to continue to be competitive in an increasingly global economy, efforts in both the secondary and postsecondary education levels are focusing on providing students with the skills they need to be successful in college and obtain postsecondary degrees or credentials. Many secondary schools have increased their efforts to focus on College and Career Readiness (CCR) to increase the likelihood that students will enroll and complete some type of postsecondary training (National Forum on Education Statistics, 2015). Nevertheless, students still enter postsecondary institutions needing remedial coursework and without meeting college readiness standards. London (2012) reported, “thirty-four percent of students at public colleges and universities need at least one remedial course; at community college it is forty-three percent” (p. 10). London also noted that one of the

challenges American students face for college and career readiness is inconsistent academic standards across the states; this results in inconsistent outcomes, high drop-out rates, persistent achievement gaps, as well as high rates of remediation at the postsecondary level.

Students must complete certain tasks to be on the path to postsecondary education, including acquisition of college qualifications, graduation from high school, and applying to college (Cabrera & La Nasa, 2001). To improve postsecondary participation and completion, states have adopted more rigorous career and college readiness standards and K-12 schools have adopted pathways to graduation that focus on college credit options and rigor (ACT, 2015). Motivating factors behind increasing college credit options at the secondary level are finding effective ways to prepare and transition students to college coursework, as well as reducing time spent working towards a postsecondary credential to reduce total college costs (ACT, 2015). If students obtain a minimal level of qualifications for postsecondary study, the likelihood of enrolling in a 4-year institution after high school graduation increases (Cabrera & La Nasa, 2001).

To increase the likelihood that students successfully enter and persist in their postsecondary education, ACC options have begun to be offered in most secondary schools across the US. Accelerated college credit options allow students to earn postsecondary credit while enrolled in high school, which increases their college and career readiness skills and their likelihood of applying to and entering into postsecondary education (National Forum on Education Statistics, 2015; US Department of Education, 2016).

Increasing ACC options in high school can also lead to several improved academic outcomes: higher grades in high school; increased college enrollment after high school; higher persistence rates in postsecondary education; greater credit accumulation in postsecondary education; preparation for the academic rigors of postsecondary education; college and career readiness skills; improved student motivation; and reduced rates of remedial needs in postsecondary education (Glancy et al., 2014; Kilgore & Wagner, 2017; Pierson et al., 2017; US Department of Education, 2016). Additionally, the benefits that ACC options provide for students include preparing students for the academic rigors of college, providing students with the skills they need to succeed in college, improving student motivation by offering courses that are interesting and have high expectations, promoting relationships among secondary schools and postsecondary institutions, providing the college course experiences for traditionally underserved populations, contributing to a college-going culture and expectation in school districts, providing accelerated pathways to postsecondary credentials, increasing the likelihood of graduation from high school and enrollment in college, increasing the rigor of career and technical programs to prepare students for the workforce, and building college awareness for students who typically would not consider enrolling in a postsecondary program (Kilgore & Wagner, 2017; Pierson et al., 2017).

Accelerated college credit (ACC) options have been steadily increasing over the years. By 2011, more than two million students had participated in at least one ACC course equivalent. Additionally, the National Center for Education Statistics (2013) reported that 3.5 million students in the US were enrolled in advanced placement (AP) or

IB courses. Eighty-two percent of high schools reported that students were enrolled in at least one option for college credit (National Center for Education Statistics, 2013).

Accelerated college credit options for high school students are typically grouped into four categories: International Baccalaureate (IB) programs; Advanced Placement (AP) courses; dual credit courses (both high school and college credit are achieved simultaneously and the courses are taken in the high school); and dual enrollment courses (both high school and college credit are achieved simultaneously and the courses are taken at a college or online through a college) (Pierson et al., 2017). The IB program is unique among these four options in that it is a comprehensive program whereby students enter and proceed through the program as a cohort and follow a structured curriculum. This is in contrast to the other three options (i.e., AP, dual credit, and dual enrollment) whereby students select individual courses for which college credit may be earned.

International Baccalaureate

The International Baccalaureate Diploma Program (IB DP) began at the International School of Geneva in 1962 as a way to educate children who had "globally mobile parents" (Hill, 2012, p. 341). These parents worked in international agencies such as the United Nations, embassies across the world, or multinational companies. The original goals established in Geneva were to: "provide an education which placed an emphasis on critical thinking skills; promote intercultural understanding and an international perspective; and provide a diploma which would be recognized for entry to higher education around the world" (Hill, 2012, p. 342). While the IB DP began as private, therefore often deemed as elitist, the IB program has increasingly been incorporated into public or state schools across the world (Hill, 2012). As of 2020, almost

5,000 IB programs were being offered in a variety of schools in over 150 countries throughout the Americas, Africa, Europe, the Middle East, and the Asia-Pacific ("About the IB", 2020).

According to the International Baccalaureate Organization (2020), the IB organization works with universities to ensure students can succeed in entering higher education institutions with college credit, advanced standing, scholarships, and other admissions-related benefits. The program continues to grow due to the strongly supported expectations that IB students are more likely than their peers to attend top postsecondary institutions and persist to their second year at greater rates (International Baccalaureate, 2016).

Program options and components. While the International Baccalaureate Program began as single program model, the IB Diploma Program, it has developed into a full Pre-K-12 model which offers four different levels: the Primary Years Program (PYP), Middle Years Program (MYP), Career-Related Program (CP), and the Diploma Program (DP). At the end of this section, Table 1 provides an overview of the total program model.

Primary Years Program. The PYP begins at the Pre-K level and ends with Grade 5. This program challenges students to take responsibility for their own learning and begin to think about local and global implications in real-life contexts (International Baccalaureate, 2020). The PYP curriculum includes a common curriculum to provide a continuity of learning and prepare students for the level of inquiry and rigor they will experience as they progress through the IB continuum, on to Middle Years Program (MYP) and then either the Career Program (CP) or the Diploma Program (DP).

Middle Years Program. The Middle Years Program (MYP) begins in Grade 6 and continues to Grade 10. This five-year program includes eight core subject area curriculum components: language acquisition; language and literature; individuals and societies; sciences; mathematics; arts; physical and health education; and design. Students are required to take at least 50 hours in each subject group for each year of the program, although in years four and five students may narrow their choice to six of the eight subject groups (International Baccalaureate, 2020). This coursework is not offered as separate classes; rather, teachers are expected to incorporate IB MYP principles (i.e., inquiry-based learning, Approaches to Learning (ATL) Skills, and the IB MYP assessment model) into the standard courses. The IB prefers that all IB MYP programs are offered as full school-wide programs, rather than the "school within a school" design, more typical of the IB DP. All students at the school take coursework that incorporates IB MYP curriculum, whether they are enrolled in honors, AP, or standard level coursework.

The MYP includes several components that are integrated into the core curriculum as well as aspects outside of the classroom. The core curriculum includes the incorporation of inquiry-based learning and ATL Skills in all eight subject areas. Inquiry-based learning is an approach to learning that centers on learners and promotes open communication between the teacher and students. Students are expected to engage in inquiry and are encouraged to ask questions to guide their learning process (International Baccalaureate, 2020). Approaches to Learning Skills focus on the following: communication, social, thinking, research, and self-management. Students are exposed to activities in the classroom that increase their aptitude in these areas and are encouraged to think about how these skills can be integrated into non-academic areas of their lives

(International Baccalaureate, 2020). Activities outside of the classroom include: service as action (community service); community projects in Grade 8; and personal projects in Grade 10 (International Baccalaureate, 2020). Like the PYP, MYP programs are designed to include all populations in a school and promote inclusion and special education needs.

Career Program. The Career Program (CP) begins in Grade 10. Students are able to take coursework in career-related strands as preparation for higher education, apprenticeships, or employment (International Baccalaureate, 2020). According to the IB (2020), the CP "develops students to be: academically strong; skilled in a practical field; critical and ethical thinkers; self-directed; collaborative; resilient and determined; confident and assured; caring and reflective; and inquirers" ("What is the CP?", 2020). The CP is also designed to focus on maturity and responsibility, strong work ethic, and time management skill; each of this is consistent with college and career readiness skills. Students enrolled in the CP must take courses from the IB DP (description to follow) in at least two subject groups; a Personal and Professional Skills course (PPS); complete service learning; complete a reflective project; complete language development (which includes the study of one language besides their primary language); and complete a career strand (schools select the types of career-related studies) (International Baccalaureate, 2020).

Diploma Program. The DP is designed to develop student knowledge both in breadth and depth and includes many rigorous components for students to complete to achieve the diploma. The program components include the study of at least two languages, traditional academic subjects (e.g. English, social studies, sciences, arts, and mathematics), and the expectations that students explore the nature of knowledge. The

program curriculum includes coursework in six subject groups and the DP core. The six subject groups which students must study in both Grades 11 and 12 include: Language and Literature; Language Acquisition; Individuals and Societies; Sciences; Mathematics; and the Arts. Students take a combination of Higher Level (HL) and Standard Level (SL) courses in each of the six subject group courses. The "HL and SL courses differ in scope but are measured according to the same grade descriptors, with students expected to demonstrate a greater body of knowledge, understanding and skills at higher level" ("Curriculum", 2020). Students take three to four (maximum) courses at HL and the remaining two to three at SL. Students take these courses to ensure mastery in academic content areas and preparation as well as to meet local high school coursework requirements.

In addition to academic coursework, students are also expected to complete the DP core elements. These include: Theory of Knowledge (TOK), the Extended Essay (EE), and Creativity, Action, Service (CAS). The TOK is a conceptual class which focuses on critical thinking skills, how we know what we know, and is "an opportunity for students to reflect on the nature of knowledge, to make connections between areas of knowledge and to become aware of their own perspectives and those of the various groups whose knowledge they share" ("International Baccalaureate Diploma Programme subject brief", 2020, p. 1). Students are required to have at least 100 hours of TOK coursework between their junior and senior year.

The Extended Essay (EE) is an extended research essay that is approximately 3500-4000 words and takes several months for the student to research and complete. Students engage in personal research in an area of knowledge (one of the approved DP

subjects). The process is intended to promote "high-level research and writing skills, intellectual discovery, and creativity" ("International Baccalaureate Diploma Programme subject brief", 2020, p. 1). The task is assigned to students as a way to prepare for rigorous research and writing requirements in postsecondary education. It also allows students a chance to work on their critical thinking, presentation, and reflection skills to strengthen their postsecondary skills.

Creativity, Activity, Service (CAS) is a series of activities that includes at least 18 months of experiences that are balanced between the three components. Students engage in CAS experiences and document these through a portfolio with attention to seven learning outcomes: identifying strengths; demonstrating challenges; demonstrating how to initiate and plan; showing commitment and perseverance; demonstrating collaboration; demonstrating engagement with global issues; and considering ethical choices and actions (International Baccalaureate, 2020). Creativity requires students to explore and extend their ideas to create an original or interpretive product or performance (International Baccalaureate, 2020). Activity experiences focus on physical activity that allows students to maintain a healthy and balanced lifestyle. Service focuses on community service and authentic need. Because the DP has a goal of students becoming caring and compassionate, as well as becoming global and open-minded learners, CAS is incorporated to help reach this holistic goal.

Once students have completed all diploma components (i.e., required coursework, TOK, EE, and CAS), they are internally and externally assessed through various exams, portfolios, oral work, fieldwork, laboratory work, investigations, performances, and other processes to determine if they have satisfactorily completed the components of the

diploma and have achieved the full IB Diploma. The assessments contribute to a total score. Each course has assessments that are scored one to seven. The TOK and EE components can earn candidates an additional three points. Students must score at least 24 points to earn the full diploma (International Baccalaureate, 2020). Postsecondary institutions award credits, based on individual institutional policies, for external examinations of individual courses rather than the whole diploma.

Table 1

International Baccalaureate Program Model

IB Program	Required Coursework	Additional Requirements
Middle Years	• Classes in the following: • Language and Literature • Language Acquisition • Individuals and Societies • Design • Arts • Mathematics • Science • Physical Education	• Service Learning (Grades 6-10) • Community Project (Grade 8) • Personal Project (Grade 10) • Assessment: not obligatory for IB MYP schools
Career	• 2 IB classes in any subject • Career Pathway for 3 years (Career Pathways to be determined by the school. For example, a school might offer Energy Technologies, Metal Working, Photography, or other elective pathways) • Complete 50 hours of Language Development	• 50 hours of Service Learning • 50 hours of Language Development • Complete the Reflective Project • Personal and Professional Skills Course • Assessment: A minimum score of at least 3 for their two IB classes
Diploma	• Coursework in each of the 6 subject groups: Studies in Language and Literature, Language Acquisition, Individuals and Societies, Sciences, Mathematics, and the Arts	• Three Core Elements: Theory of Knowledge; Extended Essay; Creativity, Activity, Service Portfolio (CAS) • Assessment: a minimum of 24 points (out of a possible 45) for the 6 subject groups (12 points minimum must be obtained from Higher Level subjects and 9 points minimum must be obtained from their Standard Level subjects. Up to 3 additional points can be obtained through Theory of Knowledge and the Extended Essay).

Research associated with International Baccalaureate. Much of the research associated with the IB program is descriptive in nature, often case studies of how the program has been implemented in various settings (e.g., Hill 2012; Hill, 2018; Hill & Saxton, 2014; Panich, 2001; Saavedra, 2014; Saavedra, Lavore, & Flores-Ivich, 2014). An additional body of research has focused on postsecondary grade point average (GPA) and standardized test scores of IB students. Panich (2001) reported that IB students had higher college GPAs than their non-IB peers. In contrast, Conley and Ward (2009) and Conley et al. (2014) saw no differences in GPA for college freshmen from the two groups; however, all three studies found that college placement scores from standardized tests, specifically for math, were higher. Indeed, Conley et al. (2014) noted that participation in an IB program was a significant indicator in scores used for postsecondary math placement. Suldo, Shaunessy-Dedrick, Ferron, and Dedrick (2018) reported that participation in the IB program can lead to higher college GPAs. Furthermore, when students enrolled in IB courses, there was a higher probability that students would graduate from a 4-year university (Scott, Tolson, & Lee, 2010). Students who participated in an IB program were also better prepared for the academic demands of college and had lower GPA drops in their first year of college (Mathews & Hill, 2005).

At the secondary level, benefits have also been reported. Participation in the IB program has been associated with an increase in secondary GPAs and class ranking of students among their peers (Wehde-Roddiger, Trevino, Anderson, Arrambide, O'Conor, & Onwuegbuzie, 2012). Additionally, students prepare for standardized tests, such as the ACT and SAT, by enrolling in coursework that they perceive as beneficial to their college admissions and coursework that will prepare them for the elements of these

standardized tests. Advanced coursework can provide a foundation and help to increase the likelihood of higher scores on these standardized tests as well as make students more competitive in the college application process. According to Suldo, Shaunessey-Dedrick, et al. (2018), participation in high rigor classes, such as those offered in IB programs, increased the likelihood of higher scores on both the ACT and the SAT. Because both the ACT and SAT have substantial content based on mathematics and English skills, as well as critical thinking skills, highly rigorous coursework prepares students for the higher-level content and thinking skills that are present on these tests. Mathews and Hill (2005) found that students from IB programs averaged higher SAT scores than those who enrolled in AP courses.

Despite the strong outcomes that participation in an IB program can have for students who aspire to postsecondary education, there still remain issues with access and equity in IB programs. According to Perna et al. (2015), while the IB DP has increased its presence in schools throughout the US, the students who participated in the programs were much less diverse than the general population of students. They reported that in the four years prior to releasing their study there was only a slight increase in IB DP participation by Hispanic and low-income students. Additionally, in 2008, about 25% of students who attended schools with an IB DP were eligible for free and reduced lunch, but only 17% of students eligible for free and reduced lunch actually participated in the IB DP. Perna et al. also reported that the IB DP was being offered in schools with diverse student bodies, but was not having much success in enrolling Black, Hispanic, and low-income students into the program. Collins and the Southern Regional Education Board (2009) made the following suggestions for increasing student success in IB programs:

increase access, offer students access to more rigorous courses through free online coursework, supplement AP and IB fees for low-income students, provide professional development funding for IB teachers, and establish incentives for teachers and schools to improve student performance on the IB exams.

Another issue associated with equity is a sense of isolation. When students from underrepresented groups enroll in IB programs, some may feel separated from their non-IB peers; this may result in students dropping the program. DiGiorgio (2010) reported that a student may feel "torn between remaining in an IB program for the academic benefits and stimulation while wanting to interact with his or her friends who are not in the program but still attend the school" (pp. 280-281). Additionally, the lack of diversity and small number of students from underrepresented groups can contribute to the perception that the program is not an open access program.

Musetti, Salas, and Perez (2009) argued that to promote underrepresented student involvement in high rigor programs and help them to connect to schools and their programs, it is important that educators support students' heritage languages and cultures to promote a more fluid and holistic understanding of course material, especially material that becomes more complicated in terms of themes and practical application to the real world. By supporting students' cultural values and encouraging students to bring their own ideas of freedom and choice into their assignments and discussions in the classroom, students feel more supported in their academic endeavors and build connections in the classroom. According to Musetti et al., underrepresented students should be encouraged to utilize their own experiences to promote and synthesize new materials and learn more efficiently. Additionally: "newcomer [new to the country] students need programs that

allow them to learn in and outside of school to become socially and academically integrated" (Musetti et al., 2009, p. 97). One characteristic of IB that can facilitate integration of students from underrepresented groups is that IB requires components and opportunities outside of the classroom to encourage more diverse opportunities for students to learn. For example, CAS experiences allow students to develop personal and interpersonal skills through their experiences and offer underrepresented students the opportunity to engage in opportunities for learning outside of the classroom setting (Musetti et al., 2009).

International Baccalaureate program requirements like CAS can also help students to develop cultural connections and incorporate individual student cultures into their educational experience, which may benefit student participation and feelings of belonging. Barillas-Chon (2010) noted that students who emigrated from Mexico had a difficult time "navigating new social, political, linguistic, and cultural settings" (p. 308). However, Barillas-Chon reported that by addressing these challenges through encouraging heritage and cultural exploration, the students may benefit from a greater understanding of the importance of individual cultures within the conversation of these themes.

Rong and Preissle (2009) addressed the importance of heritage language and culture support. They stated that maintaining cultural values helps to combat the focus of *Americanization* that has been such a recent trend in immigration debates. To be more supportive of underrepresented groups, "schools need to reconsider their choices of curricula placement, and school organization in order to educate and promote positive inter-cultural interactions, instead of promoting cultural isolation" (Brittain, 2009, p.

111). The IB program requirements like CAS and the Extended Essay allow students to bring their own interests and backgrounds into their educational program, which can help them to become connected to their heritage language and culture and provide them with further support during the rigorous elements of the program. Students also build more connections when their own culture and language are supported by teachers and schools, and therefore build more connections and academic engagement with their secondary schools.

Nevertheless, English Language Learners (ELL) tend to participate in the IB DP at lower levels than their English language proficient peers. Hertberg-Davis and Callahan (2008) interviewed 200 students enrolled in 23 US high schools about their perceptions of the benefits of high-level coursework. Overall, the ELL students perceived that high rigor courses provided higher academic challenge and included more favorable learning environments than standard high school courses, as well as improved college acceptance. One student stated that IB "looks good on your college applications and stuff. This is what gets you into college" (Hertberg-Davis & Callahan, 2008, p. 207). Another student from the study noted that "nowadays you need to take these classes if you want to be competitive and you want to get into colleges that you want to get into" (Hertberg-Davis & Callahan, 2008, p. 207). However, students from the Hertberg-Davis and Callahan study also noted that the classes were not the best fit for learners that come from traditionally underserved populations, such as ELL students, students from economically disadvantaged communities, and gifted underachievers. They reported that the curriculum and instruction were too rigid and teachers did not adjust the content to meet the unique needs of students.

According to Saavedra (2014), little research has been conducted related to the impact gender plays in IB enrollment or completion. Most research regarding gender and equity consists of male and female students in STEM fields. Bergeron and Gordon (2017) studied male and female enrollment in IB STEM courses and noted that females tended to enroll much less frequently but that they performed equally with their male counterparts. According to Bergeron and Gordon, male students were more likely to take Higher Level (HL) STEM courses for the IB DP than their female peers. Most female students preferred Standard Level (SL) courses as opposed to HL courses. While there were significantly higher numbers of males enrolled in the HL STEM courses, the findings did not show that males outperformed females. Instead, despite the fact that females were less likely to enroll in the HL STEM courses, the female students did as well as their male peers.

The IB DP is not without its critics. There have been concerns that the IB DP places too much pressure on students and has requirements that are too cumbersome and instill a focus on breadth instead of depth (Taylor & Porath, 2006). Culross and Tarver (2007) reported another drawback of the IB program has been reported to be the workload and stressful course requirements placed on the students. Culross and Tarver also recommended that parents assess the suitability of the IB program for their gifted students as the requirements can be stressful for students. The program was also reported by Culross and Tarver to interfere with students' social lives and require too much work for the students. Hertberg-Davis and Callahan (2008) reported that the program is not a good fit for all learners due to the inequity of representation. As such, they suggested that

the program needed to increase participation for underserved populations in order to diversify and increase the benefits of the programs school-wide.

Indicators of Academic Success

Several factors have been associated with general academic success. Knowledge of specific academic measures is critical. Student success has also been linked to enrichment activities that contribute to a sense of belonging at school and developing a sense of personal growth and success. Demographic characteristics have also been associated with academic success. Each is described below.

Academic Indicators of Success

The academic quality of high school curriculum is highly correlated to success in postsecondary education; students who are best prepared in high school perform better academically in college, regardless of factors like race/ethnicity, gender, or socioeconomic status (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006). Students who are exposed to rigorous high school curricula, including four years of English, three years of world languages, three years of social studies, four years of mathematics (including precalculus or higher), three years of science (including biology, chemistry, and physics), and take at least one AP course or test are at a greater advantage for college persistence and achievement (National Center for Education Statistics, 2012). Many secondary schools and postsecondary institutions use academic measures to predict a students' successful graduation from high school, enrollment in postsecondary education, and ultimate success in college. The academic predictors often used by schools include grade point average (GPA), credit attainment in Grades 9 and 10, course patterns in high school

(e.g., honors, AP, IB, and dual credit options), and standardized test scores (e.g., SAT and ACT).

Grade point average (GPA). Grade point averages are calculated from grades earned on a quarter or semester basis. The calculation is based on a scale from zero to four points and is the average of grades earned in all classes for that academic period. Some schools calculate a weighted GPA by offering up to an additional one point (meaning the scale becomes zero to five points) for students enrolled in honors, AP, or IB courses. Cumulative GPA is an average of the students' GPA over their entire time in high school and includes all completed semesters or quarters.

While research has shown various results regarding high school GPA on postsecondary performance in a students' first year, middle school GPA can be a predictor of high school GPA and help predict GPA growth (Grigorenko et al., 2009); cumulative GPA can prove to be a significant predictor of success in high school coursework. Using a weighted GPA may act as an incentive for students to enroll in more rigorous coursework. Because of the tendency for college admissions offices to consider GPA and class ranking as admissions criteria, students may earn higher GPAs when they are enrolled in advanced coursework (Lang, 2007). Therefore, GPA remains a good incentive for students who wish to be more competitive on their postsecondary applications for admission and scholarship applications.

Although GPA is used by college admissions staff as a predictor for postsecondary success, studies that have measured the impact of GPA on postsecondary performance in the first year have had mixed results. Nobel and Sawyer (2004) found that high school GPAs was not a significant predictor for the academic performance in the

first year of college. Conversely, Belfield and Crosta (2012) found that a student's high school GPA was a good and consistent predictor of college performance and could be used to explain college outcomes. In a meta-analysis of the predictive validities of ACT scores, high school grades, and SES, Westrick, Le, Robbins, Radunzel, and Schmidt (2015) reported that GPA may be a significant predictor for academic performance, but that GPAs alone do not tell the whole story. Because high school grading standards, curriculum, and content standards vary across the country, GPA should be considered along with other measures of academic predictors, such as standardized tests or coursework and associated assessments.

Credit attainment. To graduate from high school, students must attain the required number of credits. While requirements vary by states, most students in the US must obtain credits in core academic areas and elective areas. Core academic areas include English, mathematics, social studies, science, and physical education. Electives could include the arts, foreign languages, or other courses (Education Commission of the States, 2014).

Credit attainment/accrual, often described as a student being *on track* to graduate high school, is an important factor in graduation rates. The number of credits attained in freshmen and sophomore years is particularly important as a potential predictor for on-time high school graduation (i.e., in four years) (Norbury et al., 2012). Students who graduate on time earn more credits each year than students who ultimately drop out of high school (Hampden-Thompson, Kienzl, Daniel, Kinukawa, & National Center for Education Statistics, 2007). Kemple, Segeritz, and Stephenson (2013) demonstrated that

credit attainment at the end of Grade 9 was a reliable predictor for high school graduation.

The commonly used definition for on-time graduation is a four-year experience that results in at least a regular high school diploma (Stetser & Stillwell, 2014). The average national four-year graduation rate for high school students in the year 2010-11 was approximately 79% (Stetser & Stillwell, 2014). Various subpopulations, such as American Indian/Alaska Native, African American, and Hispanic/Latino, graduated at rates of 65%, 67%, and 71% respectively (Stetser & Stillwell, 2014). European Americans and Asian/Pacific Islanders, on the other hand, were higher at 86% and 88% respectively. Females also yielded a higher average than male students, at 84% versus 77% for males (Stetser & Stillwell, 2014).

Because national graduation rates reflect that around 21% of students either drop out or do not graduate at all, Allensworth and Easton (2005) recommended using the following identifiers of on track high school graduation: accumulation of the correct number of course credits to move from Grade 9 to 10 with one semester or less of failures in core credits (i.e., English, math, science, or social studies). Using these indicators to track graduation, the Consortium on Chicago Schools Research (CCSR) found that 81% of students that were considered on track were able to graduate within four years, compared to just 22% of the students who were not on track for graduation (Allensworth & Easton, 2005). A further study using the same indicators examined the percentage of on track students in five Texas school districts and found that they graduated at much higher rates within four years than their off-track counterparts (Hartman, Wilkins, Gregory, Gould, & D'Souza, 2011). The National Center for Education Evaluation and

Regional Assistance (Dynarski et al., 2008) released a guide to dropout prevention that listed low academic performance, absenteeism, and grade retention as three greatest predictors for dropping out.

Course patterns and enrollment (honors and advanced placement). Research has shown that students who took rigorous high school coursework were more likely to go to college and persist in college (Buddin, Croft, & ACT, 2014). Additionally, according to Kuh et al. (2006) and Walters, DeSalvo, Shaver, and the Minnesota Office of Higher Education (2017), completing higher level mathematics courses in high school (e.g., algebra II, precalculus, trigonometry, and calculus) was the single best predictor of academic performance in college. Students who enrolled in high rigor coursework, such as honors, AP, and IB were more likely to enroll in college and be better prepared for the academic demands of college (Buckley, Muraskin, & Pell Institute for the Study of Opportunity in Higher Education, 2009).

Walters et al. (2017) also noted that course patterns and enrollment had a significant impact on postsecondary readiness. For both high school and middle school levels, course rigor was shown to correlate with postsecondary readiness. Additionally, the Indiana Commission for Higher Education (2018) found that 93% of students who graduated high school with an honors diploma, which requires advanced coursework and additional course requirements as determined by districts and states, enrolled in college within a year, compared to just 55% of students with an advanced diploma and 20% with a general diploma. Advanced diplomas and honors diplomas both require advanced coursework and additional course requirements, but these requirements vary by districts and states and typically have different requirements. Of the students who graduated with

an honors diploma and enrolled in college, only 3% needed remediation compared to 20% of students with an advanced diploma and 48% of students with a general diploma.

Research has also supported that participation in college level courses in high school has a meaningful impact on college enrollment and completion (Taylor, 2015). For students enrolled in dual credit options, there was a 34% higher likelihood of enrollment in college and a 22% higher likelihood in completion of college when compared to non-dual credit students (Taylor, 2015). Additional research revealed that students who participated in dual credit were more well-prepared to transition into college and be successful when compared with other students who did not participate in dual credit options (Taylor, 2015). An and Taylor (2015) argued that students enrolled in dual enrollment or ACC options typically displayed higher levels of college readiness when compared with students who did not earn college credit prior to entering college.

Standardized test scores. Standardized tests (e.g., ACT, SAT), which are scored on a standardized scale and draw from a bank of questions, are commonly associated with college admissions. According to *The Princeton Review* (2018), the SAT's purpose is to "measure a high school students' readiness for college, and provide colleges with one common data point that can be used to compare all applicants ("What is the SAT?"). While colleges take into account other predictors of student success, such as GPA and extracurricular activities, standardized tests have been considered the *gold standard* for admissions at many postsecondary institutions (Wiley, Shavelson, & Kurpius, 2014). Postsecondary institutions utilize standardized tests for admissions due to the perception that they help determine a students' college readiness (Bowers & Foley, 2018) and many

colleges use scores on these tests to help place students in the appropriate college level mathematics or English courses, or if appropriate, remedial courses.

Some studies have shown that standardized test scores, such as the SAT and ACT, are highly correlated to a student's GPA and both their standardized test score and their GPA predict future academic performance, success, and persistence in postsecondary endeavors (Nobel & Sawyer, 2004; Westrick et al., 2015). Overall, standardized tests such as the SAT and ACT are still perceived by educators, colleges, and students alike as tests that determine college readiness and predict academic performance (Howard, Moret, Faulconer, Cannon, & Tomlin, 2018).

Enrichment Activities and Academic Achievement

Non-academic and non-school factors can also be key predictors in educational achievement (National Center for Education Statistics, 2006). Students who are engaged in learning that is enriched by other activities, such as fine arts, can benefit through the development of critical thinking, problem solving, communication, and collaboration (Arts Education Partnership, 2016). Links have also been found among enriched educational programming, attendance rates, and academic performance in the core content areas of reading, math, and science in early education (Sharp & Tiegs, 2018). Hodges, McIntosh, and Gentry (2017) found that students who participated in enrichment interventions made substantial academic gains in math and English on state achievement tests. Various enrichment activities, including those that occur in and out of school, can contribute to academic success by exposing students to interesting material, increasing self-concept, and increasing college readiness (Hodges et al., 2017).

Dynarski et al. (2008) noted several factors related to the prevention of drop-out, including providing academic supports and enrichment programs. Enrichment programs can be offered through course content or additional coursework as well as through homework assistance and tutoring. The research has further supported forming a more positive school culture and creating more engagement and connection with students. Academic, social, and behavioral encouragement are pivotal in creating a more engaging environment, which can be associated with great student achievement and higher attendance rates (Dynarski et al., 2008). To add to student engagement, Dynarski et al. (2008) recommended providing "rigorous and relevant instruction to better engage students in learning and provide the skills needed to graduate and to serve them after they leave school" (p. 34).

Attendance at a middle school with International Baccalaureate Middle Years Program. The IB MYP is different from the IB DP in that it does not offer college credit, but rather works as a preparatory program to help students prepare for the rigors of the IB DP and become accustomed to an inquiry-based learning model. The IB MYP is offered at many high schools that offer the Diploma Program (DP) as a way for students to prepare for the DP (International Baccalaureate, 2020). Exposure to the IB MYP in Grades 6 through 10 creates a continuum through the programs and can help students through a focus on holistic education, interdisciplinary learning, and transitions between IB programs (Harrison, Albright, & Manlove, 2015). Schools typically choose to adopt the MYP to prepare students for the IB DP because of the argument that the MYP builds a strong pedagogical foundation, and for the opportunity to unify middle and high school curricula (Reimers et al., 2004). Reimers et al. also found a positive correlation between

students who participated in the IB MYP and Extended Essay results compared to students who were not exposed to the IB MYP before their enrollment in the IB DP; however, they were unable to find any other significant correlations in actual DP examinations between the two student groups.

Gifted and talented education participation. Gifted and Talented Education (GATE) programs are designed to offer enhanced curriculum for gifted students (National Association for Gifted Children (NAGC), 2020). According to the NAGC (2020), gifted students are defined as students who give evidence of "high achievement capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who need services and activities not ordinarily provided by the school in order to fully develop those capabilities" (Frequently Asked Questions). Students in GATE programs receive special services and are considered part of special education. Services might include accommodations in the regular classroom, part-time assignment to both regular and special classrooms, full-time grouping with students of similar abilities, and/or acceleration or grade advancement (NAGC, 2020). Each state is able to use their own definition of a gifted student in order to qualify students for gifted and talented education services. In the western state where this study was conducted, students are typically identified in Grades 2 through 6 ("Fast Facts", 2020). While different districts maintain their own requirements for acceptance into the GATE program, students are referred through the use of various GT assessments. Typically students scoring above the 98 percentile on cognitive abilities are identified as gifted and are recommended for placement or further testing to determine what GATE programming they will be enrolled in ("Fast Facts", 2020).

Gifted programming has been reported to have positive influences on students' futures. Gifted students reported that they pursued doctoral degrees at higher rates than their non-gifted peers (Lubinski, Webb, Morelock, & Benbow, 2001). In follow-up interviews with students, 63% reported holding advanced terminal degrees (Kell, Lubinski, & Benbow, 2013). Herbert-Davis and Callahan (2013) also explained that gifted students need challenging, specifically-designed gifted programming in order to meet their needs as general education teachers' training may not be adequate to properly engage gifted students. In another study by Loveless, Farkas, and Duffett (2008), more than 7 out of 10 teachers of gifted students noted that many of their brightest students were not challenged or given a chance to "thrive" in general education settings.

Academic enrichment programs. Academic enrichment programs typically offer a range of high-quality activities that support student learning and development (Blazer & Miami-Dade County Public Schools, 2016). Enrichment activities can include: academic lessons or content (homework help and/or tutoring); activities such as visual and performing arts, music, cooking, gardening, health and nutrition, cultural activities, or technology; and recreational activities like sports, dance, drill team, and outdoor games (Blazer & Miami-Dade County Public Schools, 2016). For an enrichment program to be considered high quality and helpful for students, it should engage in the following practices: clearly communicate program goals; meet local needs; complement school-day learning; communicate with school-day instructional staff; provide a combination of academic, enrichment, and recreational activities; provide homework support; offer tutoring sessions; include hands-on activities; link activities to students' lives; integrate technology into activities; promote collaboration among students; provide students with

individualized attention; create a flexible environment; create a supportive setting; hire and retain quality staff; and involve families and community partners (Blazer & Miami-Dade County Public Schools, 2016). For many secondary schools, enrichment activities come in the form of clubs or activities that students can participate in after school or as curricular options.

Conversely, research has also shown that low student engagement is an academic risk factor (Suldo, O'Brennan, et al., 2018). If students are in limited extracurricular activities, it could indicate that they are minimally engaged in the school, and therefore could be considered at-risk academically. To fully engage students, Northey et al. (2018) demonstrated that collaborative activities, in and out of the classroom, helped students more fully engage. Students who participated in collaboration in a school setting were more likely to engage, and therefore achieve academically. Additionally, students who participated in school-based extracurricular activities were likely to develop more feelings of belonging and more connections to their school, which often resulted in improved academics (Marchetti, Wilson, & Dunham, 2016). Extracurricular activities, then, serve as a function to connect students to the school, which in turn can improve academic performance. Extracurricular activities that require academic performance as a condition of continued participation (such as minimum grades or GPA) can also serve as a motivating factor for students in keeping their academic performance levels higher.

Participation in school-based athletics. Participation in school-based athletics and extracurricular activities is a fairly commonplace occurrence in American high schools. While extracurricular activities and school athletics can refocus student energies and time on non-academic pursuits, these types of extracurricular activities can have

strong benefits for students. Encouraging students to explore activity through their learning in and out of school is intended to help students perform physical activities and engage in a healthy lifestyle (International Baccalaureate, 2020).

According to Darling, Caldwell, and Smith (2005), participation in school-based athletics resulted in higher academic performance, aspirations, and attitudes towards school. Marchetti et al. (2016) found that students "often achieve academically simply to remain eligible for extracurricular activities" (p. 14). Marchetti et al. also found that coaches and mentors influenced students through encouragement, which can also increase academic performance. Interpersonal relationships, such as those between coaches or teachers and their students, can help to motivate students and bolster achievement. Motivation and engagement can be positively related to academic achievement levels (Martin & Dowson, 2009).

Demographic Variables and Academic Achievement

Postsecondary education in the US has long been considered an opportunity that is open to all who wish to pursue it. However, despite this alleged equality of opportunity, many students still face disadvantages due to race/ethnicity and gender.

Race/ethnicity. College enrollment and persistence rates of African American, Latino, and Native American students are still much lower than European American and Asian American students (Kuh et al., 2006). Furthermore, while there is a desire to increase the opportunity for students from diverse backgrounds and linguistic abilities to be part of rigorous secondary programs, Perna et al., (2015) argued that access to rigorous coursework in preparation for postsecondary studies has been problematic for Black and Hispanic students. To close the gaps and allow for more equity and

opportunity and improve the academic readiness for postsecondary education, school districts can offer more rigorous coursework and recruit students from diverse backgrounds; however, efforts must be available to students at the schools they attend, students must be recruited and participate, and the programs must be structured to promote college readiness skills (Perna et al., 2015).

Colgren and Sappington (2015) stated that achievement gaps between Black and Latino students and their Caucasian peers are still prevalent, despite disproportionate (with Caucasian peers being represented in higher numbers) but growing numbers in high rigor programs. Their study, which focused on achievement using AP versus standard level coursework in English, mathematics, science, and reading courses, found that lower achieving students from underrepresented groups were not given equitable opportunities to participate in highly rigorous AP coursework. Their study also examined the ACT scores of students from various racial groups and found that those who had enrolled in AP English courses achieved higher scores on the ACT. However, the scores within each racial group had larger ranges for students from underrepresented groups. In other words, students who were Black and Latino scored much lower when exposed to standard level coursework than their Black and Latino peers who had taken AP courses. The range between their Caucasian peers in standard versus AP courses was much smaller. Colgren and Sappington concluded that equality of opportunity may be a factor in lower academic achievement and less college preparation for Black and Latino students.

Some student groups, particularly African-American males, have been disproportionately placed in special education programs and included at lower rates in GATE classes (Kenyatta, 2012). Teachers have also tended to have lower expectations of

African-American male students, and therefore they have been given less access to "rigorous educational materials" (Kenyatta, 2012, p. 840), which may result in lower test scores and success. If specific groups of students are disproportionately placed in special education, passed up for high rigor programs and coursework, and are given less access to materials, the achievement gap will continue to grow and these students will continue to be underrepresented in programs like AP and IB. This can lead to Black, Hispanic, and low-income students having inadequate academic preparation, which is a "primary force limiting college access and success" (Perna et al., 2015, p. 403).

According to Perna et al. (2015), the lack of advanced coursework and access to high rigor content can also impact students at the postsecondary level. Culpepper and Davenport (2009) found that race/ethnicity played a role in GPA predictions for success in higher education. They found that African-Americans were more likely to score lower GPAs in their first year in college than their European American counterparts when compared to their high school GPA.

Access continues to be an issue for students from underrepresented groups with regards to opportunities to enroll in more challenging and academically rigorous coursework. According to Cisneros, Holloway-Libell, Gomez, Corley, and Powers (2014), few students of color have access to AP courses due to their school lacking AP options or due to a limited number of AP courses offered. According to Cisneros et al., schools that have a high number of underrepresented or low-income students are disadvantaged because course offerings are less diverse in relation to advanced coursework. Furthermore, Cisneros et al. contended that the college persistence rates of low-income and low-achieving students who enrolled in AP classes were similar to their

high-income and high-achieving peers, indicating that simply enrolling and being exposed to rigorous coursework can benefit postsecondary attainment and achievement levels for students.

Gender. Issues of gender inequity in education have been problematic for years. Socially constructed gender norms have perpetuated achievement assumptions about both girls and boys (Stoet & Geary, 2013). While recent research has shown that girls and women are closing the gap in STEM fields, the stereotype that boys are smarter or better prepared for advanced or rigorous coursework still persists. Saavedra (2014) found that girls were twice as likely as boys to enroll in the IB DP; however, results also showed that male graduation rates were 9.5% higher and their enrollment in college was 5.9% greater than girls. Regardless of these outcomes, the boys' scores on the Iowa Test of Basic Skills (ITBS) mathematics tests in the district were only three percentiles higher and there was no significant difference in the ITBS reading test for girls (Saavedra, 2014). These results indicate that while girls may be more likely to enroll in IB than boys, they may not complete or matriculate to higher education as often as boys, despite similar skills and standardized test scores.

Gender, which is primarily constructed from society rather than biology (referring to sex), is heavily influenced by cultural values, norms, and the social surrounding of students. Gender norms that dictate educational attainment abilities, such as the stereotype that boys are better at math and science, while girls tend to have higher achievement levels in the humanities and arts (Stoet & Geary, 2013) perpetuate the issues of gender inequality in education. Women are adversely affected despite the fact that many cultures have tried to combat this stereotype in education since the 1980s (Stoet &

Geary, 2013). Because it is assumed in many areas still that women are not as good at math and science, STEM disciplines are still primarily filled with male students and workers. Women, on the other hand, tend to follow the traditional gendered jobs of working with children, becoming teachers, and working within the realm of socially acceptable female jobs, such as nurses and administrative support staff. Girls may face social pressure to avoid the STEM discipline. Even with the recent efforts to include more women in these disciplines, there is still a social stigma, as well as the discomfort for many girls who are alone in their pursuit in STEM fields. Without peers to share their experiences, many girls may feel distanced or unwelcome, which makes their educational experience less than enjoyable (Stoet & Geary, 2013).

Because the US is a country that encourages diversity and immigration, students who come from countries where gendered stereotypes are still prevalent may suffer from the inability to escape these stereotypes, even if they move to a country that has more equity of education. Ajala and Alonge (2013) stated that the best way to combat these gender disparities is to "consider region specific problems" (p. 648) and combat this issue by dealing with the specific cultural traditions and challenges that may affect women's access to education. For example, in many of these countries women still adhere to very traditional roles that tend to be in the domestic realm. In this sense, gender gaps are closely related to traditional gender roles, which support gendered stereotypes.

Gender and race can intersect and result in test bias at the K-12 level. While males tend to receive more resources (in terms of time, access to materials, etc.) from their teachers in order to promote more success in the classroom, African-American males tend to receive less (Kenyatta, 2012). In this way, both females (from any racial/ethnic

group) and African-American males tend to have the most disadvantage when subjected to test assessments at the K-12 level.

Gender bias exists as well in standardized tests like the ACT and PSAT. Instruments such as these are used as predictions for college readiness, but tend to under-predict the abilities of girls when compared to boys (Nankervis, 2013). The PSAT trends have historically been that males and females perform equally well on the reading section of the test but males outperform females on the mathematics portion (Nankervis, 2013). As assessments play a large role in placement of students in academically advanced coursework and ultimately in the admissions process of postsecondary institutions, gender bias, or being a member of an underrepresented group can unfairly disadvantage certain students and result in lower college readiness skills, less competitive GPAs or coursework, and ultimately less postsecondary enrollment.

While much research focuses on standardized admission tests, Fischer, Schult, and Hell (2013) also noted *stereotype threat*, which is the idea that "women are under additional pressure that interferes with their test performance because men are expected to outperform them on tests" (p. 484). Males tend to perform better on forced-choice or multiple-choice formats while females perform equally or better on free-response formats (Fischer et al., 2013, p. 484). Therefore, assessments that do not offer a variety of formats may give unfair advantage to either male or female students.

Gendered stereotypes are beginning to be more widely acknowledged and research has been conducted to address concerns amongst gendered stereotypes in education (Lindberg, Shibley Hyde, & Petersen, 2010). However, traditional stereotypes about females in STEM fields, including mathematics, still pervade. Zhou, Fan, Wei, and

Tai (2017) analyzed Program for International Student Achievement (PISA) data from ten different countries/regions with particular attention to mathematics and the gender gap. While there has been more attention to gender gap issues and a larger push overall for women to enter and engage in the STEM fields, their research showed a persistent advantage to male students among the top performers in mathematics, despite contrary research that indicated males and females may perform similarly (Lindberg et al., 2010).

In addition, once in a STEM field of study, females tend to leave the STEM field at higher rates, which results in females being insufficiently represented in the STEM workforce later in life (Smith, Jagesic, Wyatt, Ewing, & College Board, 2018). While women make up almost half of the workforce, they are still represented at less than 24% of the STEM workforce (Smith et al., 2018).

Despite gendered stereotypes and existing disproportion in secondary STEM programs, college enrollment has increased for females due to many factors. Achievement test score averages and enrollment in math and science courses in high school have increased for females, resulting in higher preparation for postsecondary education (Kuh et al., 2006). Changing social expectations for women in both marriage and the workplace have also contributed to the greater numbers of women attending college (Kuh et al., 2006). Despite this, females continue to encounter obstacles to academic goals. These obstacles are typically related to curriculum and instruction in the classroom and include: stereotypical gender roles within science classrooms; being less likely to speak up or called upon in class; and facing lower expectations from their teachers (Vanderbrook, 2006). These existing obstacles must continue to be studied and addressed in order to assess gender equality and equity in education.

Summary

Postsecondary education requires advanced secondary preparation in order for students to be college ready. Advanced secondary coursework, such as enrollment in IB, AP, or dual credit options can help students by: providing accelerated pathways to postsecondary credentials (dual credit options), preparing them for the higher expectations and rigor of college courses, and increasing their persistence and credential attainment (ACT, 2015; Kilgore & Wagner, 2017; National Center for Education Statistics, 2013; Pierson et al., 2017; US Department of Education, 2016). Examination of academic predictors of success, such as GPA, credit attainment/accrual, coursework patterns, standardized test scores, and enrichment activities, as well as student demographics, can help researchers to understand how high rigor Accelerated College Credit options (AP, IB, Dual Enrollment, and Dual Credit) can help students prepare for and successfully complete postsecondary education.

CHAPTER THREE

Methodology

The purpose of this study was to explore the academic and non-academic variables that may predict success in completing the International Baccalaureate Diploma Program (IB DP) for students who attended two high schools in a western state. At the time of the study, the IB programs at these two high schools had an open enrollment model. Quantitative research methods guided the analysis of this study. Univariate and multivariate statistical techniques were used and included descriptive statistics and binomial logistic regression. The organization of this chapter is as follows: research question, research design, study group, variables, data collection, data analysis, and a summary.

Research Question

The research question for this quantitative approach was:

Of the students who were designated as IB students at the beginning of Grade 11, what factors predicted successful completion of the International Baccalaureate Diploma Program?

The predictive variables considered for the research were:

1. Academic indicators: cumulative weighted grade point average (GPA) at the end of Grade 10; credit attainment at the end of Grade 10; credits earned in honors or Advanced Placement (AP) coursework at the end of Grade 10; and ACT scores;
2. Enrichment activities: enrollment in a middle school with IB Middle Years Program (MYP); Gifted and Talented Education (GATE) enrollment; and

participation in school-based athletics while IB DP students were in Grade 11 or 12;

3. Demographics: race/ethnicity and gender.

Research Design

A quantitative study was undertaken to explore the predictors of the successful completion of the IB DP in two high schools in a western state.

Descriptive statistics were used to describe the data set (Sprinthall, 1997). This allowed for an overall understanding of the data and how they might contribute to the research question. Additionally, descriptive statistics were used to obtain comparative information between groups in this study (Loether & McTavish, 1974).

For this study, binomial logistic regression was used to predict the probability that students would fall into one of two groups: IB DP completers and IB DP non-completers. Mertler and Vannatta Reinhart (2017) proposed that regression allows the researcher to describe and assess predictable relationships among the set of variables. Using binomial logistic regression allows for the examination of multiple independent variables (IVs) that best predict membership into a particular categorical dependent variable (DV) group, in this study, IB DP completers and IB DP non-completers.

In this study, the DV was not a continuous nor quantitative variable. Instead, the DV was a dichotomous, categorical variable. A binary logistic regression was the best fit for this analysis because it sought to identify a combination of IVs that may predict membership in a particular group (Mertler & Vannatta Reinhart, 2017). Because the DV was a categorical variable, binary logistic regression allowed for a prediction of group

membership, such as completion or non-completion of an academic program (Field, 2013; Mertler & Vannatta Reinhart, 2017).

Study Group

For this study, existing data from a study group of convenience from two urban school districts in the western state were used. The two schools offered the IB DP program for students in Grades 11 and 12 through open enrollment, meaning that students from throughout the school district could apply and be accepted to the program, as opposed to other programs that only offered the program to students zoned for the school. The study group included students who were enrolled in IB DP at the beginning of Grade 11 in the academic years 2015-2016, 2016-2017, and 2017-2018 and were scheduled to graduate in either 2017, 2018, or 2019. Students who completed all components of the IB DP by the end of Grade 12 and earned the required points on exams to achieve the diploma were identified as belonging to the completer group. Students who dropped from the IB DP after initially enrolling at the beginning of Grade 11 or students who did not earn the required points to obtain the diploma were identified as the non-completer group.

At the time of the study, the most recent educational data for the state where this study was conducted indicated a total student enrollment of 485,786 and a graduation rate of 80.56% (Nevada Report Card, 2018). According to the report card (Nevada Report Card, 2018), the state race/ethnicity profile was as follows: American Indian/Alaskan Native population, 0.88%; Asian, 5.49%; Hispanic/Latino, 42.21%; Black, 11.09%; Caucasian, 32.47%; Pacific Islander, 1.41%; and two or more races, 6.24%. Statewide, males made up 51.56% of the student population and females accounted for the other 48.44%.

At the time of the study, one of the urban school districts in the state offered all four IB programs: IB Primary Years Program (PYP); IB Middle Years Program (MYP); IB Career Program (CP); and IB DP. Three elementary schools offered the PYP, three middle schools offered the MYP, three high schools offered the MYP, one high school offered the CP, and five high schools offered the DP. For this study, data from the open enrollment high school which offered the IB DP and IB MYP were used. According to International Baccalaureate (2020), the school from which data were collected has been an IB school since 1979. The school had a total enrollment of 2,867 students with a graduation rate of 83.33% (Nevada Report Card, 2018). According to the report card (Nevada Report Card, 2018), the school's profile was as follows: American Indian/Alaskan Native population, 0.00%; Asian, 5.62%; Hispanic/Latino, 69.45%; Black, 12.80%; Caucasian, 7.95%; Pacific Islander, 0.00%; and two or more races, 3.17%. Males accounted for 50.54% of the student population while females accounted for the other 49.46%.

The other urban school district had two schools that offered IB programs, a middle school that offered IB MYP as a feeder school for the high school from which data were collected and the high school. The high school had an IB MYP (for Grades 9 and 10) as well as the DP and CP. Like the IB DP program in the other urban school district, the IB DP in this high school was also considered to be open enrollment. According to International Baccalaureate (2020), the high school had been an IB school since 1997. At the time of the study, the school had an enrollment of 1,666 students (Nevada Report Card, 2018). The graduation rate was 84.49%. According to the report card (Nevada Report Card, 2018), the race/ethnicity profile was as follows: American

Indian/Alaskan Native population, 1.20%; Asian, 6.84%; Hispanic/Latino, 62.42%; Black, 2.46%; Caucasian, 22.03%; Asian/Pacific Islander, 1.20%; and two or more races, 3.84%. Males accounted for 50.96% of the student population at the second high school while females accounted for 49.04%.

The data for this study were derived from a total of 205 students from one school and 216 students from the other high school; all students in the dataset were enrolled in the IB DP at the beginning of Grade 11 in the academic years of 2015-2016, 2016-2017, or 2017-2018. The total number of students in the study group was 421. Of the 205 students who were enrolled as IB DP students at the first school, 77 completed the program and 128 students were considered non-completers. Of the 216 students who were enrolled as IB DP students at the other school, 95 completed the program and 121 students were considered non-completers. Therefore, the dependent variable category of completers consisted of data from 172 students. The non-completers category consisted of data from 249 students.

The recommended ratio between the study group size (n) and the number of predictors (k) is approximately 15 participants for every predictor (Mertler & Vannatta Reinhart, 2017). By meeting this ratio, cross-validation with relatively little loss in the ability of the regression analysis to predict is achieved. Tabachnick and Fidell (2013) used the equation of $n \geq 50 + 8k$ for testing multiple correlations. Using both of these recommendations, the study group size for this study was appropriate to conduct a logistic regression. With $k = 9$ and $n = 399$ (after data cleaning), then $n\ (399) \geq 15(9)$ (or 135). Thus, the ratio was met. Similarly, Merler and Vannatta Reinhart (2017) recommended using both conditions and taking the larger n for the study. Thus,

$n(399) \geq 50 + 8(9)$ (or 122) and Tabachnick and Fidell's (2013) equation for the study group size were also met by the study group size.

Variables

The school districts maintain databases with the variables needed for the analyses associated with this study. The variables were selected after a careful review of related literature. Three types of variables were analyzed: academic indicators, enrichment activities, and demographic indicators. The codebook used for this study is found in Appendix A.

Academic Indicators

Academic indicators are considered predictors of how a student will perform in college. These variables are all independent, continuous variables. The following indicators were analyzed for the purposes of this study.

1. Grade Point Average (*GPA10th):* student's weighted cumulative GPA on a 4.0 scale at the end of Grade 10. Students who completed an honors course received a 0.025 weighted increase per course and students who took advanced courses (i.e., AP or IB) received a 0.05 weight increase per course. Students who take dual credits at one of the community colleges in both districts, also receive a 0.05 weight increase per course. Both schools were on a semester system, which means that over the two years a student is in Grades 9 and 10, they have the opportunity for increasing their weighted GPA four times (two semesters per year). An average IB DP at these schools would typically take 3-4 AP courses a year and 3-4 honors courses a year. For a student who took 7 AP courses each semester and

achieved all As, over the course of two years a student could potentially earn up to a 5.4 GPA.

2. Credit attained (*CreditAttained)*: number of credits the student obtained by the end of Grade 10. To be considered on track to graduation typically a student has obtained 10-12 credits.
3. Course Patterns (*APHONCr)*: number of honors and/or AP credits a student successfully completed in Grades 9 and 10. Successful completion was defined as the student achieving a passing grade and obtaining the AP or honors credit for the course. If the student had no courses, the value was zero.
4. ACT composite scores in Grade 11. Students were allowed to take the ACT multiple times: for the purpose of this study, scores from the first attempt were used. The range of the ACT is 1-36. The ACT is a graduation requirement in the western state and is therefore a part of the student record system.

Enrichment Activities

Non-academic factors are often considered key predictors in educational achievement (National Center for Education Statistics, 2006). Students who participate in enrichment activities are often more engaged in school and have better academic outcomes (Arts Education Partnership, 2016). The variables used in this study were all independent, categorical variables. The following variables were analyzed.

1. Attendance in Grade 8 at a middle school where the IB MYP curriculum was offered (*MS Attended)*. 0 = yes and 1 = no.
2. Gifted and Talented Education enrollment (*GATE)*. This variable was coded as "0" or "1" with "0" indicating that a student was enrolled in GATE at the

completion of Grade 8 and "1" as the student was not enrolled in GATE at the completion of Grade 8.

3. Participation in at least one school-based athletic activity in either Grade 11 or Grade 12 (*Athletics)*. This variable was coded as "0" or "1" with "0" indicating that a student participated in school-based athletics during Grade 11 or 12 and "1" as the student did not participate in school-based athletics in Grade 11 or 12.

Demographic Variables

Demographic variables, such as race/ethnicity and gender, describe study group populations and have been linked to academic achievement at both the secondary and postsecondary levels. These variables are all independent, categorical variables. The following demographic variables were analyzed for the purposes of this study.

1. Race/ethnicity (*Race),* included the following categories: Black/African American, Hispanic/Latino, Caucasian, Asian/Pacific Islander, Native American, and two or more races. In order to utilize this categorical data in a binary logistic regression, dummy variables were used in coding as there were more than two categories of race/ethnicities to be considered (Hardy, 1993; Field, 2013). Caucasian was used as the reference variable for coding. Subsequent dummy variables were created and labeled: *Hispanic*, *Asian*, *Black*, *Multiracial*, and *American Indian*.
2. Gender (*Gender),* including females = 0 and males = 1.

Outcome of the International Baccalaureate Diploma Program

This variable was used to identify a student as 0 = IB DP non-completer or 1 = IB DP completer. The dependent variable is a categorical variable. This information was

gathered from the IB diploma results, which are released to schools each July following the spring examination period.

Obtaining and Managing the Data

Data were provided by school district staff members from existing data sources that were in the official records for the school districts. The existing data and student transcripts were stored in a program, Infinite Campus, by the school districts as a part of student enrollment procedures and record keeping. Existing data regarding the diploma achievement status from the respective International Baccalaureate Diploma Program Coordinators at each school were also collected. The data compilation involved creating an "Ad Hoc Report" from Infinite Campus to obtain demographic information; reviewing student transcripts for course history, ACT score (first attempt); GPA history, middle school enrollment history, GATE participation, and athletic participation; and reviewing IB diploma examination results to determine if students completed and were awarded the diploma or not.

Compilation of the Research Dataset

At each site, an "Ad Hoc Report" was created within Infinite Campus by using the "Ad Hoc Report Filter Designer" feature and creating an "Ad Hoc Query Wizard". Once the Query was created, the following fields were added: gender and race/ethnicity. High school transcript data were provided in electronic format. The data were entered into an Excel spreadsheet by hand and included: student's weighted cumulative GPA at the end of Grade 10, total credits attained by the end of Grade 10, and the number of honors and AP courses taken by the end of Grade 10.

Results for each IB DP examination session, which include the full diploma results, are released to schools in July each year following the spring examination session. The IB DP coordinators in both districts provided the report with the results for the DP candidates from the years 2017, 2018 and 2019. These results were added to the excel spreadsheet and coded as "0" for did not complete the IB DP and "1" for completed the IB DP.

Data Management

Once the dataset was compiled, it was uploaded into SPSS for processing. Because the categorical independent variable of race/ethnicity had more than two distinct values, a set of design variables (or dummy variables) was created to represent the categories of this variable (Hosmer & Lemeshow, 2000). Reference cell coding was used to create the design variables, which sets all variables equal to zero for the reference group (in this case, Caucasian) and sets a single design variable equal to one for each of the other groups (Hispanic, Asian, Black, Multiracial, and American Indian) (Homer & Lemeshow, 2000).

Data Analysis

To answer the research question, data analysis included descriptive statistics and binomial logistic regression. Descriptive statistics provided an overall understanding of the data and helped to describe the dataset (Sprinthall, 1997). A binomial logistic regression is the probability of an outcome (e.g. completed or non-completed) for each case or participant (Mertler & Vannatta Reinhart, 2017). By performing a binomial logistic regression analysis, a regression equation was produced that allowed the prediction of probability for a student falling into the category of DP completer or DP

non-completer. In logistic regressions, no assumptions need to be made about the distributions of the predictor variables (IVs). Therefore, the predictors did not need to be normally distributed, linearly related, or have equal variances within groups (Mertler & Vannatta Reinhart, 2017). Assumptions of a binomial logistic regression include: a dependent variable that is dichotomous; independent variables that are either continuous or categorical; independence of observations; and the absence of multicollinearity ("Binomial Logistic Regression", 2019; Mertler & Vannatta Reinhart, 2017). All assumptions were met.

Data Screening

Frequencies statistics were used to search for missing data. First, all continuous variables (ACT, GPA, credit attainment, and course patterns) were analyzed. ACT was found to have three missing values; GPA was found to have ten missing values; credit attainment was found to have two missing values; and course patterns was found to have nine missing values. For the categorical variables, IB MYP middle school was the only variable with missing values, with 13 missing.

To determine if the data were missing at random or missing not at random, an independent samples *t*-test was performed by creating a new dichotomous variable using the transform function. This was labeled GPA missing data. The other continuous variables did not have a significant value when the *t*-test was conducted (ACT $p < .05$; course patterns $p < .17$; and credits attained $p < .29$), so it was concluded that the data were missing at random and could therefore be deleted or transformed. To determine if categorical data were missing at random or missing not at random, a chi-square test was conducted with IB MYP Middle School as the reference variable. The results were not

significant (gender $p < 0.54$; race/ethnicity $p < .98$; and athletics .05). Therefore, it was concluded that missing categorical data were missing at random and could be deleted.

Because categorical data cannot be accurately replaced through estimating missing values, and since only 13 out of 421 (3.10%) cases had missing categorical data, these cases were removed from the data set. This included cases: 53, 72, 104, 124, 181, 187, 254, 274, 275, 360, 378, 379, 382, 395, and 417. After these were removed, frequencies were conducted again on the continuous data. The results were that the ACT variable was missing one value, the course patterns variable was missing three values, the credits attained variable was missing one value, and the GPA variable was missing six values.

To replace the missing values for the continuous variables, multiple imputation using the linear trend at point option was used. This allowed for more objectivity and included more information in estimating the missing values than just using the overall mean (Mertler & Vannatta Reinhart, 2017). Using regression transformation to replace the missing values, four new variables were created for the continuous variables: *ACT_1, APHONcr_1, CreditsAttained_1*, and *GPA10th_1*.

According to Merler and Vannatta Reinhart (2017), regression analyses can be extremely sensitive to outliers, with as few as one or two outliers affecting the interpretation of regression analysis results. Therefore, the outliers in this study were located using Mahalanobis distance. To assess the continuous data for outliers, Mahalanobis distance was calculated by using a linear regression procedure. Mahalonobis distance was tested using chi-square criteria (Mertler & Vannatta Reinhart, 2017). Outliers were identified using chi-square values that were significant at the p

<.001 level with the respective degrees of freedom (Mertler & Vannatta Reinhart, 2017). For the four continuous variables, a table of critical values for chi-square established that the critical value of x^2 at p <.001 and df = 4 was 18.47. A new variable was created using a linear regression and labeled *MAH_1*. The Explore procedure in SPSS was used to identify any values from the *MAH_1* variable that were greater than the critical value of 18.47. Seven cases were identified as outliers with Mahalanobis distance and were excluded from the data set, bringing the final number of cases down to 399 from 421.

Finally, remaining data were screened for multicollinearity. Multicollinearity is assessed because the inclusion of IVs that are highly correlated can lead to an erroneous regression model (Mertler & Vannatta Reinhart, 2017). Tolerance statistics were analyzed using the recommendation that tolerance of higher than .1 indicates a low correlation and independent variables with a tolerance of more than .1 can be included in the model without the risk of an erroneous regression model. After the test for multicollinearity was conducted, the results indicated that multicollinearity was not violated for any independent variables (see Table 2).

Table 2

Multicollinearity results for independent variables

Variable	Tolerance
Gender	.917
IB MYP Middle School	.701
Athletics	.946
GATE	.759
ACT_1	.510
CreditsAttained_1	.477
APHoncr_1	.531
GPA10th_1	.525
Caucasian vs. Hispanic	.617
Caucasian vs. Asian	.744
Caucasian vs. Black	.741
Caucasian vs. Multiracial	.886
Caucasian vs. Am. Indian	.979

Descriptive Statistics

This study incorporated multiple measures to assess the data in different ways. Descriptive statistics were utilized to describe the data set (Sprinthall, 1997). Descriptive statistics were also used to describe the relationships between variables (Thomlison, 2001). Utilizing descriptive statistics allowed the data in this study to be described by discovering the characteristics of the students who completed the diploma program and those who did not. By understanding the *who* in the research, deeper questions could be explored to understand why the trends and characteristics that were present existed.

Distribution. Distribution was used to assess the arrangement of a given set of scores (Sprinthall, 1997). By using distribution, the data were ordered to determine general trends. Grade point average and ACT scores were analyzed by examining the distribution to see what the score ranges for IB DP completers and non-completers were to summarize or gather information about the two groups in the study group.

Measures of central tendency. Mean, median, and mode provided information about the distributions of scores or student groups. These measures were used to give information about the average or typical score in the study group (Sprinthall, 1997). The data points in the study were analyzed using measures of central tendency to assess the distribution of students in the two main groups in the study, IB DP completers and IB DP non-completers. By using distribution and measures of central tendency, it was possible to learn about the composition of each group, such as ethnicity, gender, enrichment activity participation and exposure, as well as academic characteristics.

Binomial Logistic Regression

Mertler and Vannatta Reinhart's (2017) Decision-making Tree for Statistical Tests tool supported the use of a logistic regression. According to the Decision-making Tree for Statistical Tests, the primary consideration when determining the appropriate statistical test is the variable, and specifically the type or scale of variables and the number of independent and dependent variables. Because both influence the nature of the research question posed, this was another consideration in the decision-making process for statistical analysis. Based on the information provided by Mertler and Vannatta Reinhart (2017), prediction of group membership by identification of a set of IVs can be best analyzed with a logistic regression.

Using multiple measures of inferential statistics can help to make predictions or infer characteristics of an entire group based on a small study group (Sprinthall, 1997). Regression analysis helps to reveal structural links between variables (Lewis-Beck, Bryman, & Futing Liao, 2004). In this way, regression analysis can help explain and estimate how a population may behave, based on predictor variables. According to

Mertler and Vannatta Reinhart (2017), logistic regression can identify independent variables that predict group membership, which can be represented by a categorical dependent variable. This study had a dichotomous dependent variable, with the two categories being an IB DP completers of non-completers.

By using a Binomial Logistic Regression (BLR), it was possible to assess the probability of whether a student would fall into one dependent variable category or another. Because logistic regression allows for no assumptions about the distributions of the predictor variables, it provides more flexibility than multiple regression and discriminant analysis (Mertler & Vannatta Reinhart, 2017). Binomial Logistic Regression also negates the possibility of negative prediction and provides a range of zero to one (Mertler & Vannatta Reinhart, 2017).

Multiple methods of performing a logistic regression are available. The data were analyzed using a Forward: LR method, which enters the independent variables one at a time and uses the likelihood ratio to determine variable selection (Mertler & Vannatta Reinhart, 2017). In addressing these predictor variables, this research discovered potential factors that may have enhanced or hurt a students' progression to the full IB Diploma. By using BLR, it was possible to test multiple hypotheses about the outcomes of students enrolled in the IB DP.

Using BLR allowed for a probability of 0-1 to be created in order to consider the probability that a student would pass the IB DP (completer group) or fail the IB DP (non-completer group). Once the BLR was conducted, the independent variables were assessed to see if they contributed significantly to the model/prediction ("Interpreting and reporting", 2019). However, this only predicted the probability of a student completing or

not completing the IB DP if all other independent variables were kept constant ("Interpreting and reporting", 2019). Therefore, once the initial model was analyzed, each independent variable was assessed independently to see whether the relationship between the dependent variable to any given independent variable was due to random sample variation or whether each independent variable contributed to the model and prediction of the dependent variable (Menard, 2009). When analyzing the various independent variables, the analysis assessed stronger and weaker variables or predictors variables that may be more accurate in predicting the dependent variable.

Three output components from the data analysis were interpreted in order to analyze the model and answer the research question: goodness-of-fit tests, a classification table for the DV, and the table of coefficients for the variables included in the model (Mertler & Vannatta Reinhart, 2017). The goodness-of-fit test compared at each step the "actual values for the cases on the DV with the predicted values on the DV" (Mertler & Vannatta Reinhart, 2017, p. 309). The chi square goodness-of-fit statistic was used to assess how well the model reflected the data and delineated the difference between the constant-only model and the generated model (Mertler & Vannatta Reinhart, 2017). If the value of chi-square is significant, it indicates that the model in the regression analysis is able to classify cases more correctly than the constant-only model.

The Step Summary output from SPSS was assessed to obtain the indices for each step and the overall model fit for the dataset. The -2 Log Likelihood value was used to assess the model of each result. This indicates the model fit; a perfect -2 Log Likelihood model is equal to zero. The lower the value of the -2 Log Likelihood, the better the model fits the data (Mertler & Vannatta Reinhart, 2017).

The next component analyzed, the classification table for the DV (completer or non-completer), compared the predicted values for the DV, which was based on the BLR, with the actual observed values (Mertler & Vannatta Reinhart, 2017). If the calculated probability was less than .50, the case was classified into category one of the DV, the completer group. The third component, the table of coefficients, uses the Wald statistic and associated significance value (rather than a *t* test) to assess the significance of each predictor (Mertler & Vannatta Reinhart, 2017). The Wald statistic helps to understand the significance of each variable and its contribution to the model, as well as measuring the significance for *B*.

In a BLR model, therefore, a standardized regression coefficient was used to assess the number of standard deviations that a dependent variable changes in response to a single standard deviation change in an independent variable (Menard, 2010). Logistic regression also produces a regression equation that accurately predicts the probability of whether a participant will fall into one group or another (Mertler and Vannatta Reinhart, 2017). Knowing the effects of various independent variables on the dependent variable can help to inform decisions and understand the data predictions in response to the research questions.

Summary

This chapter focused on the methodology used to answer the research question for this study. The chapter included the research question, described the study group for the study, presented information about the variables that were used, and explained how the data would be collected. The chapter then identified the data analysis and statistics methods used, including a description of the descriptive statistics and logistic regression

process. The data analysis discussion included a discussion about the data screening process.

CHAPTER FOUR

Results

The purpose of this study was to explore the academic and non-academic variables that may predict success in completing the International Baccalaureate Diploma Program (IB DP). This study explored traditional academic predictors, including grade point average (GPA), course enrollment patterns, and ACT scores. Additionally, the study explored enrichment program predictors, including attendance at a middle school that offered the International Baccalaureate Middle Years Program (IB MYP), Gifted and Talented Education (GATE) enrollment, and participation in school-based athletics. The study also explored differences in gender and race/ethnicity to ascertain if there were any significant predictions amongst these demographic categories for successful IB DP completion. Quantitative research methods guided the data analysis. Data were analyzed using descriptive analysis and binomial logistic regression. This chapter presents the results of the descriptive analysis and binomial logistic regression.

Descriptive Analysis

A descriptive analysis was performed to summarize data and identify trends in the data. The dataset for this study, after missing cases were removed, included 399 cases. The following variables were analyzed descriptively: gender, race/ethnicity, academic indicators, and enrichment activities.

Gender

There were a total of 248 females and 151 males in the dataset. Of the females, 112 completed the IB DP and 136 did not. This was a 45.2% completion rate of females.

Of the males, 51 completed the IB DP and 100 did not, representing a 33.8% completion rate of males. See Table 3.

Table 3.

Gender Distributions by Study Group and IB DP Completer Groups

	Study Group	**IB DP Completer**	**IB DP Non-Completer**
Female	248 (62.2%)	112 (45.2% of females)	136 (54.8% of females)
Male	151 (37.8%)	51 (33.8% of males)	100 (66.2% of males)
Total	399	163 (40.9%)	236 (59.1%)

Race/Ethnicity

For the study group with respect to race/ethnicity, the largest group of students were Caucasian with 140 (35.1%) of students participating in the IB DP. These students also made up the largest percentage of the group who completed the program, with 39.3% of the students who completed the program identifying as Caucasian. Conversely, students who identified as Hispanic were the largest percentage of students who did not complete the program, with 33.9% of those who did not complete the program identifying as Hispanic. See Table 4.

Table 4.

Race/Ethnicity Distributions by Study Group and IB DP Completer Groups

	Study Group (percentage of total group)	**IB DP Completer (percentage of the study group)**	**IB DP Non-Completer (percentage of the study group)**	**Percentage of total completed**	**Percentage of total non-completed**
Caucasian	140 (35.1%)	64 (45.7%)	76 (54.3%)	39.3%	32.2%
Hispanic	122 (30.6%)	42 (34.4%)	80 (65.6%)	25.8%	33.9%
Asian	68 (17.0%)	33 (48.5%)	35 (51.5%)	20.2%	14.8%
Black	41 (10.3%)	11 (26.8%)	30 (73.2%)	6.8%	12.7%
Multiracial	27 (6.8%)	13 (48.1%)	14 (51.9%)	8.0%	5.9%
American Indian	1 (0.3%)	0 (0.0%)	1 (100%)	0.0%	0.4%
Totals	399	163	236		

Grade Point Average (GPA)

The average weighted GPA at the end of Grade 10 of the study group was 4.14 on a scale of 0-4.0, with a possible weighted increase of 0.025 per honors course and 0.05 per Advanced Placement (AP) course. The range for GPA had a minimum value of 2.50 and a maximum value of 5.15 for the overall group. For students who completed the IB DP, the average weighted GPA was 4.39 with a range of 2.77 minimum and 5.15 maximum. For those who did not complete the IB DP, the average weighted GPA was 3.97 with a range of 2.50 minimum and 4.96 maximum. See Table 5.

Table 5.

GPA Distributions by Study Group and IB DP Completer Groups

Variable	N	Minimum	Maximum	Mean	Mode	Median	Std. Deviation
Completer	163	2.77	5.15	4.39	4.45	4.43	0.42
Non-completer	236	2.50	4.96	3.97	4.45	4.03	0.49
Total	399	2.50	5.15	4.14	4.45	4.19	0.51

Credit Attainment

The average number of credits attained by the end of Grade 10 was 15.83 credits for the study group with a range of 12.50 to 21.00. To be considered on track, a student should have 10-12 credits by the end of Grade 10. Thus, all students in this dataset would have been considered on track for high school graduation. For those who completed the IB DP, the average number of credits attained was 15.92 with a range of 14.00 to 21.00. The non-completer group had an average number of credits of 15.77 with a range of 12.50 to 20.50. See Table 6.

Table 6.

Credit Attainment by Study Group and IB DP Completer Groups

Variable	N	Minimum	Maximum	Mean	Mode	Median	Std. Deviation
Completer	163	14.00	21.00	15.92	15.00	15.50	1.59
Non-Completer	236	12.50	20.50	15.77	14.00	15.50	1.49
Total	399	12.50	21.00	15.83	14.00	15.50	1.53

Advanced Placement (AP) and Honors Credits

For the study group, the average number of AP and/or honors credits completed at the end of Grade 10 was 7.82 with a range of 4.00 to 11.00. For those who completed the

IB DP, the number of AP or honors credits was 8.04 with a range of 6.00 to 11.00. For those who did not complete the diploma program, the average credits completed in AP or honors courses was 7.67 with a range of 4.00 to 11.00. See Table 7.

Table 7.

AP and Honors Credit Attainment by Study Group and IB DP Completer Groups

Variable	N	Minimum	Maximum	Mean	Mode	Median	Std. Deviation
Completer	163	6.00	11.00	8.04	8.00	8.00	1.03
Non-completer	236	4.00	11.00	7.67	8.00	8.00	0.99
Total	399	4.00	11.00	7.82	8.00	8.00	1.02

American College Test (ACT)

For the study group, the average composite ACT score on the first attempt was 24.00 with a minimum score of 13.00 and the maximum score of 35.00 on a 36.00 point scale. For the IB DP completer group the average ACT composite score was 25.70 with a range of 16.00 to 35.00. For those who did not complete the IB DP, the average composite ACT score was 22.83 with a range of 13.00 to 34.00. See Table 8.

Table 8.

ACT Composite Score by Study Group and IB DP Completer Groups

Variable	N	Minimum	Maximum	Mean	Mode	Median	Std. Deviation
Completer	136	16.00	35.00	25.70	24.00	26.00	3.55
Non-completer	236	13.00	34.00	22.83	19.00	22.00	4.44
Total	399	13.00	35.00	24.00	22.00	24.00	4.33

Middle School with IB Middle Years Program (IB MYP)

In the study group, 93 (23.3%) students attended a middle school that offered the IB MYP and 306 (76.7%) students attended a middle school that did not offer the IB MYP. Of those who completed the IB DP, 31 (19.0%) students attended a middle school that offered the IB MYP and 132 (80.9%) did not. Of those who did not complete the IB DP, 62 (26.3%) students attended a middle school with the IB MYP and 174 (73.7%) did not. See Table 9.

Table 9.

IB MYP Middle School Attendance by Study Group and IB DP Completer Groups

	Total Study Group	**IB MYP Middle**	**Non-IB MYP Middle**
Completer	163	31 (19.0%)	132 (80.9%)
Non-Completer	236	62 (26.3%)	174 (73.7%)
Total	399	93 (23.3%)	306 (76.7%)

Gifted and Talented Education (GATE)

For the study group, upon completion of Grade 8, 163 (40.9%) students had been in GATE and 236 (59.1%) had not. Of those who completed the IB DP, 78 (47.9%) had been in GATE and 85 (52.1%) had not. Of those who did not complete the IB DP, 94 (39.8%) had been in GATE and 142 (60.2%) had not. See Table 10.

Table 10.

GATE Variable by Study Group and IB DP Completer Groups

	Total Study Group	**GATE**	**No GATE**
Completer	163	78 (47.9%)	85 (52.1%)
Non-Completer	236	94 (39.8%)	142 (60.2%)
Total	399	163 (40.9%)	236 (59.1%)

Participation in School-based Athletics

For the study group, 252 (63.2%) students participated in school-based athletics in either Grade 11 or 12 and 147 (36.8%) did not. Of those who completed the IB DP, 111 (68.1%) participated in school-based athletics and 52 (31.1%) did not. Of those who did not complete the IB DP, 141 (59.7%) participated in school-based athletics and 95 (40.3%) did not. See Table 11.

Table 11.

Participation in School-based Athletics by Study Group and IB DP Completer Groups

	Study Group	**Athlete**	**Non-athlete**
Completer	163	111 (68.1%)	52 (31.1%)
Non-Completer	236	141 (59.7%)	95 (40.3%)
Total	399	252 (63.2%)	147 (36.8%)

Summary of Key Descriptive Findings

Of the 399 cases in the study group, there were more females than males in the dataset; in addition, more females completed the IB DP than males. Of the 399 cases in the study group, the highest proportion of IB DP completers was the Caucasian population, with 45.7% of the students completing the program identifying as Caucasian. The smaller proportions of students completing the program were Hispanic (34.4%), Black/African American (26.8%) and American Indian (0.0%).

The IB DP completer group displayed higher academic characteristics when considering the weight cumulative GPA. All students who were enrolled in the IB DP had high weighted cumulative GPAs, with an average of 4.14. However, students who completed the IB DP had a higher average weighted cumulative GPA at 4.39, compared to the average of 3.97 for those who did not complete the IB DP.

The average number of credits a student obtained by the end of Grade 10 was 15.83. For the IB DP completer group, this was 15.92. For those who did not complete the IB DP, the average number of credits attained was 15.77. Additionally, the minimum number of AP or honors credits obtained by the end of Grade 10 by IB students was 4, while the maximum number of AP or honors credits obtained was 11. Likewise, the total credit accrual by the end of Grade 10 for all credits had a minimum of 12.50 and a maximum of 21.0.

It should also be noted that there was a wide range in academic performance among the IB DP students. The minimum test score for the ACT composite was only 13.00, while the maximum was 35.00, out of a total possible score of 36.00. Additionally, the group average ACT composite score was 24.00. For the IB DP completer group, the mean was 25.70, while for the IB DP non-completer group , the mean was only 22.80.

As for the number of students enrolled in the IB MYP in middle school, 93 (23.3%) of the 399 total students attended a middle school with the IB MYP. Of those who completed the IB DP, 31 (19.0%) attended a middle school with the IB MYP and 132 (80.9%) did not attend a middle school with IB MYP. Of those who did not complete the IB DP, 62 (26.3%) attended a middle school with the IB MYP and 174 (73.7%) did not attend a middle school with IB MYP.

For the study group, 163 (40.9%) of the students had been enrolled in GATE and the majority, 236 (59.1%), had not been enrolled in GATE. The dataset revealed that, while 78 (47.9% of completers) of the students who completed the IB DP were in GATE, only 94 (39.8%) of the students who did not complete the program were in GATE. In

contrast, 142 (60.2%) of the students who did not complete the program and were not in GATE.

When reviewing school-based athletics, the dataset revealed that most DP completers were athletes, with 111 (68.1%) being athletes. Athletes also made up the larger proportion of students who did not complete the program, with 141 (59.7%) of the non-completers being athletes.

Binomial Logistic Regression Results

The initial dataset of 421 cases was reduced to 399 cases after missing data and outliers were removed or transformed. A binomial logistic regression (BLR) analysis was conducted using the Forward: LR method, which enters the independent variables one at a time and uses the likelihood-ratio to determine variable selection (Mertler & Vannatta Reinhart, 2017). The 399 cases were used to address the research question for this study: *Of the students who are designated as IB students at the beginning of Grade 11, what factors predict successful completion of the International Baccalaureate Diploma Program?* The independent variables used as predictors included: cumulative weighted GPA at the end of Grade 10, credit attainment at the end of Grade 10, credits earned in honors or AP coursework at the end of Grade 10, ACT composite score from the first attempt, enrollment in a middle school with IB MYP, GATE enrollment, participation in school-based athletics, race/ethnicity, and gender. The dependent variable was IB Diploma complete status, which had two categories: (0) did not complete IB DP or (1) completed the IB DP. Students were only placed into one completion category, either did not complete the IB DP or completed the IB DP.

A logistic regression analysis provides a nonlinear model (Mertler & Vannatta Reinhart, 2017). Because a categorical variable violates the assumptions of a linear model in regression, the data must be transformed using a logarithmic transformation to express a nonlinear relationship in a linear way (Field, 2013). The BLR analysis using 399 cases revealed that the model was significant [-2 Log likelihood = 442.33; $x^2(4)$= 97.37, p <.0001]. For this analysis, the Hosmer and Lemeshow test was non-significant [$x^2(4)$= 9.65, p <.29. Given the Hosmer and Lemeshow test was non-significant, the model adequately fit the data. See Table 12.

Table 12.

Logistic Regression Model Summary

-2 Log likelihood	Chi-square	*df*	*Sig.*	Cox & Snell R Square	Nagelkerke R Square
442.33	97.37	4	.00*	.21	.29

Note. * p<.01

Four independent variables contributed significantly to the model: cumulative weighted GPA at the end of Grade 10 (*GPA*), ACT composite on first attempt (*ACT*), credits attained by the end of Grade 10 (*CreditsAttained_1)*, and GATE enrollment (*GATE*). The variables that did not contribute significantly to the model were: race/ethnicity, gender, IB MYP middle school, participation in school athletics, and credit patterns. See Table 13.

Table 13.

Variables not Included in the Model

Variable	*df*	*Sig.*
Gender	1	.17
Caucasian vs. Hispanic	1	.45
Caucasian vs. Asian	1	.61
Caucasian vs. Black	1	.12
Caucasian vs. Multiracial	1	.81
IB MYP Middle School	1	.15
Participated in School Athletics	1	.30
AP/Honors Credits	1	.42

Smaller values for the -2 Log Likelihood indicated a better fit for the model (Mertler & Vannatta Reinhart, 2017). When the output was further explored, the model correctly classified 69.7% of the participants into the correct category: IB DP completer or non-completer. See Table 14.

Table 14.

Classification Table

Observed		Predicted		Percent Correct
		IB Diploma Achieved		
		No	Yes	
IB Diploma Achieved	No	179	57	75.8
	Yes	64	99	60.7
Overall Percentage				69.7

A significant Wald value for a variable indicated that it was significantly related to the grouping variable. As shown in Table 15, the Wald values were significant for four predictor variables; therefore, they were included in the model equation.

Table 15.

Regression Coefficients

	B	*Wald*	*df*	*P*	Odds Ratio
GPA	2.14	38.15	1	.00*	8.51
ACT	.12	11.15	1	.00*	1.12
CreditsAttained	-.18	4.07	1	.04	.83
GATE	-.57	4.52	1	.03	.57
Constant	-9.07	32.19	1	.00*	

Note. * $p<.01$

The odds ratio is defined as a probability of the participant being classified in one of the two different categories of the dependent variable group, as either an IB DP complete or non-completer. Odds ratios for the four variables can be seen in Table 15. For every increase of one unit in GPA, the student's odds of completing the diploma program increased 8.51 times. For every one unit increase in ACT score, the student's odds of completing the diploma program increased 1.12 times. The odds of completing the IB DP were 0.83 less for every one unit increase in the number of credits attained; in other words, the odds of completing were decreased by 16.6%. For students who were not enrolled in GATE, the odds of completing the IB DP were 0.57 less than for those who were enrolled in GATE; the odds are decreased by 43%. In other words, if a student was not enrolled in GATE at the end of Grade 8, that student was less likely to complete the program.

As estimates of R^2, Cox & Snell R Square and Nagelkerke R Square indicate the proportion of variability of the dependent variable, IB DP completion, that may be accounted for by the independent variables included in the equation, GPA, ACT, credits attained, and GATE participation. The Cox & Snell R Square value for the model summary was .22 and the Nagelkerke R Square value was .29. The Nagelkerke's R

Square suggests that the model explained 29% of the variation in the outcome (see Table 12 above). The Wald statistic for each of the variables in the model indicated significance in predicting whether a student would complete or not complete the IB DP.

Summary of Key Findings of the Binomial Logistic Regression

A binomial logistic regression analysis was conducted to test whether academic indicators of success, enrichment activities, and demographic variables could predict IB DP competition. For this analysis, 399 cases were used after adjusting for missing data and outliers in the data set. Four of the nine variables were found to contribute significantly to the model: GPA at the end of Grade 10, ACT composite score on the first attempt, number of credits attained at the end of Grade 10, and GATE enrollment at the end of Grade 8. The results indicated that a student's GPA at the end of Grade 10 raised the probability that the student would complete the IB DP. Higher ACT composite scores also raised the probability that a student would complete the IB DP. The number of credits attained at the end of Grade 10 was found to decrease the probability that a student would complete the IB DP. Finally, a student's odds of completion increased when a student was a GATE participant.

Summary

The purpose in this research was to assess the completion outcome for the International Baccalaureate Diploma Program to see if the outcome could be accurately predicted from the knowledge of a set of variables, including academic predictors, enrichment activities, and demographic variables. Results from descriptive analyses and binomial logistic regression were presented. Chapter Five will discuss findings, conclusions, and recommendations.

CHAPTER FIVE

This study was conducted to examine whether International Baccalaureate Diploma Program (IB DP) completion could be predicted given a set of academic and non-academic variables, specifically, grade point average (GPA) at the end of Grade 10, number of credits attained by the end of Grade 10, number of Advanced Placement (AP) and honors credits attained by the end of Grade 10, American College Test (ACT) composite score on the first attempt, attendance at a middle school that offered the IB Middle Years Program (MYP), participation in Gifted and Talented Education (GATE), participation in school-based athletics, gender, and race/ethnicity. These variables were included based on a review of the related literature.

Descriptive statistics and binomial logistic regression test results were presented. The dataset for the analysis included 399 cases. Included in the study were records of students from two schools in two different urban school districts in the same western state. Data from students enrolled as IB DP students upon entering Grade 11 during the academic years 2015-2016, 2016-2017, and 2017-2018 and who graduated high school in the years 2017, 2018, and 2019 were included. Of the 399 cases, 163 students were classified as IB DP completers and 236 students were classified as IB DP non-completers. In this chapter, a discussion of the salient findings is presented along with the implications for practice, recommendations for future research, and conclusions.

Discussion of Salient Findings

The findings from this study revealed four salient points: the role of academics in completing the IB DP; the role of early preparation in the likelihood of completing the IB DP; indications of a persistent gap in IB DP enrollment among racial/ethnic

subpopulations; and gender inequities in completion of the IB DP. These findings provide insight to the study group and suggest areas for further research to explore the significant predictors of successful IB DP completion.

Role of Academics in IB DP Completion

The findings in this study are consistent with other research that has revealed that accelerated college credit (ACC) options, including IB DP, are associated with strong academic outcomes, such as higher grades in high school (Glancy et al., 2014; Kilgore & Wagner, 2017; US Department of Education, 2016). Suldo, Shaunessy-Dedrick, et al. (2018) noted that enrollment in AP/IB courses is typically as a result of a history of academic success. Pierson et al. (2017) also found that students who enroll in dual credit options, such as the IB DP, are more likely to already be high achievers. Unsurprisingly, findings from the study indicated that a student's GPA at the end of Grade 10 and ACT composite score on their first attempt significantly predicted their likelihood of successfully completing the IB DP.

The current study revealed that students with higher GPAs when entering the program were more likely to complete the IB DP. This suggests that students must have advanced preparation, as indicated by strong academic skills and, therefore, a high GPA to enter into the IB DP. Grade point average, which is not a program prerequisite for these schools, was found to be a strong predictor of academic preparation and success; because of this, and because GPA has been linked to long-term outcomes for students, a student's GPA is an important factor in assessing student preparedness for high rigor programs, such as the IB DP (Freeman, Kern, Gambino, Lombardi, & Kowitt, 2019; Grigorenko et al., 2009; Lang, 2007). The findings by this study support the idea that

students who are not academically strong before entering the IB DP are less likely to complete the program.

In addition to academic outcomes and academic preparedness, GPA has also been correlated with self-discipline, which suggests that students with greater self-discipline, as evidenced by a higher GPA may be more successful in completing the IB DP. Duckworth and Seligman (2005) reported that self-discipline was more than twice as likely to predict a student's final GPA as the IQ of the student. While this study did not examine self-discipline specifically, increased academic outcomes, such as higher GPAs, have been shown to be correlated with academic skills like self-management and self-discipline (Payton et al., 2008). For students to obtain advanced skills, Buddin et al. (2014) suggested better academic preparation. Because the IB DP requires that students have strong self-discipline, self-management, and study skills to complete the various program components, students who enter the program with higher GPAs are more likely to have stronger academic skills compared to students with lower GPAs, and are therefore more likely to complete the IB DP.

While grade point average is a way to assess academic skills, such as self-discipline, persistence, and cognitive abilities, the ACT only measures cognitive skills. The ACT measures student abilities in English, mathematics, reading, and science, which are important skills that students acquire in high school and are important for success in postsecondary education (ACT, 2018). This study found that both GPA and the ACT were predictors of successful completion of the IB DP; however, GPA was a stronger predictor. This suggests that students who have higher academic skills and cognitive abilities are more likely to complete the IB DP than those who only display higher

cognitive abilities. The findings of this study revealed that ACT scores did predict a higher likelihood of completing the IB DP, but also found that overall, students with better academic preparation, as measured by GPAs, were more successful with the IB DP. Because academic skills and student outcomes in coursework (i.e., GPAs) both contribute to successful completion of the IB DP, the ACT, when combined with a high GPA, provided a significant contribution to the model in predicting for IB DP completion.

Another remarkable finding in the study was that the study group had a composite ACT score of 24.0, which was 6.3 points higher than the state average of 17.7 and 3.2 points higher than the national average of 20.8 (ACT, 2018). This is even more remarkable because the test is typically taken by students in this state as a graduation requirement in Grade 11; however, students may take the ACT more than once. The scores reflected in this study were the students' first attempt. Because the ACT and GPA both measure cognitive abilities, this suggests that overall, IB DP students have stronger academic skills and abilities than average students. Both GPA and ACT have been considered as predictors for college readiness due to their measures of cognitive skills. However, the ACT has also been criticized as a measurement of college readiness because it only measures cognitive abilities, rather than other academic skills that are needed to be successful in college (Nobel & Sawyer, 2004). These findings suggest that students who are successful in the IB DP are those who have both strong cognitive abilities and academic skills.

Gifted and Talented Education enrollment was also found to be a predictor for successful completion of the IB DP. An enrichment program used throughout the United

States (US), GATE offers gifted students high-rigor programming. It is not a program open to all students; rather, GATE is a selective program that offers programming for students who score above their peers in cognitive tests administered in Grades 2 through 6. In the western state where this study was conducted, students are only referred to the GATE program who achieve above the 98 percentile on cognitive abilities tests ("Fast Facts", 2020). The finding of GATE as a predictor of successful completion of the IB DP is consistent with research that has found that students who enrolled in enrichment opportunities (e.g., GATE) or more challenging coursework (e.g., AP, IB, or honors) were more academically successful (Bowers and Foley, 2018; Buckley et al., 2009; & Buddin et al., 2014). Because the IB DP is an ACC option that is intended as an advanced coursework opportunity, it is not surprising that students with high cognitive abilities, such as those enrolled in GATE, are more successful in the program. As a predictor of successful completion, GATE enrollment indicates that students who are exposed to enriched programing may be better prepared for the high rigors of the IB DP, and therefore are more likely to complete the program successfully.

While it would seem that as an advanced offering, the IB DP would attract many students in GATE, the dataset revealed that only 172 out of 399 students (43.1%) were identified as Gifted and Talented. Because the IB DP is designed as a rigorous ACC option, it is expected to attract Gifted and Talented students. However, in this case less than half of students in the program were identified as GATE students. This might be explained by the results of a qualitative study regarding gifted student perspectives of the IB DP. Hertberg-Davis and Callahan (2008) found that gifted students who dropped out of the IB program did so because they felt that the classes were not designed to allow

them to succeed or learn in ways they preferred. Despite this perception, Hertberg-Davis and Callahan reported that students still believed the IB courses offered better experiences than the regular courses. Although the study presented did not examine the reasons that students did not complete the program, the finding that Gifted and Talented students were such a small portion of the program suggests the students may have felt the program could not meet their needs or would not be challenging enough.

Role of Early Preparation in IB DP Completion

Perhaps the most notable findings of this study were that efforts that are considered early preparation for ACC options did not significantly contribute to a students' likelihood of completing the IB DP. The two early preparation variables included in this study were credit accrual and enrollment at a middle school with the IB MYP. The number of credits accrued by the completion of Grade 10 actually resulted in a lower likelihood of obtaining the IB DP. It is notable that the number of credits attained by students in their freshman and sophomore years of high school has been cited as a predictor for on-time high school graduation (Hampden-Thompson et al., 2007; Hartman et al., 2011; Norbury et al., 2012). Findings from this study suggest that on-time high school completion is not the same as preparation for a high-rigor program such as the IB DP.

In this study, students at the high schools were considered *on track* to graduate if they had obtained 10-12 credits. Yet, despite only needing 10-12 credits by the end of Grade 10 to be on track for timely graduation, the mean number of credits attained by the students in the study group was 15.83 and the range was 12.5 to 21 credits. Every student in the study had obtained more than the number required to be on track for graduation,

and most students had obtained several more credits than the minimum number required. Despite the mean number of credits for students in the study being much higher than the number needed to be on track at the end of Grade 10, higher credit accrual meant a student was less likely to complete the IB DP. This suggests that the students in this study were increasing their number of credits, but not necessarily increasing their rigor and their preparation for the IB DP. Buddin et al. (2014) noted that an increase in coursework may include courses that are less advanced (i.e., online or standard level courses as opposed to honors or AP), and therefore may offer less academic preparation. The data included in this study did not include specific courses, other than the designation of AP or honors; therefore, speculation about the types of courses take by students in the study group is beyond the scope of this research. However, it appears that simply taking more courses in Grades 9 and 10 was not sufficient academic preparation for completion of the IB DP.

Perhaps the most striking finding was that enrollment in a middle school with an IB MYP program was not found to be a predictor of successful completion of the IB DP. Only 19.0% of students who completed the IB DP attended a middle school with the IB MYP. The IB MYP is a pre-DP program that is intended to help prepare students for successful completion of the IB DP. Harrison et al. (2015) reported that one benefit is that IB MYP can help students transition between programs. Reimers et al. (2004) added that the IB MYP builds strong pedagogical foundations. Specifically, Reimers et al. found a positive correlation between students who participated in the IB MYP and the Extended Essay (a research requirement) results. Previous research also found that attendance at an MYP school positively impacted IB performance when compared with

students who did not attend an MYP school (Sperandio, 2010; Wade & Wolanin, 2015; Walker, Bryant, & Lee, 2014). Wade and Wolanin (2015) also found that MYP participation was positively related to greater success on AP or IB exams and Gordon and Bergeron (2015) suggested that students who performed better in the MYP tended to have better performance on the IB DP exams.

In addition to greater success on AP or IB exams, IB MYP students have been shown to have greater high school academic outcomes. Wade and Wolanin (2015) examined data from students in Grade 8 and later IB and AP course enrollment and SAT/ACT scores. They found that an MYP background prepared students for the diploma program by providing experience and understanding of criterion-based assessment and developing academic skills, such as organization and inquiry. Wade and Wolanin also indicated that the skills gained in the MYP prepared students for success in advanced courses, including IB.

While research has supported that IB MYP enrollment could increase academic outcomes for students, it was not revealed to be a significant predictor of successful IB DP completion in this study. This could be as a result of the low number of students, as only 93 out of 399 (23.3%) of the students were enrolled in a middle school that offered the IB MYP. It could also indicate that the IB MYP programs in the two districts were not being implemented with fidelity. The International Baccalaureate requires that at least one teacher per subject area is trained in an IB certified workshop (International Baccalaureate, 2020). Schools are also subject to a re-evaluation approximately every five years in order to assess their implementation of the program. Although this study did not assess the fidelity of the programs in the two districts, it may account for the reason

the findings of this study seem to contradict other research indicating that the IB MYP prepares students for successful completion of the IB DP.

Persistent Gap in IB DP Enrollments

Findings from this study can also provide insight into the persistent gap in IB DP enrollment based on race or ethnicity. What was particularly noteworthy was the comparison of the race and ethnicity of the students in the study group (i.e., IB DP students) with the overall student population of the two schools they attended. The significance of this comparison is that the two IB programs represented in the study were considered magnet or academy schools with open enrollment, meaning that students across the school district could apply and be accepted to the program, as opposed to other programs that only offered the programs to students zoned for the school. Both schools in the study are located in economically disadvantaged communities and have histories of low academic achievement; the IB programs were placed in these schools by school district leadership to offer a rigorous academic program to students who have been underserved academically.

Comparisons between the school and IB DP populations were stark. The Caucasian population at the first high school was 7.95% and the second high school was 22.03%. In contrast, the percentage of Caucasian students who participated in the IB DP was 35.1%, which was much higher than the Caucasian population at both schools, indicating an overrepresentation of Caucasian students in the IB DP at both schools. Similarly, the Asian population at the first high school was 5.62 and at the second high school was 6.84. The percentage of Asian students participating in the IB DP was 17.0%, which also indicates that there was an overrepresentation of Asian students in the IB DP.

Conversely, according to the descriptive analysis, Hispanic/Latino students tended to be underrepresented in the IB DP. The Hispanic/Latino population at the first high school is 69.45% and at the second high school is 62.42% but only 30.6% of students participating in the IB DP identified as Hispanic/Latino.

School within a school models, often called school choice models, tend to exacerbate already existing segregation and may lead to a wider gap of access to education on the basis of race or class (Ganski, 2015; Wells & Roda, 2013). In these two districts, the IB DP was implemented in areas of the cities that were specifically chosen due to their economically disadvantaged student populations. Because the racial demographic in both of these areas is highly African American and Hispanic/Latino, the school districts hoped to provide a high-rigor program that would offer opportunity to minority and economically disadvantaged students. However, the students in these programs were still predominantly Caucasian and Asian, suggesting that many of the IB DP students were from other neighborhoods in the cities where the schools were located. This finding indicates that the magnet model may act in diversifying the schools, but is not proportionately diversifying the IB DP within the schools. Therefore, it does not appear that the IB DP is providing as much equity and access to the African American and Hispanic/Latino students as was intended by offering the program in these schools.

In addition to the underrepresentation of students from historically marginalized groups, there was also a disparity in achievement rates by race/ethnicity, though race/ethnicity was not a significant predictor in the model. Descriptive statistics revealed trends of higher achievement rates (proportionally) in the IB DP for Caucasian and Asian students over African American and Latino students. Previous research has reported that

college enrollment and persistence rates for African American, Latino, and Native American students tend to be lower than those of European American and Asian American students (Kuh et al., 2006). Further literature revealed that access to rigorous coursework in preparation for postsecondary education has been inequitable for African American and Latino students (Perna et al., 2015). Colgren and Sappington's (2015) study revealed that there were still persistent achievement gaps between African American and Latino students and their Caucasian peers and that despite the growing numbers in high rigor high school ACC options, there is still a disproportionate representation. In this study, the inequitable access was highlighted in the programs at these two high schools. The findings may suggest that despite attempts to diversify the schools and offer high-rigor coursework and opportunities to those in disadvantaged communities, these programs are primarily benefiting Caucasian and Asian students. While the two districts in this study implemented the program in the two schools to increase opportunity and introduce diversity, the descriptive findings in this study suggest that the IB DP may not be providing a way for disadvantaged students in these districts to increase their high school achievement.

Gender and Equity in IB DP Completion

The trends in IB DP completion by gender revealed by the study also provide interesting results. Similar to the persistent equity issues associated with race and ethnicity, females were overrepresented and had higher completion rates than the males in this study. According to research, females may be more likely to enroll in ACC options and tend to be more college ready than their male peers (An & Taylor, 2015; Pierson et al., 2017). Saavedra (2014) found that girls were more likely to enroll in the IB DP as

boys. The College Board (2019) also reported that females are more likely to participate in AP courses and score higher on AP exams than male students. Vanderbrook (2006) reported that despite the tendency for females to face lower expectations from their teachers, which may result in less referral to advanced coursework, female students tended to outperform their male peers (Fischer et al., 2013).

This study revealed similar trends as previous research. In the two schools, 62.2% of the students enrolled in the IB DP were female while only 37.8% of the students were male. Females also had a higher completion rate, with 45.2% (or 112 of the 248) of the females completing the program and just 39.8% (or 51 of the 151) of the males completing the program. Because females completed at a higher rate than males, there may be an inequity in access. Saavedra (2014) reported that the IB DP may be a way to increase high school achievement, the probability of graduation from high school, and may be particularly beneficial for boys, who have a lower likelihood than girls for graduating from high school and enrolling in college. The suggested inequity of access in this study may result in females being more college ready than their male peers if they complete the IB DP.

Implications for Practice

This study revealed that the strongest predictors for successful completion of the IB DP were academic characteristics, rather than non-academic characteristics or early preparation. The results of this study supported previous research findings that academic characteristics such as GPA, ACT scores, and high rigor enrichment options, such as GATE, can increase the likelihood of students successfully completing the IB DP. Therefore, if the goal of the school district is IB DP completion, a focus should be on

overall high achievement in coursework, recruiting students from the GATE program, and ACT preparation. In essence, the results of this study suggest that recruitment efforts should focus on students who are academically strong in their early high school years.

Perhaps the most interesting finding in this study was the factors related to early preparation and their impact on the model. First, the number of classes taken by students was a negative predictor to the model. In other words, the greater number of classes taken by a student (i.e., credits attained), the less likely they were to complete the IB DP. This suggests that students may not benefit more from a quantity of classes and may do better if they choose to focus their extra efforts on strengthening their academic skills in order to increase overall academic achievement. This is a particularly interesting finding in the study as it suggests that students may be at a greater advantage if they only take the required number of courses to remain on track, rather than taking extra courses, which is generally perceived as a way to increase rigor and preparedness. Likewise, the number of AP or honors credits a student obtained before entering the program had no significant impact on the model. Since AP and honors courses are intended to increase a students' academic preparedness, this was a surprising finding of the study.

Another interesting finding of the study was the overall completion rates for the two schools. Only 40.9% of the students completed the program, despite strong academic indicators. For the study group, the average GPA was 4.14 at the end of Grade 10. For those who completed the program, it was 4.39 and for those who did not complete it was 3.97, which is well above average. The average ACT score (nationwide) is 21 ("What is a good ACT score?", 2019). This study revealed that the average for both groups was 24.00, the average for the completer group was 25.70, and the average for the non-

completer group was 22.83. All groups were above the national average of 21.00, indicating a high level of academic achievement for students enrolled in the program. This suggests that students may need more support, even though they had strong academic indicators when they entered the program.

While the students in this study tended to have high GPAs, a high number of credits, and high ACT scores, the findings of the study indicate that students may need more early preparation in order to increase their readiness and success in the program. This suggests that students should learn study skills, self-discipline, and self-management techniques early on in order to increase their GPAs and their likelihood of completing the IB DP. As many of the IB DP components require students to have self-discipline, self-management skills, and persistence, and because these traits are shown to increase GPA which is a critical predictor of success in the program, there should be a focus on strengthening these academic traits in students. If the districts focus their efforts on strengthening these skills, they may increase student GPAs, ACTs, and overall likelihood of IB DP completion.

Preparation for the IB DP also provided some interesting implications for practice. The finding that the IB MYP, which is intended to be a program to prepare students for the rigors of the DP, had no significant impact on a students' completion of the program was a somewhat troubling finding about early preparation in the study. This suggests that the program may not be operating as it is intended. In other words, if the program is intended to be a preparatory program for the DP, the fidelity with which the program is implemented in the middle schools where students attend may need to be reviewed. Dickson, Perry, and Ledger (2019) found that teachers at MYP schools

reported that skill development is challenging and unauthentic. Authentic skill development in the MYP means that the skills are developed to provide students with realistic opportunities that will be replicated in the future ("How the MYP facilitates authentic learning", 2019). The Dickson et al. (2019) study also found that only a small proportion of teachers were enthusiastic about the program. This lack of staff buy-in may result in less fidelity of implementation. The finding that MYP was not a predictor of successful IB DP completion suggests that the IB MYP programs in these districts are not adequately preparing students for the IB DP; the districts may need to assess student performance, program rigor, and fidelity of the program implementation in order to strengthen them.

Achievement gaps were also found to be persistent, with a greater percentage of females completing the program than males. Additionally, the data revealed that more Caucasian students completed the program; Hispanic or African American students completed at lower rates. Therefore, additional supports and resources should be used to target the needs of students with gender or ethnic differences in order to close the achievement gaps and improve academic achievement for all students.

All of these findings suggest that the two districts in this study reassess their intentions for offering the IB DP in these two high schools. The IB DP was implemented in both high schools in order to provide opportunity to disadvantaged students and to diversify the schools by offering a prestigious program. However, as indicated by the findings of the study, this intention may not be being met. The districts in this study may want to reassess whether open enrollment is appropriate. If the goal is to provide opportunity to disadvantaged students, they are providing that opportunity. However, the

data reveals that students who Latino or African American are still enrolling at disproportionately lower rates, which may indicate that the program is not as successful as the districts would like at offering a rigorous program to disadvantaged students. If the goal of the districts is to offer the program and increase the completion of the diploma, the districts may want to rethink the open enrollment policies. The data reveals that students who are already academically strong when they enter the program are more likely to complete with the diploma, and therefore selection criteria should focus on students who display strong academic qualities.

Future Research

This study focused on IB DP students from two schools in two urban school districts in a western state. To gain a more comprehensive understanding of how academic predictors can contribute to the successful completion of the IB DP, and as a result the findings of this study, future research should also evaluate enrollment patterns of students in the IB DP in order to gain a more comprehensive view of the academic characteristics of students who enroll, students who complete the program, and students who do not complete the program. This research should also focus on specific academic skills (e.g., self-discipline) students have when entering the program in order to ascertain whether certain skills increase the likelihood of IB DP completion.

It is also recommended that future research examine the fidelity of the MYP to see why the program may not be adequately preparing students for the IB DP. Future research into the fidelity of implementation in the school districts in this study may provide insight as to whether the MYP is not a predictor due to fidelity, student performance, or another reason.

Finally, qualitative research could be conducted in order to understand student motivations for program enrollment and the reasons students did not complete the program, such as program failure or student choice to drop the program. Understanding data related to program failure and reasons students choose to drop the program may provide insight as to how to better prepare students for the program, how to support students throughout the program, and may help schools make program administration decisions, such as enrollment requirements.

Conclusions

This study sought to explore the relationship of academic and non-academic predictors with successful completion of the IB DP. The study provided insight into the factors that successfully predict the completion of the IB DP. Academic achievement, early preparation, and achievement gaps were key findings in this study. The data revealed that the three variables that significantly predicted a students' likelihood of completing the IB DP were: enrollment in GATE, GPA, and ACT composite score. While the number of credits attained by the student was also a significant predictor, it was a negative predictor, meaning that a student was less likely to complete the IB DP when they obtained a higher number of credits.

The findings of this study indicate that students who are academically strong before entering into the IB DP are more likely to be successful. Grade point average was a strong predictor, which suggests that students who have stronger academic skills (e.g., self-discipline) are more likely to be successful in the program. The ACT was another predictor; this finding suggests that students with a strong academic background will be more likely to succeed. The final academic predictor was a students' enrollment in

GATE. However, there were low numbers of students in the study who were actually enrolled in GATE. Typically, Gifted and Talented students seek challenging opportunities that will enhance their educational attainment. That GATE was a strong predictor is not surprising; what is surprising is that only 43.1% of the students in the study group were in GATE, which may suggest that Gifted and Talented students do not feel that the program offers enough challenge or enough benefit for them to enroll in it. Overall, it appears that these schools should focus recruitment efforts on students who show strong academic skills and abilities early in high school

The findings also indicate that students who have received early preparation by taking AP and honors coursework or attending a middle school with the MYP, were not adequately prepared for the rigor of the program. This suggests a possibly inequity due to middle school attendance. It also suggests an issue with program fidelity in the middle schools where the IB MYP is offered. Early preparation also includes the number of credits a study obtained, which was found to be a deterrent to successful completion in this study. This suggests that quantity does not necessarily mean quality, and that students may benefit from stronger coursework that prepares them by increasing academic skills and abilities over taking more courses.

Finally, equity of access and disparity in achievement rates were found to be problematic in the study. Many efforts have been made in education over the last few decades focusing on offering equal opportunities to all students, regardless of race/ethnicity. However, this study found that Caucasian and Asian American students were overrepresented and had a disproportionately higher rate of achievement than their Hispanic and African American peers. Additionally, females were more likely to enroll in

the program and complete the program than males. Both of these findings suggest that equity and access are still prevalent in low-income, diverse schools.

Overall findings suggest that students are more successful in completing the IB DP if they have higher levels of academic achievement, with includes academic skills and abilities. The findings also suggest that there may be a disparity in achievement and equity of access among Hispanic and African American students and that males may underrepresented, indicating that more focus should be placed on diversifying IB programs.

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Appendix A

Codebook

Variable Label	Variable Code	Type	Coding
Gender	Gender	IV	0 = Female, 1 = Male
Race/Ethnicity	Race	IV	1 = Caucasian, 2 = Hispanic, 3 =Asian, 4 = Black, 5 = Multiracial, 6 = Indian
IB MYP Middle School	MSAttended	IV	0 = Yes, 1 = No
Participated in School Athletics	Athletics	IV	0 = Yes, 1 = No
Gifted and Talented	GATE	IV	0 = Yes, 1 = No
ACT, First Attempt	ACT	IV	N/A
Credit Patterns	APHONCr	IV	N/A
Credits Attained	CreditsAttained	IV	N/A
GPA end of Grade 10	GPA10th	IV	N/A
Caucasian vs. Hispanic	Asian	IV	0 = Caucasian, 1 = Hispanic
Caucasian vs. Asian	Asian	IV	0 = Caucasian, 1 = Asian
Caucasian vs. Black	Black	IV	0 = Caucasian, 1 = Black
Caucasian vs. Multiracial	Multiracial	IV	0 = Caucasian, 1 = Multiracial
Caucasian vs. American Indian	Indian	IV	0 = Caucasian, 1 = Indian
IB Diploma Achievement	Diploma	DV	0= No, 1 = Yes

Note. N/A = Not Applicable.