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EXAMINING THE PERCEPTIONS OF FIRST-YEAR STEM STUDENTS ON
RETENTION FACTORS AT THE UNIVERSITY OF THE WEST INDIES

By

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B.Sc., University of the West Indies, Cave Hill, Barbados, 1985

M.B.A. Education Management, University of Leicester, UK, 2002

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A Dissertation

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in Partial Fulfillment of the Requirements

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Doctor of Philosophy

in

Counseling and Personnel Services

Department of Educational and Counseling Psychology

University of Louisville

Louisville, KY

May, 2015

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A Dissertation Approved on

April 1, 2015

by the following Dissertation Committee

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Second Committee Member, Michael J. Cuyjet, Ed.D.

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DEDICATION

This dissertation is dedicated to my parents Mr. Eustace Leroy Harewood and Mrs. Norma Esther Harewood (deceased), who are responsible for making me the individual I am today; my brothers, Junior, Noel, and Tony, and their families, to Edgar, and to my two beautiful daughters Maisha Makeda Cox and Shanika Akilah Cox, true blessings in my life. You all stood by me and encouraged me to keep going when things got really stressful.

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ABSTRACT

EXAMINING THE PERCEPTIONS OF FIRST-YEAR STEM STUDENTS ON
RETENTION FACTORS AT THE UNIVERSITY OF THE WEST INDIES

Joy A. Harewood Cox

April 1, 2015

The study explored the relationships between student attributes and institutional experiences associated with re-enrollment status in first-year Caribbean students enrolled in science, technology, engineering, and mathematics (STEM) fields. The research was conducted during student's first semester at two campuses of the premier Caribbean university. The nature of academic advising and student's satisfaction with the advising process, a program perceived in the literature as contributing to student's persistence and retention, was also explored. This study tested the relevance of Tinto's (1993) Longitudinal Model of Institutional Departure to the Caribbean tertiary level education system. The study adopted a survey research design and binary logistic regression analysis was used to determine the effects of the independent variables on re-enrollment. The predictor variables included the campus that the student attended as well as student attributes (sex, race/ethnicity, secondary school academic achievement, degree aspiration, parental education, residency status, and financial concerns). Additionally, the institutional experiences predictor variables comprised student interaction with faculty, faculty concern for students, academic and intellectual development, institutional and

goal commitments, and peer-group interaction as measured by the Institutional Integration Scale (Pascarella & Terenzini, 1980). The binary outcome variable was students 'intent to re-enroll' in the university in the second semester.

The results indicated that the chances of a first-year student re-enrolling at the Cave Hill campus were greater than the chances of a student re-enrolling at the St. Augustine campus. The significant predictors of re-enrollment status for the second semester were secondary school science and math GPA, parental education, and student's institutional and goal commitments. Student's secondary school science and math GPA increases the chances that a student re-enrolls increase. On the other hand, as parental education increases, the probability that a student re-enrolls decreases. Furthermore, student's institutional and goal commitments are shown to increase the likelihood that a student re-enrolls. The nature of academic advising at both campuses was measured using the Academic Advising Inventory (Winston & Sandor, 2002). The outcomes deemed that the faculty advising approaches at both campuses were more related to prescriptive learning for personalizing education items but developmental advising-teaching for items describing academic decision-making and selecting courses. Students seemed to be dissatisfied with the overall academic advising process. Implications for practice and future research were also considered.

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CHAPTER 1

INTRODUCTION

Retention, persistence, and student success are pressing issues at many universities globally. Student participation in higher education institutions is expanding considerably in the United Kingdom and there is a dynamic movement towards increased student access and increased student involvement in Australia. These events generate intense interest and activities intending to improve retention rates of undergraduate students in colleges and universities (Yorke & Longden, 2004). In higher education in the United States (U.S.), retention and student success rates have been important (particularly as state performance indicators) and have created a long-standing challenge to colleges and universities (Braxton, 2006; Yorke & Longden, 2004).

According to the Organization for Economic Co-operation and Development (OECD, 2014), only 39% of young adults between the ages of 25 and 34 have completed tertiary education worldwide. At the University of the West Indies (UWI), the premier University in the Caribbean, Paterson and Gordon (2010) conducted a study on full-time, first degree entrants, and found that the six-year graduation or *throughput* rate (2001-2007) ranged from 68.5% in Pure and Applied Sciences to 94.5% in Education. This rate appears higher than in the U.S. where 59% of all undergraduates who began their studies in a four-year university in the 2005-2006 academic year graduated with a bachelor's degree within six years (National Center for Educational Statistics [NCES], 2014). In spite of this positivity, the UWI attrition rates, explained by student voluntary

withdrawal, have been increasing over the last decade, and this trend is cause for concern (Paterson & Gordon, 2010; Tewarie, 2010a). When students withdraw from a university it not only has a personal impact on the individual but it affects the institution and has financial consequences for the economy and society through the loss of prospective knowledge and skills (Crosling, Heagney, & Thomas, 2009). In some countries, for example, Denmark, and some U.S. states (Florida, Indiana, and Tennessee) policy makers use retention and graduation rates as an indicator of student performance for funding institutions (Jongbloed & Vossensteyn, 2001). Subsequently, retention of students in tertiary education is seen as one student outcome which benefits all stakeholders: students, parents, faculty, administrators, student affairs professionals, and policy makers (Astin & Oseguera, 2012). By enhancing student retention in tertiary education, more students are prepared for a challenging and more dynamic world of work.

Chapter one examines the rationale for the study and describes the research setting and the concept of tertiary education in the Caribbean. Following is the problem statement, conceptual framework, purpose statement, research questions, and definitions of terms. Finally, an overview of the study is presented.

Rationale for Study

Research on retention has provided a great deal of insight on student persistence in the U.S. and the factors that contribute to it (Astin & Oseguera, 2012; Braxton & Hirschy, 2005; Pascarella & Terenzini, 1980; Tinto, 1985, 1993), but there seems to be very little research conducted on the status of retention at any of the four campuses of the University of the West Indies (UWI). In the Caribbean, having a university degree is a

means to social mobility and access to economic capital, not only for the individual but for their future generations (Gordon, 1987; Pascarella & Terenzini, 2005). Completing a university degree will increase the likelihood of maintaining a well-paid job (Baum, Ma, & Payea, 2013; Tinto, 2012). Additionally, tertiary education is a public good. The Caribbean governments have adopted a human capital approach to higher education and perceive that the success of their national economies is contingent on the degree to which their labor force is educated (Yorke & Longden, 2004). In the Caribbean, shifting to a science and technology based economy will bring great advantages to the developing nations (Vision 2020, 2013). Knowledge in science, technology, engineering and mathematics (known collectively as STEM) fields is seen as a factor for rapid economic and industrial growth: creating jobs, a wealthy society, and promoting sustainable human capital (Vision 2020, 2003). However, the ability to maintain a highly educated society will depend on the ability of the regional universities to graduate highly qualified citizens, particularly in STEM fields. Research has shown that as more citizens are educated, it stimulates the economy and benefits society since more tax revenue and economic activities are generated (Perna, 2006). Educated individuals require fewer social services, civic responsibility increases, and there is reduced criminal activity (Perna, 2006). Education also provides trained workers needed to keep the Caribbean competitive on the global and money market.

From the institutional perspective, being able to predict the chances that a student will return to the institution and complete a degree, and to control the types of programs or services to offer the student are quite valuable. According to Tewarie (2010a), high student attrition rates present challenges for the UWI since government financial support

is an issue on some campuses; therefore, if those campuses lose tuition dollars they may be deemed “at risk”. Also, high attrition rates may indicate institutional academic failure or student dissatisfaction with their experiences at the institution. Consequently, student retention is essential for “financial stability and to sustain academic programs” (Tewarie, 2010a, p.1).

Tertiary Education in the Anglophone Caribbean

Similar to higher education in the U.S., tertiary education in the Caribbean is “voluntary in nature, androgogical, and student centered in orientation, and caters to the intellectual, social and occupational needs of young and adult learners, preparing them to function as productive and adaptive citizens in a global environment” (Roberts, 2002, p. 2). Tertiary education in the Caribbean has also been influenced by elitism, decentralization, globalization, and technology (Roberts, 2003). However, there are many differences between the U.S. educational system and that in the Anglophone (English-speaking) Caribbean since the latter is fashioned after the British educational system.

One of the main differences is access to secondary school, college, and university. Throughout the Anglophone Caribbean, students are required to take an examination commonly known as the Common Entrance Examination or the Secondary Entrance Assessment at the end of their primary school education at the ages of 10-11 years, which grants them access to secondary education. Secondary education is mandatory for students 11-16 years old for five years, at the end of which students take the Caribbean Secondary Education Certification (CSEC), prepared by the Caribbean Examination Council (CXC). Students can receive a grade from one to six on the CSEC examination,

where grades one, two, and three are considered a passing grade, with a grade one showing that they have a comprehensive understanding of the concepts, knowledge, skills and competencies in the subject area (CXC, 2014).

On completing their CXC, CSEC examinations, students then have the option to continue for two additional years in a “sixth form”, equivalent to grades 11 and 12, and take the Caribbean Advanced Proficiency Examination (CAPE), also prepared by CXC or they can continue their education in a tertiary institution. In Barbados, where there are 23 public and 7 private secondary schools, but only four of them have a sixth form, entrance to a sixth form school is competitive, and most students planning to continue their education attend the Barbados Community College first and attain an associate degree. Therefore, the role of a community college in the Caribbean tertiary education system differs from its role in the United States. In the U.S. community college students tend to be nontraditional, part-time enrolled, working, first-generation, and mainly commuters, while in the Caribbean, where most students complete their secondary education at age 16 (grade 10), community college students are usually traditional aged (16-24 years), full-time students. Community colleges provide a transition stage to university.

To be admitted to the UWI as an undergraduate, matriculation requires students to have at least five acceptable passes in CXC, CSEC examinations, including English Language and either Foreign Language or Mathematics and two approved science subjects. Students entering with only these requirements commence their program with preliminary courses. However, as previously mentioned, most students enter the UWI after attending a sixth form school or community college. Normal matriculation requires passes in five subjects of which at least two must be in CXC, CAPE or an associate

degree from an approved Caribbean tertiary level institution with a minimum GPA of 2.5 (UWI, St. Augustine, 2014). The typical first year student at the UWI is therefore not a first-time college “freshman”. According to U.S. classification, these students are first year, transfer students.

Another major difference between the educational systems in the U.S. and the Caribbean relates to how tertiary education is financed. In the U.S. financing higher education is the responsibility of students and their families or they rely on federal and state financial aid in the form of grants and loans. In Trinidad and Tobago the government subsidizes students’ tertiary education by paying students’ full tuition. Students at the Cave Hill and St. Augustine campuses have benefited from free tuition for over five decades. However, beginning in the first semester, 2014, all students at the UWI, Cave Hill campus were asked to pay the full tuition fees as well. In Barbados, the situation has therefore become similar to that in the U.S. However, financial assistance in Barbados is currently mainly in the form of student revolving loans. Scholarships and grants awarded are currently merit-based more so than needs-based.

The Research Setting

The University of the West Indies (UWI) serves the Anglophone (English speaking) Caribbean region and is comprised of four campuses. The University College, established in 1948 at Mona, Jamaica, was the first campus of the University of the West Indies. It was established as a public institution with a special relationship with the University of London, England (Roberts, 2003). Later, campuses were established at St. Augustine, Trinidad and Tobago in 1960 and at Cave Hill, Barbados in 1962. Today, the

University of the West Indies is comprised of these three main campuses and one Open Campus in Antigua and Barbuda that serves students online (Roberts, 2003; UWI, 2014).

The mission of the UWI is: “To advance education and create knowledge through excellence in teaching, research, innovation, public service, intellectual leadership and outreach in order to support the inclusive (social, economic, political, cultural, environmental) development of the Caribbean region and beyond” (UWI, 2014, para. 6). The campuses of the university have institutional accreditation with national accreditation agencies. Currently, three fully functioning agencies exist. These agencies are the Accreditation Council of Trinidad and Tobago, the Barbados Accreditation Council, and the University Council of Jamaica (UWI, 2014). The UWI was ranked in the top seven percent of 12,000 universities in the world (UWI stats, 2010).

At the UWI, the sticker price of an undergraduate degree program is composed of economic cost, a tuition fee, and university registration fees (UWI, 2014). The four campuses are funded jointly by the governments of the 17 contributing countries. However, the payment of tuition fees differs between the governments of the contributing nations. At the St. Augustine campus, the economic cost is 100% of the cost of the academic programs and is paid by the government. On the other hand, at the Cave Hill campus in Barbados, the tuition fee constitutes 20% of the total cost of academic programs. The remaining 80% is called the ‘economic cost’ and is paid by the government. Most other territories normally sponsor their citizens by paying their economic cost including tuition fee while students are only required to pay university fees. These university fees may include student guild fees, amenities fees, and a charge

for an identification card. Amenities include facilities and services such as computer labs, wireless facilities, health facilities, and scheduled bus service.

Traditionally, each of the UWI campuses had specialized in a particular major. At the Mona campus, that area of focus was Medical Sciences, at St. Augustine campus – Engineering, and at the Cave Hill campus - Law. However, recently a College of Medical Science has been established in Barbados as well as Trinidad and Tobago. The UWI is considered a regional university since 98% of UWI students are from the 17 Caribbean contributing nations. Students relocate to the particular campus to pursue their degree in those specific fields. Consequently, decreasing retention at any of these universities will adversely affect the entire Caribbean region. For practical and logistical reasons, this study focused on two of the three main campuses: St. Augustine in Trinidad and Tobago and Cave Hill in Barbados.

Table 1 shows a comparison of the demographic profiles of the two countries. As displayed in Table 1, Caribbean societies are generally small and multiracial. Gordon (1987) argued that Caribbean societies are based on class stratification: upper class, middle class, and working class. Though based on the original plantation model, class stratification still applies to contemporary Caribbean societies (Gordon, 1987). In this model, the upper class were traditionally Caucasian and owned wealth which was a means of political power; the middle class were *mulatto* (mixed), usually educated, owned some wealth, but lacked political power; while the working class were the Blacks, who lacked wealth and political power. Smith (1965) argues that most Caribbean societies are plural societies where division is not along class. However, significant cultural diversity exists, and social inequality occurs between ethnic groups. Smith points

out that the factors color, culture, economic background, and education influence an individual's position within the social strata.

Table 1

Demographic Profiles of Barbados versus Trinidad and Tobago (2013)

	Barbados	Trinidad and Tobago
Population	288,725	1,225,225
Urbanization	44%	14%
Ethnic group	Black 93%	East Indian 40%
	White 3.2%	Black 37.5%
	Mixed 2.6%	Mixed 20.5%
	East Indian 1%	Other 1.2%
	Other 0.2%	Unspecified 0.8%
*Literacy	99.7%	98.8%

Note₁: Adapted from “Barbados Demographic Profile 2013,” by Index Mundi, 2013a and “Trinidad and Tobago Profile 2013,” by Index Mundi, 2013b.

Note₂: *Definition of literacy is individuals who are 15 years and over who can read and write.

At the UWI, the student demand for admission surpasses the number of available places; therefore, the university is highly selective. For example, in the 2009-2010 academic year, 20,627 qualified applicants matriculated in the university system but only 9,374 (47%) were admitted to specific schools or academic programs (UWI stats, 2010). A student may satisfy general entry requirements to the university but these may be below the requirements stipulated by the faculty in a particular department or school. If so, the student may fail to matriculate into his or her preferred academic program. There is a steady demand from the better performing students at the secondary level for

available places (UWI stats, 2010). As such, the students at UWI tend to be high achievers, the faculty members have rigorous expectations of students, and the institution is highly competitive (Roberts, 2003). According to Braxton and Hirschy (2005), high selectivity in the admissions process and perceived success of graduates contribute to cultural capital. Additionally, researchers found that institutions which are highly selective had the highest rate of retention when controlling for other predictors of student persistence (Astin, 1993; Astin, 2005; Bean, 2005; Titus, 2004). Astin (1993) felt that at highly selective universities, students motivate each other, during peer-groups interaction, towards high aspirations. In fact, Astin and Oseguera (2005) believed that peer-group motivation in selective institutions is so important that if students contemplated stopping out, their peers would convince them to reconsider. However, Astin (2005) found that even among institutions with similar selectivity, there was a significant disparity in degree attainment rates.

The Saint Augustine Campus

The UWI, St. Augustine, offers undergraduate and postgraduate certificates, diploma and degree options in six colleges and schools or faculties: Engineering; Humanities, and Education; Medical Sciences; Science and Technology; Food and Agriculture; and Social Sciences. The majors offered in Science and Technology at UWI, St. Augustine are Biochemistry, Biology, Chemistry, Computer Science, Ecology, Electronics, Information Technology, Mathematics, Microbiology, and Physics. Medical Science offers one major-Medicine. St. Augustine has the largest student enrollment of all UWI institutions of approximately 17,500 students of whom approximately 3,500 are first-years (UWI, St. Augustine, 2014). St. Augustine graduates approximately 4,000

undergraduates annually, but enrollment in science and technology fields decreased from 51% in 2000 to 48% in 2010 (UWI stats, 2010; UWI, St. Augustine, 2014). Additionally, in the 2008-2009 academic year St. Augustine campus had the highest attrition rate of the three campuses. Approximately 14% of their first-year students did not return for the 2009-2010 academic year (Tewarie, 2010a). The undergraduate degrees are generally three-year programs and the professional programs, medical sciences and engineering for example, are five years. However, the institution has seen a recent trend in which undergraduate students are completing their programs two or more years after their expected graduation time (Paterson & Gordon, 2010).

The Cave Hill Campus

The UWI, Cave Hill, Barbados, is the smallest of the three campuses with a student enrollment of about 9,500 of whom approximately 2,000 are first-year students. The campus houses five faculties (colleges and schools): Humanities and Education; Science and Technology; Social Sciences; Medical Science, and their main area of focus, Law (UWI, Cave Hill, 2014). Science and Technology is comprised of two departments, namely the Department of Biological and Chemical Science and Department of Computer Science, Math, and Physics. The degrees offered are generally three years programs. However, like at St. Augustine, some first year Cave Hill students may take preliminary courses, depending on whether they were admitted to the university directly from secondary school or from another tertiary institution such as the Barbados Community College. The majors offered in Science and Technology are similar to those offered at St. Augustine. Also, the Cave Hill campus has seen a decline in students enrolled in the science and technology fields over the past decade (25% of the total

enrollment in 2000 to 17% in 2010). Approximately 10% of their first-year students did not return for the 2009-2010 academic year (Tewarie, 2010a).

Comparison of the St. Augustine and Cave Hill Campuses

The two UWI campuses studied are similar in governance, selectivity, and students' age and sex, but they differ in size, STEM enrollment, financial support, as well as race/culture/ethnicities. Currently, the major difference between the two institutions is that from the fall semester, 2014, the Government of Barbados has asked students to be responsible for the full payment of the tuition fees for their program of study (Henry, 2014), while in Trinidad and Tobago the government continues to finance 100% of student tuition. According to Madden (2014) all five faculties (colleges and schools) at UWI, Cave Hill have recorded declines in first year enrollment for the 2014-2015 academic year. Science and Technology has reported a 13% decrease in enrollment from 331 in 2013 to 289 in 2014 and Medical Science has a total enrollment of 51 compared to 64 for 2013. Madden (2014) article states, "An official from the UWI has blamed the noticeable fall off on the Government's decision to have students pay their full tuition cost from September" (p. 2).

First Year Student Retention

The first year of college has been viewed as the most overwhelming year for first time college students and the year in which student voluntary departure is the highest (Habley & McClanahan, 2004; Pascarella & Terenzini, 1978; Tinto, 2012). Tinto (2012) argued that there are four conditions that encourage student retention in this critical first year of college. These are expectations, support, feedback, and involvement. First, first

year students attending institutions that have high and clear expectations for student achievement are more likely to persist and graduate; second, the availability of academic and social support promotes retention; third, students are more likely to persist and graduate in institutions that provide feedback about their performance; and fourth, the more involved or engaged first year students are with faculty, staff, and peers, the more likely they are to persist and attain a degree (academic and social integration). In this study, since the typical first year student at the UWI may not be a first-time college student but a first year, transfer student Tinto's (2012) four conditions may need to be modified to this unique Caribbean student population.

Additionally, Wardley, Bélanger, and Leonard (2013) found that first year students' voluntary withdrawal from an institution can be related to students' perception of the university created through advertisement and marketing prior to attendance, and to the university's environment in terms of what they actually offer and deliver. Dissonance between expectations and realities is positively related to attrition. Consequently, if administrators are able to identify the areas of institutional culture that are most closely associated with retention and persistence in the students' first year of college, they will be able to modify and develop their policies and programs to fit the students' needs and expectation, as well as reduce the revenue and institutional resources related to student departure and the extra cost associated with recruiting new students (Habley & McClanahan, 2004; Pascarella & Terenzini, 1978; Tinto, 2012). Furthermore, research has shown that it is better, financially, to retain students than to recruit new students (Schultz, Dickman, Campbell, & Snow, 1992).

The time students take to attain a college degree is cause for concern. According to the *National Center for Education Statistics* (NCES, 2014), 57% of first-time, full-time students who began seeking a bachelor's degree at a 4-year public institution in fall 2006 completed the degree at that institution within six years (para. 2). Generally speaking, medical science and engineering degrees require more than four years of full-time study, but most regular STEM full-time students are also taking at least six years to earn a three or four-year degree (Tinto, 2012). There is a great deal of literature and statistics on student retention and persistence in the U.S. but very little research has been done on this topic at the UWI. The data presented may not be a perfect correlation to the UWI but it provides some context and bolsters the need for this study.

Problem Statement

The number of students returning to the UWI after their first year in science and technology fields has recently decreased annually. Overall, 11% of the student body admitted at the UWI in the 2009-2010 academic year did not resume their studies in fall 2010. The difference was three percentage points higher than the 2008-2009 first year cohort with Pure and Applied Science having the highest student attrition rate (19%) for the fall 2010 semester (Tewarie, 2010a; Tewarie, 2010b).

Research in the U.S. has shown that undergraduate students who declare a major in science, technology, engineering, and mathematics (STEM) are more likely to stop out of the university than students declaring other majors (Chen, 2013; Shaw & Barbuti, 2010). Chen (2013) found that about one-half (48%) of the students who declared a STEM major in their first year at a 4-year institution switched to another non STEM

major over their next six years. Furthermore, 25% of these students dropped out of college without earning a degree or certificate. This percentage varied across the STEM areas from 38% amongst math majors to 59% amongst computer/information technology majors (Chen, 2013). Additionally, only 27% of the students who entered in the STEM fields graduated with a bachelor's degree in that major (Chen, 2013).

Consequently, student departure from the university after the first semester reflects a loss of the individual's time and talent, institutional resources, as well as a national economic loss (Reason, Terenzini, & Domingo, 2006). The UWI functions as a regional entity and impacts the human resource development and public policy needs of the region. It cost the UWI over BD\$851 million (US\$425.5 million) to educate over 46,000 tertiary level students during the 2009-2010 academic year. The significant contribution of the regional governments was just over BD\$460 million (US\$230 million) or 51% of the total expenditure (UWI Stats, 2010). At the St. Augustine campus, the expenditure of tertiary education was TT\$991.5 (US\$165) million, and the government contributed 48% (UWI St. Augustine, Annual Report, 2013). Subsequently, at St. Augustine, where the local students' tuition is paid by the government of Trinidad and Tobago, retention is very significant because when a student stops out, that 'human resource' is not being utilized to its full potential. In addition, according to the UWI Strategic Plan (2013), a SWOT analysis identified a declining average student entry scores as a threat to the institutions since this will likely negatively affect the University's retention rates.

At the UWI, Cave Hill where the government of Barbados has asked all students to pay full tuition from the first semester, 2014 the financial changes may impact first-

year students' decision to return to the institution in their second semester. Additionally, UWI has a policy that no student who is working for more than 12 hours weekly may enroll as a full-time student (UWI, Cave Hill, 2014-2015). In the literature, financial concerns were found to be the single most important enrollment variable that influenced whether first-year students re-enrolled in the university in the U.S. (Cabrera, Stampen, & Hansen, 1990; Murdock, 1987; Tinto, 2012).

Additionally, a first year retention study conducted by the Pro-Vice Chancellor for Planning and Development at UWI found that approximately 22-23% of students surveyed at each on-campus institution identified inadequate academic advising as a factor influencing their decision not to return to the institution after completing their first year (Tewarie, 2010a). Research has shown that academic advising positively impacts student persistence and subsequently retention (Cuseo, 2002; Habley & McClanahan, 2004; Nutt, 2003). Academic advising is perceived as the only structured activity on a campus in which students have the opportunity for that one-to-one interaction to develop a relationship with a person who is interested in their success (Drake, 2011; Nutt, 2003). "Good advising may be the single most underestimated characteristic of a successful college experience" (Light, 2001, p. 81).

At UWI, the purpose of academic advising is:

To help students, particularly new students, in planning, monitoring and successfully managing their chosen field of study, in relation to clear career objectives. Students are guided to accept responsibility for their learning, to be informed of the services provided for them, to access information, and to be managers of their time (UWI, 2014, para.1).

According to Drake (2011), “academic advising is more than clerical recordkeeping; it is the very human art of building relationships with students and helping them connect with their personal strengths and interest with their academic and life goals” (p. 10).

At the UWI, students’ transitioning from secondary school to the university were deemed underprepared for the demands of their specific program and this contributed to subsequent withdrawal from the program (Tewarie, 2010a). In the recent literature, students’ secondary school achievement has been linked to retention and persistence in college (Astin, 1993; Pascarella & Terenzini, 2005; Tinto, 1993). Reason (2009) stated that a rigorous secondary school curriculum is a strong predictor of a students’ persistence in college. He also noted that this is particularly reflected in the students’ first years in college.

The two UWI campuses, St. Augustine and Cave Hill, differ in relations to the sex of their STEM students, the race/ethnicity of the student population and the source of funding for student tuition. First, at UWI, Cave Hill campus, females predominate in all departments including science and technology in a 2:1 ratio (UWI stats, 2010), while at St. Augustine, males are the majority in Engineering, and this skews the male to female ratio in STEM fields at this institution to a 1:1 ratio (UWI stats, 2010; UWI, St. Augustine Stats, 2012-2013). Second, the race/ethnicity at each institution should reflect the population of the country. In Trinidad, the East Indian race makes up the majority, while in Barbados, the Black race predominates. Third, due to the new stipulations at Cave Hill campus, students attending Cave Hill in first semester, 2014 experienced different financial concerns from first year students at St. Augustine.

To explore these problems, a study was conducted during the first semester, 2014 at the two campuses of the UWI. A survey was administered to determine the characteristics, attitudes, and perceptions of first-time degree seeking freshman who declared a major in a STEM field in first semester, 2014. Retention rates were perceived as an indicator of student success and measured by the students' intent to return and re-enroll at the UWI for the second semester. This study differs from other studies since it examines student attitudes and perceptions on retention status at the largest university system in the Caribbean and explores students' concerns about institutional practices. The study contributes to a gap in the literature since there is very little research on this topic at UWI or in the Caribbean region, so this study is a pioneering study and provides a foundation for other researchers.

Conceptual Framework

Since the study examined the perceptions of first year, STEM students as they relate to student retention at the University of the West Indies (UWI), it is appropriate to view the study through the lens of a Caribbean cultural identity. Kuh and Love (2000) posit that students' decision to withdraw from a university is facilitated by the students' "cultural meaning-making system" (p. 201). Hall (2001) argues that the Caribbean identity is a hybrid of various cultures and is grounded in the *survival* and *assimilation* of its peoples. Consequently, the perception and attitudes of Caribbean youths will differ from youths in the U.S. in relation to educational norms, advising and counseling, and educational goals and achievement.

Additionally, since student departure from tertiary institutions is described as an ill-structured problem (Braxton & Mundy, 2001-2002), a phenomenon which cannot be explained by a single theory or model, the study utilizes a framework with two theoretical models to predict student retention from an institutional perspective. Tinto's (1993) *Longitudinal Model of Institutional Departure* is used as the context for understanding student departure. Researchers have at least partially supported the predictive validity of Tinto's (1993) model by operationalizing the main postulates of the theory and predicting students' decision to re-enroll in the institution (Braxton & Hirschy, 2005; Caison, 2007; Pascarella & Terenzini, 1980). Pascarella and Terenzini (1980) identified faculty as the main factor of students' institutional integration. Students' interaction with faculty and their perception of the level of faculty concern were found to be the strongest contributor to students' decision to re-enroll. Second, Crookston's (1994) *Advising as Teaching* model addresses one institutionally developed activity, faculty advising, that a student can access prior to his or her decision to voluntarily withdraw from the institution.

Figure 1 illustrates a conceptual model for the study. The model asserts that first year students at the university commence college with certain traits and influences including students' background characteristics (sex, race/ethnicity, secondary school academic achievement, secondary school science and math grades, degree aspiration, parental education), and enrollment factors (enrollment status, residency status, financial concerns) which impact how they will integrate academically (faculty interactions and concern for student development, academic and intellectual development, academic advising) and socially (peer-group interactions). Along with their institutional and goal commitments (importance of attending and graduating from UWI), these traits will

impact student's decision to persist or voluntarily withdraw from the university which is defined in this study by the student's "intent to return or re-enroll."

Figure 1: Conceptual Model for First Year STEM Caribbean Students' Institutional Departure

Purpose Statement

The purposes of this study are twofold; first, to examine the students' attributes and the institutional experiences that contribute to retention of first year, Caribbean students in science, technology, engineering and mathematics (STEM) majors during the first semester, 2014. Secondly, this study seeks to determine the nature of and student satisfaction with the academic advising students received during their 2014 semester.

Research Questions

The research questions in the study are:

1. Does the campus attended predict intent to re-enroll at the two UWI campuses: St. Augustine and Cave Hill, in first year STEM students?
2. What student attributes are associated with intent to re-enroll the following semester in first year STEM students at the UWI: St. Augustine and Cave Hill, controlling for campus?
3. What institutional experiences are associated with intent to re-enroll the following semester in first year STEM students at the UWI: St. Augustine and Cave Hill, controlling for campus?
4. What perceptions do first year STEM students at the UWI have about the type of academic advising they received?
 - a. The nature of academic advising on a developmental-prescriptive continuum.
 - b. Students' satisfaction with academic advising.

Definition of Terms

In order to facilitate a greater understanding of the study, operational definitions of key terms and concepts have been provided below.

Academic Advising

Academic advising refers to “the situations in which an institutional representative gives insight or direction to a student about an academic, social or personal matter. The nature of this direction may be to inform, suggest, counsel, discipline, coach, mentor or teach” (Kuhn, 2008, p. 3).

Anglophone Caribbean

The Anglophone Caribbean is the English-speaking Caribbean, especially where one or more language is spoken. The Anglophone Caribbean includes Anguilla, Antigua, Bahamas, Barbados, Belize, British Virgin Islands, Cayman Islands, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Trinidad and Tobago, and Turks and Caicos (Roberts, 2003, p. 3).

Archipelago

An archipelago is a “string of related, but not necessarily connected, geographically and social pods in physical proximity” (Evans, Forney, Guido, Patton, & Renn, 2010, p. 285). In this study it is also used as a metaphor for Caribbean identity (Hall, 2001).

Attrition

Attrition is the act of a student who fails to re-enroll at a tertiary level institution in consecutive semesters (Berger, Ramírez, & Lyons, 2012).

Caribbean Contributing Countries

Member countries of the English speaking Caribbean that contributes to the finances of the University of West Indies (UWI Stats, 2010). The 17 territories are Anguilla, Antigua, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Dominica, Grenada, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent, Trinidad and Tobago, and Turks and Caicos (UWI, 2014).

Cultural Capital

Cultural capital refers to the resources such as language skills, cultural knowledge and manners derived in part from one's parents as well as educational credentials, which can be used to maintain and advance an individual's social status (Bourdieu, 1986).

Developmental Advising

Developmental advising is “a systematic process based on a close student-advisor relationship intended to aid students in achieving educational, career, and personal goals through the utilization of the full range of institutional and community resources” (Winston, Miller, Ender, Grites, & Associates, 1984, p. 19).

Faculty

At the University of the West Indies, the Faculty is comprised of the colleges or schools, their departments, and faculty members.

Faculty-Only Advising Model

In a faculty-only model, all students are “assigned to an institutional faculty member for advising. There is no advising office” (Kuhn, 2008, p. 7). In contrast, some universities employ academic advisors with administrative appointments.

Full-time Student

At the UWI, registered students who carry the full course load associated with their university program for the academic year are considered full-time (UWI stats, 2010, p. 11). This is not associated with a credit hour as observed in the U.S. system.

Human Capital

Human capital is the personal investment in education, training or other types of learning opportunities which contribute to an individual's economic investment (time, money, energy) (Becker, 1964).

Institutional Accreditation

Institutional accreditation is an external peer evaluation process which an institution undergoes under the umbrella of a recognized accreditation agency. It is also a status conferred or the outcome of the evaluation process (UWI, 2014).

Matriculation

Matriculation means to enroll as a member of a university, but not necessarily all academic units. "A student may satisfy matriculation requirements for the University but may not equal to the demands of the Department and faculty" (UWI Stats, 2010, p. 4).

Part-time Student

At the UWI, registered students who carry less than the full course load associated with their program for the academic year are considered part-time (UWI stats, 2010, p. 11). Part-time refers to the number of courses taken rather than the time of day and is not associated with a credit hour as observed in the U.S. system.

Persistence

Persistence refers to the desire and action of students to stay within the system of higher education from beginning year to degree completion (Berger, Ramírez, & Lyons, 2012, p. 12).

Rastafarianism

Rastafarianism is a Black conscious movement amongst the Afro Caribbean people. The term refers to both a religious group and a social conscious group (Hall, 2001).

Retention

Retention refers to the ability of an institution to retain a student from admission through graduation completion (Berger, Ramírez, & Lyons, 2012, p. 12).

STEM

STEM stands for science, technology, engineering, and mathematics majors. Science and engineer majors are students enrolled in one or more of the following two categories: physical, mathematical, and engineering science, or life science and allied health (Vision 2020, 2003). Technology refers to the students enrolled in computer science and information technology.

Social Capital

Social capital focuses on how individuals acquire forms of capital through their membership in social network, norms and social trust that facilitate coordination and cooperation for mutual benefit through their relationships with faculty, advisors and peers (Bourdieu, 1986). Social capital differs from cultural capital

and human capital in that it emphasizes the value of social networks as opposed to social mobility or economic value.

Stop Out

A 'stop out' refers to a student who temporarily withdraws from an institution or system (Berger, Ramírez, & Lyons, 2012, p. 12). It does not include students who were forced to leave for academic reasons (Tinto, 2012).

Student Success

Student success is defined using measures of academic achievement and degree attainment. It can also be defined by the degree to which students are satisfied with their educational experience and feel comfortable and affirmed in their learning environment (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006).

Tertiary Education

The third stage of education which builds on secondary education (Roberts, 2003).

Throughput Rate

The term throughput rate is used at the University of the West Indies to refer generally to the academic progression of students from entry to graduation. It is a *time-to-degree* measure much like the federally prescribed (NCES) graduation rate in the United States (Paterson & Gordon, 2010, p. 5).

Overview

This study focuses on retention factors in two UWI campuses: St. Augustine and Cave Hill for students declaring a Science, Technology, Engineering, or Mathematics (STEM) major. The study is organized into five chapters, references, and appendices. Chapter 2 presents a review of the literature and a synthesis of recent articles on issues and concerns relating to student persistence and retention in a university setting. Chapter 3 outlines the methodology and research design of the study. It describes the population and determination of the sample, the instruments used to collect the data, and the procedures for collecting the data. Chapter 4 contains an analysis and a discussion of the findings. The final chapter presents a summary and conclusions of the study as well as recommendations for future research and implications for practice.

CHAPTER 2

LITERATURE REVIEW

The transition to university from either secondary school or community college is usually challenging for first year students generally, but especially for first year students declaring science, technology, engineering and mathematics (STEM) major (Chen, 2013). First year students enter the university with expectations and preferences about their first year at a university which may be based on secondary school achievement or information from parents, peers, marketing, or society. However, these expectations may be altered by their first year experiences, including academic advising, and this may influence students' decision to return to the university after the first semester. Tinto (2012) states that once a university has admitted a student, it has the obligation to do whatever it can to help the student stay and graduate.

This study examined the relationship between first year students' characteristics and institutional experiences associated with retention in first year students declaring STEM majors. The study utilizes the theory of student departure described by Tinto's (1993) *Longitudinal Model of Institutional Departure* as the conceptual framework in the Caribbean tertiary education system.

Conceptual Framework

Tinto's theory of student departure (1975) is regarded as seminal in student retention research and has formed the framework for many studies. It is viewed as "the most studied, tested, revised and critiqued in the literature" (Braxton & Hirschy, 2005, p. 66). A *Google scholar* search (26th July, 2014) showed that Tinto's theory was cited over 7,450 times in the literature. Informed by a Caribbean cultural perspective, the study used Tinto's model of student retention as the framework for understanding why first-year students stop out of the university.

Caribbean Cultural Identity

"The Caribbean is the original and the purest diaspora" (Hall, 2001, p. 28). Hall describes the cultural identity of the Caribbean people from a nationalist perspective, and this viewpoint is also used to understand the ethnic identity of the students in this study. The Caribbean islands form an 'archipelago' and the Anglophone Caribbean is viewed as a melting pot, since all the islands' inhabitants differ in terms of their ethnic composition, producing an interesting combination of inherited, physical features and traits on each island as well as different cultural traditions which reflect elements of the various colonizing cultures: British, Africans, Chinese, Indians, Portuguese, Syrians, Jews and Lebanese. In the process of combining cultures, a new distinctive culture developed called *creolization* (Evans, Forney, Guido, Patton, & Renn, 2010; Hall, 2001). Additionally, according to Hall (2001), every cultural characteristic has its own class, color, and race. In some islands however, a significant proportion of the population is mixed and biracial. This distinction is observed especially in Trinidad and Tobago where 20.5% of the population identifies as mixed.

Hall (2001) identifies two processes which contribute to Caribbean cultural identity. These are *survival* and *assimilation*. Survival of the Caribbean people, especially those that were enslaved, are described in the context of the retention of old customs, and cultural traits from Africa and “traditions that were retained in and through slavery, in plantations, in religion, partly in language, in folk customs, in music, in dance, in all forms of expressive culture that allowed men and women to survive the trauma of slavery” (Hall, 2001, p. 29). These cultures were developed within the English culture and Christian traditions, “always surrounded by the colonizing culture” but “retaining something of the connection” (Hall, 2001, p. 29) to the motherland. The second process is *assimilation* where Caribbean people strived to be the “Black Englishman” (Hall, 2001, p. 32). However, during the 1960s, Caribbean cultural identity evolved and its people became more conscious of their roots and the religions of the motherland, Africa including the religious beliefs and social consciousness of Rastafarianism (Evans et al., 2010; Hall, 2001).

The social structure of the Caribbean is basically a hierarchical one which has been influenced by colonialism. According to Gordon (1987), education has been a powerful factor in social mobility, producing the contemporary “middle class” in society. He argues however, that although some Blacks have moved up from the working class through education to the middle class, they will never attain “upper class” strata, and inequality continues to exist throughout the region. This factor may impact student retention in tertiary education since students from the upper class in society are more likely to have resources that may not be available to the student from the middle or working class.

In the last three decades, the Caribbean region has been exposed to American culture due to the influence of media, particularly television. American dress, foods, music, and means of communication are currently a part of Caribbean life. At the UWI, where over 50% of the undergraduate student population is 24 years and under, the culture of the millennial generation emerges. However, Caribbean youth have not completely lost their ancestral cultural identity. As such, the students' cultural identity and cultural capital may affect their perceptions of degree attainment, generally and institutional practices like advising, specifically. For example, in Caribbean cultures, students experiencing challenges may prefer to get advice from a priest, family member, or peer rather than from a faculty advisor or counselor. Jordan (1997) identifies this practice as cultural mistrust, where students (particularly Black women) are cautious of not only counselors but of the counseling process as a factor in advising or counseling. The researcher speculates whether Caribbean cultural identity and cultural capital affects students' decision to return to or stop out of college after their first semester.

Tinto's Model of Institutional Departure

Tinto's interactional model on student departure uses an adaptation of Durkheim's (1951) theory of suicide to explain attrition as the failure to be academically or socially integrated into a college or university (Tinto, 1975). Tinto argues that students enter the college and the academic and social integration students experience in college enhances each other. In Tinto's model, academic integration is defined as academic performance and interaction with faculty and/or peers while social integration relates to being involved with social subcultures, such as extra-curricular activities and socially interacting with faculty and/or peers. Academic and social integration are comprised of normative

congruence and structural integration. Normative congruence addresses the idea of fit where individuals question whether or not their value patterns fit with those of the college collectively while structural integration relates to how the student interacts with faculty, student affairs professionals, and peers in the institution (Tinto, 1975).

Tinto (1993) postulates that students enter the university with diverse background characteristics and goal commitments (highest degree expected, importance of graduating from college). These traits not only influence how the students will perform in college but also how they will interact with, and subsequently become integrated into the social and academic system of the university (Pascarella & Terenzini, 1980). Subsequently, the more the students' traits and the mission of the institution match, the greater will be the students' goal commitment (commitment to complete college) and institutional commitment (commitment to remain at their respective institution). Tinto (1993) made revisions to this model by including financial resources in student's pre-college characteristics and recognizing the role external commitments (family, work and community) play in students' decision to withdraw from the university. Tinto (1993) presents a longitudinal model of institutional departure (Figure 2) that focuses on the individual student and the concept of integration. He argues:

Individual departure from institutions can be viewed as arising out of a longitudinal process of interactions between an individual with given attributes, skills, financial resources, prior educational experiences, and dispositions (intentions and commitments) and other members of the academic and social systems of the institution. The individual's experience in those systems, as indicated by his/her intellectual (academic) and social (personal) integration,

continually modifies his or her intentions and commitments” (Tinto, 1993, pp. 113, 115).

Figure 2. Tinto's Longitudinal Model of Student Departure (1993)

Tinto's (1975, 1993) models yield 13 testable propositions which are logically interconnected, and collectively try to account for the individual student voluntary departure from the institution (Braxton, Hirschy, & McClendon, 2004). In a longitudinal study of first-year students at a large, independent, highly selective university, Pascarella and Terenzini (1980) explored the predictive validity of Tinto's academic and social integration propositions between freshmen students who persisted and those who stopped out voluntarily and developed a multidimensional instrument that was used to assess the major dimensions identified in Tinto's (1975) model. Subsequently, Pascarella and Terenzini developed the *Institutional Integration Scale (IIS)* with five subscales that

contributed to student persistence. The subscales were identified as peer-group interactions, interactions with faculty, faculty concern for student development and teaching, academic and intellectual development, and institutional and goal commitments. Pascarella and Terenzini (1980) found that these five constructs are useful in identifying potential stop out in first year students during the second semester of their freshman year.

Tinto's (1975) model of student departure has been criticized in the literature because it did not include the role of external factors (family approval, financial constraints, opportunity to transfer to another university, work) in shaping students' perceptions, and influencing the students' institutional commitment and decisions to voluntarily withdraw (Bean, 1982; Braxton & Hirschy, 2005; Cabrera, Castañeda, Nora, & Hengstler, 1992). Bean (1980, 1982) developed a model which claimed that students' withdrawal is analogous to turnover in work organizations. Bean's (1982) model identified factors external to the institution that influence students' satisfaction and subsequently decision to leave the institution. In this respect the Bean model appears stronger than Tinto's model. However, Tinto's (1993) and Bean's (1982) models have some features in common. They both postulate that student attributes influence student's stop out decision, the student's decision to persist or withdraw depends on a multifaceted set of interactions over time, and the individual's fit with the institution is crucial to student retention and persistence (Yorke, 1999). Another critique of Tinto's (1975, 1993) model is that it does not work equally well in all contexts and is not supported across all types of institutions (Braxton, Doyle, Hartley III, Hirschy, Jones, & McLendon, 2014).

However, the predictive value of the model's postulates has been tested for first year students in a highly selective university setting (Pascarella & Terenzini, 1980).

Student Attributes and Student Retention

Several pre-college experiences and entry characteristics have been shown in the literature to influence a student's decision to persist in college and complete a bachelor's degree (Astin & Oseguera, 2012; Pascarella & Terenzini, 2005; Tinto, 1993). These student attributes include student's background characteristics such as sex, race/ethnicity, secondary school academic achievement, secondary school math and science scores, degree aspiration, and parental education as well as enrollment factors such as residency status, and financial concerns.

Student Background Characteristics

The literature on the relationship between sex and student retention varies, especially as it pertains to STEM majors. According to Tinto (2012), "data from a six-year longitudinal study of students who began higher education in 1995 indicated that women earn bachelor's degrees more frequently than men (21.9% versus 19.6%)" (p. 2). Tinto (1993) posited that the institutional experiences of females are somewhat different from the male experiences, and female voluntary departure is more associated with social integration than academic integration. Additionally, Pascarella and Terenzini (1980) observed that the quality of peer-group interactions in the decision to stop out of the institution was more important in females than males. In the latter, institutional and goal commitments seemed to be more strongly related with the student's decision to stop out. In more recent studies, females generally had a higher graduation rate than males at

public universities (NCES, 2014). However, Whalen and Shelley (2010) presented evidence that the females in STEM majors were significantly less likely to persist than their male counterparts. Conversely, Chen (2013) added that more males (24%) than females (14%) seemed to withdraw from STEM majors because they stopped out of the university.

Similarly, student's race and ethnicity are depicted in the literature as factors influencing student retention (Tinto, 1993). Race is defined as "a family, tribe, people, or nation belonging to the same stock (Lee, 1997, p. 17). Although, this definition inherently addresses the concept of ethnic groups, ethnic relates to "large groups of people classified according to common racial, national, tribal, religious, linguistic, or cultural origin or background" (Lee, 1997, p. 17). Tinto (1993) posited that the more predominant race is generally linked positively with student retention in tertiary education. However, Berger (2000) suggested using cultural capital for studying student persistence. He posited that students with high social and cultural capital perceived college attendance and degree attainment as an entitlement. He argues, "Students with higher levels of cultural capital are more likely to persist, across all types of institutions, than are students with less access to cultural capital" (Berger, 2000, p. 114). Cultural capital (Bourdieu, 1986) helps define an individual's class in society. Wells (2008-2009) supported Berger's (2000) theory by examining the role of social and cultural capital in first year student's persistence in college and how race and ethnicity are related to initial levels of social and cultural capital. His findings suggested that there is a significantly positive association between student's prior social and cultural capital and student's persistence across all racial and ethnic groups. Additionally, Wells (2008-2009) noted that the variables which

contributed to the highest retention rates were higher parental education and peer interaction and the overall culture in which college attendance and degree attainment were perceived as a norm.

Research on student retention from an individual student perspective has shown that secondary school preparation and academic achievement were the strongest predictors to student persistence and retention in undergraduates, and students with stronger past academic performance and better grades were more likely to persist (Astin, 1985; Astin & Astin, 1992; Reason, 2009; Tinto, 1993, 2012), especially for students who declared a major in a STEM field (Astin & Oseguera, 2012; Chen, 2013; Shaw & Barbuti, 2010; Whalen & Shelly, 2010). Tinto (2012) hypothesized that students whose grade point average was greater than 3.25 (29.6%) were more likely to persist than students whose grade point average was less than 2.5 (7.5%).

In this study, the number of CSEC examinations that the student acquired in secondary school was used to determine secondary school academic achievement. Students who passed eight or more CSEC examinations were considered high achievers. Academic achievement in mathematics and science prior to entering the university was operationalized by the mean score obtained in CSEC biology, chemistry, physics, and mathematics. A mean score of three or above was used as an indicator of high achievement. In the literature, academic achievement in mathematics and science prior to entering the university, and achieving high scores in advanced placement examinations in STEM fields in secondary school were significantly associated with persistence across all STEM majors (Chen, 2013; Shaw & Barbuti, 2010). Chen (2013) stated that 41% of undergraduate students who did not take Algebra II, trigonometry, or any higher math

course in secondary school, was not only more likely to withdraw from their STEM majors, but to stop out of the university. Astin (1993) found that students attending a 4-year institution who entered the university with a strong past research focus were more likely to major in engineering.

The initial degree aspirations, goals, and values of students are also viewed in the literature as significant predictors of student persistence and retention (Astin & Oseguera, 2012; Shaw & Barbuti, 2010; Tinto, 1993). Students with higher degree aspiration or occupational aspirations were viewed as more likely to persist (Astin, 1975; Astin & Oseguera, 2012). Shaw and Barbuti (2010) observed that undergraduate students who expressed a goal of obtaining a doctorate were more likely to persist and graduate in a declared STEM field. They found that the greater the student's aspirations and goals, the higher the self-efficacy and motivation and the more likely the student was to re-enroll and graduate from the university.

Parental education has also been widely used in the research literature as a variable that is positively correlated with student persistence and retention since students with more educated parents were more likely to persist (Astin, 1975; Astin & Oseguera, 2012; Bean, 2005; Tinto, 1993, 2012). Tinto (2012) presented evidence that students from college-educated families (37%) were more likely to graduate from tertiary education than the first generation college student (12.2%). Generally, in the literature, first-generation college students were associated with lower GPA, had a decreased likelihood of persistence, and deemed "at-risk" for attrition (Chen, 2005; Jehangir, 2010; Pike & Kuh, 2005). Alternately, students whose parents had some college experience were more likely to receive support and encouragement from their family towards

graduating and this increased his or her chances of degree attainment (Horn & Carroll, 1998). This characteristic was even more evident in STEM majors. Chen (2013) stated that STEM students whose parents had only a secondary school degree stopped out of the university at a higher rate than students whose parents had some college experience. However, Ishitani (2006) suggested that the effects of first generation status may be alleviated by higher levels of academic preparation in secondary school.

In this study, parental education was used as an indicator for socioeconomic status (SES) since some of the measures used in the U.S. to define the SES variable, such as “items in the home, parental occupation, and family income” (Cabrera, Burkum, La Nasa, & Bibo, 2012, p. 196), did not adequately ‘fit’ the Caribbean context. For example, for family income, the currency used would be problematic because it would be difficult for students to convert between the three different currencies (U.S., Barbados, and Trinidad and Tobago) and the meaning of ‘family income’ as a variable varies from country to country.

Student Enrollment Factors

The student enrollment factor in the literature that was viewed as the most consistent with student persistence and degree attainment in undergraduates was student residency status (Astin, 1993; Astin & Oseguera, 2012; Pascarella & Terenzini, 1991). Astin and Oseguera (2012) reported that the chances of completing a bachelor’s degree are significantly improved if the student lived on campus in their first year of college. Students in STEM majors, especially, who lived on campus have a higher success rate than students who lived off campus (Pascarella & Terenzini, 2005; Whalen & Shelly, 2010). Students living on campus were more likely to participate in extracurricular

activities and form peer groups (social integration), which contributed to their persistence (Whalen & Shelley, 2010).

Financing college and its association with student persistence and degree attainment was traditionally portrayed in the literature with ambiguous conclusions (Cabrera, Stampen & Hansen, 1990; St. John, 2000). However, St. John (2000) argued that as government assistance decreased, student finances was then recognized as a critical factor in student persistence and further research discovered that finances does have an impact on student persistence and retention. St. John et al. (1994) found that tuition charges had a consistently negative influence on student persistence by traditional aged students in four-year colleges.

The variable finances have been measured in the literature by various indicators such as financial aid, socioeconomic status, student and parent's income, and student perception of their finances (Cabrera et al., 2012; Gross, Torres, & Zerquera, 2013; St. John, Andrieu, Oescher, & Starkey, 1994; Solomon & Gordon, 1981). However, similar to the SES indicators, these constructs are not defined in the Caribbean context. Consequently, in this study, the degree of financial concern was used as an indicator of student perception on finances (Pryor, Hurtado, De Angelo, Blake, & Trans, 2009; Solomon & Gordon, 1981). Solomon and Gordon (1981), in examining the field of study which students had the most concern about their abilities to finance college, found that the biological and science majors were the most concerned. They concluded that these concerns may be reflected by the long period of time that the student anticipated staying in a university. Pryor et al. (2009) found that more than half of first year students (55.4%) had 'some' concern about financing college and the concerns increased "2.2 percentages

points and continued to climb to its highest level since 1971” (p. 6). However, the literature connecting financial concerns and student persistence was very limited. Braxton and Hirschy (2005) found in residential colleges that the students who had ongoing financial concerns were less likely to be socially integrated into the institution.

Institutional Experiences

The broader construct of institutional experiences are comprised of social integration and academic integration, significant components of the student withdrawal process in tertiary education (Tinto, 1975, 1993). However, Pascarella and Terenzini (1980) included institutional and goal commitments to the student’s institutional experience in their model. Tinto (1993) suggested that students who are more engaged academically and socially in the university and more goals and institutionally committed are less likely to voluntarily withdraw from tertiary education than students who are less engaged and less committed.

Academic System and Student Retention

The academic system in the university is how a student interacts with academic resources and is associated with the formal and informal structures of the institution (Tinto, 1993). The ways in which a student interacts with the academic environment include student’s interaction with faculty, academic and intellectual development, and academic advising (Bean, 2005; Pascarella & Terenzini, 1980; Tinto, 1993). Bean argues that “the combination of the student’s background, interaction with the institution related to academic matters, and a belief in one’s ability to perform academic work have a cumulative mutual influence resulting in academic integration” (p. 226).

Faculty interactions and concern for student development. Tinto (1993)

suggested that out- of- classroom interactions between students and faculty members had a great effect on students who were considering withdrawing from the institution.

Pascarella and Terenzini (1980) found that items designed to assess the quality of student's interaction with faculty, separated into two factors: interaction with faculty and faculty concerns for student development and teaching.

Student's interaction with faculty focused on faculty's availability to students and the impact of student-faculty informal contact (Pascarella & Terenzini, 1980). The researchers presented evidence that there is a significant relationship between the frequency of student-faculty contact outside the classroom and student persistence to the second year of college. The more frequently student-faculty interaction occurred, the more likely students were to remain at the institution (Bean, 2005). Pascarella and Terenzini (1980) concluded that, "the quality and impact of student-faculty informal contacts may be as important to students' institutional integration, and thereby, their likelihood of persisting in college as the frequency with which such interactions occur" (p. 72).

Student contact with faculty was also viewed as having a direct positive relationship to learning, academic performance, and degree attainment (Astin, 1993). Hossler (1990) suggested that both academic and out-of classroom activities encouraged student-faculty interaction. Furthermore, it was suggested that faculty interaction "reinforce or challenge a student's self-image as a person outside the classroom" (Bean, 2005, p. 225). The out-of classroom activities included advising student organizations; participating in orientation; eating in the cafeteria with students, and serving on student

committees. Pascarella and Terenzini (1980) also found that out-of-classroom interactions between faculty and students had a positive influence on first year students' personal and intellectual growth, values, and attitudes as well as their career goals and aspirations and that these attributes were significantly positively associated with student persistence.

Pascarella and Terenzini (1980) identified faculty concerns for student development and teaching as a separate construct from faculty interaction. They found that when students perceived the faculty as being generally interested in them and helping them grow in more than just academics, and the faculty were willing to spend time out of the classroom discussing issues that they were interested in and important to the students, as well as the faculty being genuinely interested in teaching, the first year students were more likely to persist in the institution. Bean (2005) added that when a student felt that faculty members did not care about their development, their commitment to the institution weakened.

Academic and intellectual development. Tinto (1993) postulated that academic and intellectual development is a key component of student retention in his longitudinal model of student departure. Pascarella and Terenzini (1980) supported this postulate and found that when students are satisfied with their academic experience at the university and perceive that their academic experiences have had a positive influence on their intellectual growth, and their courses are intellectually stimulating, they are more likely to persist. Bean (2005) argues that the importance of the effect of academic development in college retention should not be taken lightly since it helps students develop a sense of

“academic self-efficacy” (p. 227), students feel more committed to the university, and are more likely to re-enroll.

Developmental versus prescriptive academic advising. At the UWI ineffective institutional practices were identified by first-year students as an important influence on their decision to withdraw from the university (Tewarie, 2010a). She found that 22% of first year students surveyed at UWI identified academic advising as a reason for not returning to the institution since the first year students did not know who to turn to when they were having financial difficulties, family issues or health related issues. Tewarie felt that an advisor would have known who to refer students to with these issues. According to Tewarie, students transferred to other institutions because UWI did not have an adequate support system in place at any of their campuses by which students could rely on for assistance. Habley and McClanahan (2004) identified academic advising as an institutional practice that has the most impact on students’ intent to persist in the university.

Advising is viewed in the literature as positively impacting student persistence and subsequently retention (Nutt, 2003; Cuseo, 2002). According to Cuseo (2002), advising has a strong influence on student retention through (1) student’s satisfaction of the college experience; (2) effective educational and career planning and decision making; (3) student utilization of campus support services; (4) student-faculty contact outside the classroom; and (5) student mentoring (p. 1). Bean (2005) summarized that good advising links a students’ academic capabilities with his or her major, access to learning resources and career choice. The UWI employs a faculty-only advising model. The purpose of academic advising at UWI is to “help students, particularly new students,

in planning, monitoring and successfully managing their chosen field of study, in relation to clear career objectives. Students are guided to accept responsibility for their learning, to be informed of the services provided for them, to access information, and to be managers of their time” (UWI, 2014, para. 1). Crookston (1994) describes this traditional relationship, based on the advisor as an authority figure, between the academic advisor and advisee as “prescriptive” (p. 5). He adds that “some faculty members see the prescriptive advising as convenient and desirable” (p. 6).

The literature on the nature of academic advising advocates for the delivery of advising from a more developmental perspective which emphasizes building relationships, coaching, mentoring, and/or teaching (Crookston, 1994; Cuseo, 2002; Drake, 2011; Kuhn, 2008; Nutt, 2003). In developmental advising, the advisor and advisee engage in a series of “developmental tasks” (p. 6), which is described as more holistic and student-centered (Kramer, 2003). Table 2 differentiates prescriptive learning from the developmental approaches in advising.

Developmental advising is perceived as having a positive impact on student retention since it “increases students’ involvement in institutional programs and services and increases the overall impact of educational experiences for students” (Winston, 1994, p. 114). According to Crookston (1994), advisors who practice developmental advising are not only concerned with specific personal decisions or career planning but with “facilitating the students’ rational process, environmental and personal interactions, behavioral awareness and problem-solving, decision-making and evaluation skills” (p. 5). Crookston points out that not only are these advising tasks but also aspects of teaching; hence the adage *Advising as Teaching*.

Table 2

Prescriptive Learning versus Developmental Advising-Teaching

Prescriptive Learning	Developmental Advising-Teaching
Advisor has primary responsibility	Advisor and student share responsibility
Focus is on limitations	Focus is on potentialities
Effort is problem-oriented	Effort is growth oriented
Relationship is based on status	Relationship is based on trust and respect
Relationship is based on authority and advice	Relationship is based on equally shared problem solving
Evaluation is done by advisor	Evaluation is a shared process

Note: Adapted from “Advising as teaching,” by G. L. Kramer, 2003. In G. L. Kramer (Ed.), *Faculty advising examined: Enhancing the potential of college faculty as advisors* (p. 4).

At UWI, where the faculty advisor is the main personnel that students encounter on a one on one basis, faculty are in the unique position that they not only disseminate knowledge in their disciplines but they can also teach, guide, and advise students on careers and skills valuable to the workforce (Kennemer & Hurt, 2013). Perceptions about faculty advisors would therefore have major implications for student satisfaction and subsequently retention at the university. In the developmental advising model, faculty are viewed as advisor-teacher who align the goals of the student with that of the university, assist students to take responsibility for their career goals and ask students questions to assist them in making connections (Kramer, 2003). In the *Advising as Teaching* concept, the faculty advisor therefore takes academic advising far beyond scheduling meetings and discussing appropriate course selection to developing an advising curriculum and

advising syllabus. However, when Allen and Smith (2008) examined faculty attitudes towards and experiences with academic advising, they found a gap in the advising services in relation to what faculty believed their responsibility was as an advisor. The faculty believed that they were responsible for providing the most accurate information that students needed but when it came to assisting students in navigating the institution by understanding its policies and procedures, faculty felt this was important but that it was not their role. Allen and Smith (2008) observed that the faculty felt that it was their responsibility to refer students only for academic reasons and were not concerned with student's personal issues.

Ender (1994) reported that faculty members are ineffective in developmental advising practices without adequate training since it requires "skills, competencies, and knowledge beyond any given academic discipline" (p. 106). Cuseo (2002) suggested that faculty advisors be required to attend professional development workshops to acquire these skills to practice developmental advising. Bean (2005) added that the debate about whether first year student advising should be done by a professional or faculty is unnecessary. He argued that what is important is that advising is done well so the student can make informed academic decisions and either staff or faculty can provide this information.

Tewarie's (2010a) study suggested that there are several university functions, including academic advising, that if improved, could provide personal support to the first year students. Kennemer and Hurt (2013, p. 2) summarized the traits from the literature that have been determined to be essential for effective academic advising. According to Kennemer and Hurt, advisors should:

- Possess the ability to disseminate accurate information, to give appropriate guidance, and to be knowledgeable about university and degree requirements (Baker & Griffin, 2010; Creamer, 2000; Dillon & Fisher, 2000; Harrison, 2009; Upcraft & Garner, 1989)
- Understand student development and be able to effectively guide students toward setting and reaching goals (Harrison, 2009; Johnson & Morgan, 2005)
- Know how and when to effectively guide students to additional campus resources that are needed (Johnson & Morgan, 2005)
- Develop relationships with the student (Upcraft & Gardner, 1989)
- Show courtesy and respect toward the advisee (Hester, 2008)
- Show interest in advisee's academic program (Hester, 2008)
- Exhibit approachability (Harrison, 2009) and be a good listener (Hester, 2008)

Social System and Student Retention

The relationship in Tinto's (1975) model that was best supported by empirical evidence from the literature was the effect of social interaction on institutional commitment and student retention (Braxton et al., 2004). While interaction with faculty is important, research has shown that interaction with peers is also vital for improved retention (Pascarella & Terenzini, 1980). Social interaction is also formed through both the formal and informal structures of the institution and is mainly a function of the quality of peer-group interactions. Bean (2005) posited that social support and close friendships formed the core components of social integration. These social interactions

with peers may develop either in the class or outside the classroom at social events such as fraternities and sororities, clubs, or other student organizations. Researchers found that students who were more socially engaged on campus were more likely to persist and graduate (Astin & Oseguera, 2012; Oseguera & Rhee, 2009; Bean, 2005; Braxton & Lee, 2005; Tinto, 1975). Bean argued that as the first year student becomes more connected to other students, their self-confidence increased, the institution is perceived as a good “fit” and he or she is more likely to re-enroll. Therefore, establishing that strong support network is important for a successful transition to the university. Developing interpersonal relationships with other students on campus have been shown to have a positive influence on students’ personal growth, attitudes, and values as well as their interest and ideas and these were positively associated with first year persistence in college students (Astin & Oseguera, 2012; Cabrera et al., 1993; Pascarella & Terenzini, 1980). However, Astin and Oseguera (2012) warned that engaging in activities such as partying and drinking are negatively related to persistence and degree attainment.

Commitments and Student Retention

Social and academic integration lead to commitment (Tinto, 1993). According to Tinto (1975), “Other things being equal, the higher the degree of integration of the individual into the college system, the greater will be his commitment” (p. 96). This commitment is to a particular higher education institution and to the student’s goals, which are associated with degree attainment and career decision making. Institutional commitment is defined as the student’s obligation to remain and graduate at his or her institution while goal commitment refers to the personal importance that a student places on attaining a college degree (Pascarella & Terenzini, 1980). Unlike Tinto’s (1993)

model of longitudinal student retention, Pascarella and Terenzini (1980) found that the items constructed to measure goal commitment and institutional commitment “tended to cluster together and yield a single, composite factor” (p. 65). According to the literature, as the level of institutional and goal commitments increases, the likelihood of student persistence at the institution increases (Braxton & Hirschy, 2005; Pascarella & Terenzini, 1980; Tinto, 1993).

Chapter Summary

This chapter presented an overview of the literature and empirical studies that conceptualize student attributes and institutional experiences in persistence and retention. Several studies reveal that student’s demographic and enrollment characteristics are associated with student’s decision to persist and graduate from a university. Additionally, student’s perception of his or her experiences at the institution, including experiences with academic advising, was identified as predicting degree attainment. Astin and Oseguera (2012, p. 132) summarize,

Those with the best chances of finishing college thus tend to have good grades in high school, to come from intact families that are affluent and well educated, and show a propensity to become highly involved or engaged in the social and academic life of the institution.

The following chapter examines the methodology utilized in the study. Chapter 3 outlines the research design, the population and sample of the students’ investigated, description of the instrument used, the variables explored, and the methods used to analyze the data collected. The chapter culminates with the limitations of the study.

CHAPTER 3

METHODOLOGY

The study explored issues pertaining to retention and persistence at a public university system in the Caribbean during the 2014-2015 academic year. The study focused on first year students in STEM majors at the University of the West Indies, St. Augustine campus in Trinidad and Tobago, and the Cave Hill campus in Barbados. The purposes of this study are twofold; first, to examine the students' attributes and the institutional experiences that contribute to retention of first year, Caribbean students in science, technology, engineering and mathematics (STEM) majors during the first semester, 2014. Second, to determine the nature of and student satisfaction with the academic advising students received during their first 2014 semester.

The research questions and hypotheses are:

1. Does the campus the student attended predict intent to re-enroll at the two UWI campuses: St. Augustine and Cave Hill, in first year STEM students?

H₁: There will be a significant relationship between the campus students attended and first year STEM students' intent to re-enroll at the UWI. Students are more likely to re-enroll at the Cave Hill campus.

2. What student attributes (including sex, race/ethnicity, secondary school academic achievement, secondary school science and mathematics grades, degree aspiration, parental education, residency status, and financial concerns) are

associated with intent to re-enroll the following semester for first year STEM students at the UWI: St. Augustine and Cave Hill, controlling for campus?

H₂: There will be a significant relationship between the predominant sex (none at St. Augustine and females at Cave Hill), the predominant race/ethnicity (East Indians at St. Augustine and Blacks at Cave Hill), stronger secondary school academic achievement, higher secondary school science and mathematics scores, higher degree aspiration, higher educated parents, on campus residency, and financial concerns (none at St. Augustine and higher at Cave Hill), with first year STEM students' intent to re-enroll at the UWI.

3. What institutional experiences (including interactions with faculty, faculty concern for student development, academic and intellectual development, institutional and goal commitments, and peer-group interaction) are associated with intent to re-enroll the following semester in first-year STEM students at the UWI: St. Augustine and Cave Hill, controlling for campus?

H₃: There will be a significant relationship between higher interaction with faculty, higher faculty concern for students, stronger academic and intellectual development, stronger institutional and goal commitments, and higher peer group interaction with first year STEM students' intent to re-enroll at the UWI.

4. What perceptions do first-year STEM students at UWI have about the type of academic advising they received as measured by the *Academic Advising Inventory* (AAI) (see Appendix A)?

H₄: First-year students will perceive:

- a. The nature of academic advising at the UWI as being more prescriptive than developmental.
- b. The overall academic advising experience at UWI will be below the average score (< 2.5) which indicates dissatisfaction.

Research Design

A quantitative research design was used to determine the perceptions and attitudes of first year students in STEM fields at the Caribbean university system. Teddlie and Tashakkori (2009) defined quantitative design as the strategies associated with gathering, analyzing, interpreting, and presenting numerical information. The correlation study adopted a non-experimental, survey research design in which self-reported data were collected using a questionnaire, *The UWI Survey of First-Year Students' Perceptions*, to answer the research questions and predict the attitudes and perceptions of the target population during the first semester, 2014. A survey instrument was used since it provided good generalizability and external validity to the population (Teddlie & Tashakkori, 2009).

Binary logistic regression analysis was used to determine the variance and effect of the predictor variables on the likelihood of spring enrollment in research questions one and two. Logistic regression was an appropriate approach to measure student retention for the study because it allowed the researcher to “regress” the continuous and categorical predictor variables on the binary, categorical dependent variable, intent to re-enroll (Osborne, 2014). Intent to re-enroll at the university is operationalized as 0=do not intend to re-enrolled; 1= intend to re-enroll. Research question three is assessed using

descriptive statistics (mean standard deviation, frequency charts, and graphs). It was important that the study was completed during the first semester because academic advising policies at the institutions only mandate advising at the beginning of the freshmen year during orientation and registration, and the literature supports conducting the research during their first semester (Pascarella & Terenzini, 1980).

Context: The University of the West Indies

The research was conducted at two of the regional campuses of the University of the West Indies, the St. Augustine campus in Trinidad and Tobago and the Cave Hill campus in Barbados, with a total undergraduate enrollment of about 19,329 students, approximately 4,891 of whom are ‘new first time’ students (Table 3). The undergraduate population at UWI comprised approximately 75% of the student body and approximately 51% of the students are 24 years and under (UWI stats, 2010). The UWI undergraduate student population has a ratio of 1:2 males to females across all campuses, except in STEM fields, where there is a 1:1 ratio of males to females (Table 3). According to UWI stats (2010), approximately 37% of the student body (17% Science/Technology; 12% Medical Science; 7% Engineering) enrolled in STEM based programs annually. Table 3 shows the distribution of STEM majors at the two UWI institutions.

Table 3

Statistics of Undergraduate STEM Students at the two UWI Campuses during the 2013-2014 Academic Year

	St. Augustine	Cave Hill	Both Campuses
Undergraduate Student Population	11,941	7,388	19,329
First-Year Undergraduate Students	3,121	1,770	4,891
Sex	Males 36%	Males 32%	Males 34%
	Females 64%	Females 68%	Females 66%
Sex in STEM fields	Males 47%	Males 49%	Males 48%
	Females 53%	Females 51%	Females 52%
STEM Enrollment Status	Full-time 95%	Full-time 79%	Full-time 92%
	Part-time 5%	Part-time 21%	Part-time 8%
First-Year Students in STEM Fields	(1,420) 45%	(389) 22%	(1,809) 37%

Note. Adapted from “St. Augustine Student Statistics 2013-2014,” “Cave Hill Student Statistics 2013-2014.”

Population and Sample

The target population for this study was first year students who declared a science, technology, engineering, or mathematics (STEM) major in the fall 2014 semester. This population included undergraduate students from Science and Technology, Medical Sciences, and Engineering at the two campuses. Upper classmen and students who did not declare a bachelor’s degree in a STEM field were excluded from the study. The population was derived from an estimated 1,800 STEM students on the two UWI campuses (Table 3). A purposive sample was used where participants were

deliberately selected to be in the sample based on their class standing and major (Shadish, Cook, & Campbell, 2002). At the Cave Hill campus, the researcher identified 13 preliminary and introductory (1000-level) courses offered in the first semester of students' first year (see Appendix B). Two sampling frames for the Cave Hill campus (Science/Technology and Medical Science majors) were used. Each sampling frame included students who were registered in the introductory courses identified (see Appendix B, Table B1). At the St. Augustine campus, the sample was determined using a snowball sampling method where respondents were asked to identify additional participants to include in the study (Patton, 2002). The three sampling frames used for the St. Augustine campus were Science, Technology, and Agriculture; Medical Science; and Engineering. The snowball sampling started by contacting one or two persons in each sampling frame and encouraging them to pass on the survey to peers and other students in their dormitories and classes who matched the criteria given.

Variables and Instrument

The study examined student retention in first year, full-time students, in STEM majors at the UWI during their first semester, 2014. There is one dependent variable and 16 independent variables (Tables 4 and 5). The dependent variable (intent to re-enroll) was defined as the student's intent to return during the second semester, 2015. Tables 4 and 5 describe each independent variable and how it is operationally defined and coded. Table 4 also shows how intent to re-enroll, race/ethnicity, and secondary school math and science GPA variables were recoded.

Table 4

Description, Coding, and Recoding of Study Variables

Type of Variable	Variable	Level of Measurement	Definition/ Codes	Recode
Dependent Variable	Intent to Re-enroll the following semester (REENR)	Categorical, 4 levels	1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree	1 and 2 = 0: not intending to re-enroll, 3 and 4 = 1: intending to re-enroll
Independent Variable	Campus (CAMP)	Categorical, 2 levels	0=St. Augustine, 1=Cave Hill	
Student Attributes (Independent Variable)	Sex (SEX)	Categorical, 2 levels	Sex: 1=Male, 2=Female	
	Race/Ethnicity (RACE)	Categorical, 9 levels	1=Black/African, 2=East Indian, 3=Native Indian, 4=Chinese, 5=Hispanic, 6=Mixed, 7=Portuguese, 8=White, 9=Other	1=Black/African, 2=East Indian, 3=Mixed, 4=Other
	Secondary School Academic Achievement (SSACH)	Continuous, (Interval) 6 levels	Number of CXC, CSEC exams passed: 1=five, 2=six, 3=seven, 4=eight, 5=nine or more	
	Secondary School Science and Math GPA (SSGPA)	Continuous (Interval), 4 levels	Mean score of Math, Biology, Chemistry and Physics grade point average: range=1 to 4	Mean score of Math, Biology, Chemistry and Physics grade point average: range=4 to 1

Table 5

Description and Coding of Study Variables

Type of Variable	Variable (Name)	Level of Measurement	Definition/Codes
Student Attributes (Independent Variable) Continued)	Degree Aspiration (DEGASP)	Continuous (Ordinal), 4 levels	Highest degree aspired: 1=None, 2=Bachelor's, 3=Master's, 4=Doctorate
	Parental Education (PEDU)	Continuous (Ordinal), 6 levels	Parent highest level of formal education: 1=Primary School, 2=Secondary School, 3=Some Tertiary, 4=Tertiary other than university, 5=University First Degree, 6=Postgraduate Degree
	Residency Status (LIVE)	Categorical, 2 levels	First year living arrangements: 1=Home/Off Campus, 2= On Campus
	Financial Concerns (FINCON)	Continuous, (ordinal) 3 levels	Concerns about financing tertiary education: 1=No concerns, 2=Some concerns, 3=Major concerns
Institutional Integration (Independent Variable)	Interaction with Faculty (FACINT)	Continuous (Ordinal), Mean score of 5 items	Interacting with Faculty: 1=influence of out-of-classroom interactions with faculty on personal growth, values and attitudes, 2=influence of out-of-classroom interactions with faculty on intellectual growth, values, and attitudes, 3=influence of non-classroom interactions with faculty on career goals and aspirations, 4=personal relationship with faculty member, 5=opportunities to interact informally with faculty members (Likert scale: strongly disagree, disagree, neither agree or disagree, agree, strongly agree)

Table 5: Description and Coding of Study Variables (continued)

Type of Variable	Variable	Level of Measurement	Definition/Codes
Institutional Integration (Independent Variable) Continued	Faculty Concern for Students (FACCON)	Continuous (Ordinal), Mean score of 5 items	Concern for Students: 1=faculty are generally interested in students, 2=faculty are generally outstanding or superior advisors, 3=faculty are willing to spend time outside of class to discuss issues of interest and importance to students, 4=faculty are interested in helping students grow in more than just academic areas, 5=faculty are genuinely interested in the students (Likert scale: strongly disagree, disagree, neither agree or disagree, agree, strongly agree)
	Academic and Intellectual Development (AID)	Continuous (Ordinal), Mean score of 7 items	Student Development: 1=intellectual development, 2=influence of academic experience on intellectual growth and interest in ideas, 3=academic experiences, 4=courses are intellectually stimulating, 5=interest in ideas and intellectual matters, 6=attending a cultural event, 7=academic performance (Likert scale: strongly disagree, disagree, neither agree or disagree, agree, strongly agree)
	Institutional and Goal Commitments (IGC)	Continuous (Ordinal), Mean score of 5 items	Commitments: 1=importance of getting a bachelor's degree, 2=confidence in making the right decision choosing to attend UWI, 3=satisfied with choice of major, 4=importance of graduating from UWI, 5=importance of getting good grades (Likert scale: strongly disagree, disagree, neither agree or disagree, agree, strongly agree)

Table 5: Description and Coding of Study Variables (continued)

Type of Variable	Variable	Level of Measurement	Definition/Codes
Institutional Integration (Independent Variable) Continued	Peer Group Interaction (PEER)	Continuous (Ordinal), Mean score of 7 items	Interacting with Peers: 1=relationships with other students, 2=friendships, 3=influence of interpersonal relationships with other students' on personal growth, attitudes, and values, 4=influence of interpersonal relationships with other students' on intellectual growth and interest in ideas, 5=difficulty meeting and making friends with students, 6=students willing to help with a personal problem, 7=students values and attitudes (Likert scale: strongly disagree, disagree, neither agree or disagree, agree, strongly agree)
	Developmental-Prescriptive Advising (DPA)	Continuous (Ordinal), Mean score of 9 items	Personalizing Education: 1=My advisor is interested in helping me learn how to find out about courses and programs for myself, OR, My advisor tells me what I need to know about academic courses and programs. Qu. 1, 3, 4, 5, 8, 9, 10, 13 (Likert scale: 1 to 8)
		Continuous (Ordinal), Mean score of 4 items	Academic Decision Making: My advisor registers me for classes, OR, My advisor teaches me how to register myself for classes. Qu. 6, 7, 11, 14 (Likert scale: 1 to 8)
		Continuous (Ordinal), 2 items	Selecting Courses: My advisor tells me what would be the best schedule for me, OR, My advisor suggests important considerations in planning a schedule and then gives me. Qu. 2, 12 (Likert scale: 1 to 8)

Table 5: Description and Coding of Study Variables (continued)

Type of Variable	Variable	Level of Measurement	Definition/Codes
	Student Satisfaction with Academic Advising (SSA)	Continuous (Ordinal), Mean score of 5 items	Satisfaction with Advising: 1= overall satisfaction, 2=accuracy of information provided, 3=adequacy of notice about important deadlines, 4=availability of advising when desired, 5=amount of time available during advising sessions (Likert scale: strongly disagree, disagree, agree, strongly agree)

The study adopted a survey design. According to Groves, Fowler, Couper, and Lepkowski (2009), a survey is a “systematic method for gathering information from entities for the purpose of constructing quantitative descriptors of the attributes of the larger population of which the entities are members” (p. 2). In this study the entities are a sample of first-year university students who have declared a bachelor’s degree in a STEM field.

The instrument used was *The UWI Survey of First-Year Students’ Perceptions*. This instrument was a compilation of student attributed the literature deemed as contributing to student retention, an adaptation of the *Institutional Integration Scale* (Pascarella & Terenzini, 1980), and the *Academic Advising Inventory* (Winston & Sandor, 1972). The questionnaire was composed of a total of 43 questions and divided into Part I and Part II (see Appendix A). Part I was comprised of 24 questions and was adapted by the investigator using variables that were identified in the literature as student attributes and intuitional experiences important to student retention (Astin & Oseguera,

2012; Bean, 1980, 1982; Cabrera et al., 2012; Pascarella & Terenzini, 1980; Tinto, 1975, 1993). Part II had two sections (Sections A and B). Section A was comprised of 14 questions and Section B had 5 questions. These sections were developed by Winston and Sandor (1984b) as part of the *Academic Advising Inventory (AAI)*. The *AAI* instrument is nationally used and available to all members of the National Academic Advising Association (NACADA), without cost provided that the member observes the following:

NACADA members have permission to use *AAI* Parts I and II in their entirety, but individual items may not be removed from these two parts for use in other instruments. NACADA members have permission to use individual items from Parts III and IV. Items in Parts III and IV may be altered or eliminated to fit local conditions (Winston & Sandor, 2002, para. 2).

The researcher is a member of NACADA and qualifies to use parts I and III of the survey under the specified conditions. In this study parts I and III have been relabeled sections A and B.

Description of Survey

In the *UWI Survey of First-Year Students' Perceptions, Part I*, the constructs are divided into two units: Student attributes and the *Institutional Integration Scale (IIS)*. Student attributes consisted of nine questions that provided students' background characteristics and enrollment information, factors deemed by literature as contributing to student retention (Astin & Oseguera, 2012; Pascarella & Terenzini, 1980; Tinto, 1975, 1993). These factors were sex, race/ethnicity, secondary school academic achievement, secondary school math and science grades, degree aspiration, parent education, enrollment status, residency status, and financial concerns.

The second unit consisted of the *Institutional Interaction Scale (IIS)* developed by Pascarella and Terenzini (1980) to measure the dimensions identified by Tinto as contributing to student persistence. The scales consisted of 30 Likert-type items arranged in five subscales. The subscales were peer-group interactions (7 items, “*Since coming to this university, I have developed close personal relationships with other students*”), interactions with faculty (5 items, “*My non-classroom interaction with faculty have had a positive influence on my personal growth, values and attitudes*”), Faculty concern for students development and teaching (5 items, “*Most of the faculty I have had contact with are interested in helping students grow in more than just academic areas*”), academic and intellectual development (7 items, “*I am satisfied with the extent of my intellectual development since enrolling in UWF*”), and institutional and goal commitments (6 items, “*I am satisfied with choice of major*” and “*It is important for me to graduate from UWF*”) (Pascarella & Terenzini, 1980). The *IIS* has been used in various forms in student retention research and has been found to generally support the predictive validity of the key measurements of Tinto’s theory of student integration in identifying first-year students who voluntarily drop out of tertiary institutions (Caison, 2007; French & Oaks, 2004; Mannan, 2001). The *IIS* possesses desirable traits that were appealing to university students since it was relatively short and easy to administer (French & Oaks, 2004). Students were asked to indicate their level of agreement with the items that were related to institutional satisfaction. The items were coded on a five-point Likert scale where 5= strongly disagree to 1 = strongly agree (see Appendix A). However, prior to analysis, items which loaded negatively, such as “*Few of the faculty members I have had contact*

with are generally interested in students,” were re-coded 1=strongly agree to 5=strongly disagree.

The UWI Survey of First-Year Students’ Perceptions, Part II explored the *Academic Advising Inventory (AAI)* designed by Winston and Sandor (1984a). Part II-Section A of the inventory consisted of 14 items on a Likert-type scale that best described the nature of the advising process (Winston & Sandor, 2002). The scale measured academic advising approaches between the two complementary behavioral styles and attitude (developmental advising and prescriptive advising) on a continuum, and the student was asked to respond to his or her preferred approach and their perception of the advisor’s approach to academic advising. The total scale was composed of three subscales: Personalizing education (PE), academic decision making (ADM), and selecting courses (SC). PE was defined in items 1, 3, 4, 5, 8, 9, 10, and 13, and revealed student’s concerns about their total education: “Career/vocational planning, extracurricular activities, personal concerns, goal setting, and identification and utilization of resources on the campus” (Winston & Sandor, 2002, p. 11). ADM was defined in items 6, 7, 11 and 14, and focused on whose responsibility it was (advisor versus advisee) for making and implementing academic decisions. The ADM subscale included “monitoring academic progress, collecting information and assessing the student’s interests and abilities concerning academic concentrations, as well as other areas, and then carrying through by registering for appropriate courses” (Winston & Sandor, 2002, p. 11). SC was defined by items 2 and 12, and dealt with selecting appropriate courses and academic and degree planning. Higher scores on all the scales and subscales indicated a more developmental approach to academic advising (Table 8).

According to Winston and Sandor (2002), each question consisted of two statements, one was developmental (“*My advisor and I plan my schedule together*”) and one was prescriptive (“*My advisor plans my schedule*”). The two statements were connected by the word ‘OR’. Students were asked to rate their level of agreement with each statement on a 4-point Likert-type scale, ranging from *very true* to *slightly true* (A through H) for a range from 1 to 8 points. Students responded by making two decisions about each pair (Winston & Sandor, p. 2):

(1) Decide which one of the two statements most accurately describes the academic advising they received this year, and then

(2) Decide how accurate or true that statement is.

<p>My advisor talks with me about my other-than –academic interest and plans.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR</p>	<p>My advisor does not talk with me about interests and plans other than academic ones.</p> <p>E-----F-----G-----H slightly true..... very true</p>
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However, in order to prevent the occurrence of a response set, Winston and Sandor (1984b) randomly placed the developmental and prescriptive ends of the item continuum on both the left and right side of each item pair. Subsequently, items with developmental statements on the left side had to be recoded (Figure 7).

Section B of the *AAI* is composed of five items that measured student’s satisfaction with the academic advising they had experienced during the semester. The five items addressed (a) overall satisfaction, (b) accuracy of information provided, (c) adequacy of notice about important deadlines, (d) availability of advising when desired, and (e) amount of time available during advising sessions. Students responded to each item using a 4-point Likert-type scale (from *strongly disagree* to *strongly agree*). A

correlation between the students' overall satisfaction with academic advising items (*The UWI Survey of First-Year Students' Perception, Part II-B*) was reported.

The data were analyzed and the reliability and validity of the research was recorded. According to Osborne (2012), "the better your reliability, the more accurate and replicable your results" (p. 262).

Instrument Reliability and Validity

Pascarella and Terenzini (1980) found that alpha reliabilities of the *Institutional Integration Scales* ranged from .71 to .84 where Peer-Group Interactions ($\alpha = .84$), Interaction with Faculty ($\alpha = .83$), Faculty Concern for Student Development and Teaching ($\alpha = .82$), Academic and Intellectual Development ($\alpha = .74$), and Institutional and Goal and Commitments ($\alpha = .71$) were all deemed adequate to use in further analyses. A reliability coefficient of .70 or higher is considered acceptable in social science research.

Additionally, Pascarella and Terenzini (1980) established that the intercorrelations among the five *IIS* scales were modest, ranging from .01 to .33 with a median correlation of .23. This correlation showed that the subscales were assessing the measurements of the *Institutional Integration Scale* independently. Using principal component factor analysis, multivariate analysis of covariance and discriminant analysis, Pascarella and Terenzini (1980) determined the predictive validity of the *Institutional Integration Scale* in accurately identifying freshmen who subsequently persisted or stopped out voluntarily.

The *Academic Advising Inventory (AAI)* is also a widely used instrument with high internal consistency and reliability, estimated through the use of the Cronbach alpha

procedure. According to Winston and Sandor (1984b, 2002), the alpha coefficient for the total developmental-prescriptive advising (DPA) scale was .78, with coefficients ranging from .42 for the items on the selecting course (SC) subscale to .81 for the items on the personalizing education (PE) subscale. Winston and Sandor (2002) concluded that the DPA and its subscales are relatively “homogeneous and stable enough measures” (p. 15) to use to determine advising approaches.

Construct validity of the *AAI* was determined using contrasted groups in freshmen. One group was “specially-admitted, academically-marginally-prepared freshmen students” (Winston & Sandor, 2002, p. 19) enrolled in the Developmental Studies Division at the University of Georgia who received intensive developmental advising while the comparison group of regularly admitted freshmen received more prescriptive advising, planning and arranging class schedules. The group in Developmental Studies Division was predicted to perceive more developmental advising than the group that was regularly admitted. The results demonstrated that scores on the DPA and PE scales were statistically significantly different for the groups ($p < .001$). This test was used as providing strong support for the construct validity of the DPA and PE scales of the *AAI* (Winston & Sandor, 1984b, 2002). Additionally, the intercorrelations among the five scales in Part II-B of the *AAI* were adequate, ranging from 0.33 to 0.67 with a median correlation of 0.50.

Procedures and Data Collection

The *UWI Survey of First-Year Students' Perceptions* was administered to a sample of first year students during the first semester of their freshmen year. The survey

instrument was piloted prior to distributing the questionnaire. The pilot test was done by the researcher who collected the information from ten first-year students at Cave Hill campus, Barbados, during the first fifteen minutes of a first year experience class. The ten students were asked to complete the survey and make comments on the relationship between the purpose of the study and the clarity of the questions (Wortman & Upcraft, 2001). This pilot indicated that the instructions for the *Academic Advising Inventory* needed clarification. Subsequently, the instructions were modified by including an example and its possible response.

The survey was administered by the researcher to students at the University of the West Indies during November 4th and 21st, 2014, near the end of their first semester. IRB permission was approved at the University of Louisville and at the UWI, Cave Hill campus prior to conducting this research. The UWI, St. Augustine did not have a research ethical review board.

At the UWI, Cave Hill campus, 13 preliminary and introductory courses were identified in the Science, Technology, and Medical Science, departments. The researcher e-mailed the Deputy Dean of Science and Technology, and the Dean of Medical Sciences at the UWI, Cave Hill, Barbados, seeking their assistance in collecting data for the research study. The e-mails were forwarded to the science and technology, and medical science faculty (see Appendix B). The researcher obtained the names of the professors and their class schedules for each course identified from student services personnel. Faculty members were contacted via e-mail to schedule day and time to distribute the survey for 10 minutes from November 4 – 11, 2014. The survey was then circulated by the researcher to first year students only during a regularly scheduled class. Winston and

Sandor (2002) argued, “Data collected in a relatively controlled setting, such as a class provides the most complete and reliable results” (p. 13). To avoid repetition, the researcher asked students to take the survey only once. The survey’s consent form included contact information for the Office of Research at UWI, Cave Hill and asked to exclude students under 18 years of age. The data were collected using a pencil and paper collection method which allowed the researcher to collect the information from the targeted audience, which resides outside the U.S. in the most efficient manner (Wortman & Upcraft, 2001).

At the UWI, St. Augustine campus, an e-mail was sent to the registrar of the institution with the research proposal, outlining the purpose of the study, questions to be asked, and how the information in the final project will be treated. However, the registrar did not receive approval from the faculty at St. Augustine campus to conduct the research during their scheduled class time. The researcher further contacted the Director of Student Services at UWI, St. Augustine to seek her assistance, outlining the purpose of the study, the research design, target population, and the survey. The Director assigned one of her staff to assist the researcher with collecting the data. First year science and technology students as well as engineering students were non-randomly identified and asked to complete the survey. A snowballing technique was employed where students were asked to invite other students in their halls and dormitories to complete the surveys. For example, 20 surveys were given to a Master’s in Engineering student who I met while staying in the graduate flats and asked him to distribute them to first-year science students. He took the surveys to an undergraduate hall and the next day returned 16 completed surveys. He also gave a few of the surveys to his roommate who was majoring

in Agricultural Science and his roommate distributed the surveys to two of his classmates. Student services staff at the UWI Medical School (Mount Hope) in Trinidad and Tobago were also asked to distribute the surveys to their first year students. The medical science staff distributed the questionnaires during scheduled classes. Surveys were collected at St. Augustine between November 13th and 22nd, 2014.

In order to ascertain student's intent to re-enroll at the beginning of the second semester, the question was posed in the survey: *"I intend to return to UWI in the spring 2015 semester (second semester)."* Student's intent to return or re-enroll has been used by researchers as an alternative variable for re-enrollment status (DaDeppo, 2009; Taylor, 2012). The dependent variable is dichotomous and can be analyzed using binary logistic regression. The unit of analysis is the individual student.

Data Analysis

Descriptive statistics were used to review the demographic and institutional data which were collected for informational purposes. These items were secondary school graduation year, major, and financial support.

Data cleaning and appropriate assumptions (linearity, multicollinearity, independence of errors) were conducted, prior to analyzing the results, to determine any violations. Data cleaning was performed since "careful screening of your data can pay large dividends in terms of goodness of your results" (Osborne, 2012, p. 262).

Consequently, each analysis of the continuous variables examined standardized residuals for error analysis as well as DfBetas to remove inappropriate influential cases.

To analyze the data to predict the influence of the campus and student attributes on student retention in research questions one and two and to examine if institutional experiences influence the student's decision to re-enroll at the institution after the first semester in research question three, binary logistic regression was used (Table 6).

Table 6

Statistical Analyses Used in the Study

Research Question	Analysis	Independent variables	Dependent Variables
1	Logistic Regression	Campus	Intent to Re-enroll
2	Logistic Regression	Student Attributes	Intent to Re-enroll
3	Logistic Regression	Institutional Experiences	Intent to Re-enroll
4	Descriptive Statistics	Advising Approaches	—

Logistic regression is appropriate to measure student retention because it allows the researcher to regress both the continuous and categorical predictor variables on the binary dependent variable (Osborne, 2014). Linear regression allows the researcher to predict which of the two categories a student is most likely to belong to based on the treatment. Additionally, Peduzzi, Concat, Kemper, Holford, and Feinstein (1996) introduced 'events per variable' (EPV). EVP refers to the number of participants who experience the event in the dependent variable. In this case, that event is "intend to re-enroll" in the institution. These researchers argued that there should be at least 10 events per independent variable in order to have a valid logistic regression equation. In this

study, with 16 independent variables, a minimum of 160 “intend to re-enroll” cases are needed.

In logistic regression, the effect of the predictor on the population is expressed as the odds ratio (OR) or the ratio of success to the ratio of failures. In assessing the model, the -2log-likelihood (-2LL) indicates the unexplained variance and provides an indication of goodness-of-fit of the model using the chi-square distribution. A large value indicates a poor fitting model. The Wald statistic is then used to assess the significance of the predictors. In the study, the method of regression used in analyzing the data was ‘forced entry’ where all variables were entered into the model simultaneously (Field, 2009; Osborne, 2014). Logistic regression allows the researcher to use a continuous independent variable, such as *secondary school math and science grades*, if he or she assumes, “that the logit is linear in the variable” (Hosmer & Lemeshow, 2000, p. 63). Equation 1 denotes the general form of the logit model where b_0 is the intercept, and b_1 through b_{10} represent the slope coefficients for the predictor variables, corresponding to each construct (x_1 through x_{10}) in our conceptual model.

Equation 1. General Form of the Logistic Regression Model

$$\text{Logit}(\hat{Y}) = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 \dots b_{10} X_{10}$$

Binary logistic regression was employed in this study since the outcome variable is categorical with two levels (0=did not intend to re-enroll, 1=intend to re-enroll) and the predictor variables are continuous and categorical (Field, 2009; Osborne, 2014). The dependent variable was measured on a 4-point Likert-type scale from 1=strongly disagree to 4=strongly agree. Responses on the “disagree” side of the scale (1-2) were collapsed

and re-coded 0 (not intending to re-enroll) and responses on the “agree” side of the scale (3-4) were collapsed and re-coded 1 (intending to re-enroll).

Research question one explored whether a significant difference existed between the St. Augustine campus and the Cave Hill campus associated with students’ intent to re-enroll the second semester. The variable *campus* was dummy coded with St. Augustine as the reference group (St. Augustine = 0 and Cave Hill campus = 1).

In research question two, student attributes (sex, race/ethnicity, secondary school academic achievement, secondary school science and math grades, degree aspiration, parental education, residency status, and financial concerns) were the independent or predictor variable set and ‘intent to re-enroll’ was the dichotomous dependent variable. Sex, race/ethnicity, and campus are categorical variables. Since *Black* was the dominant race/ethnicity, this variable was dummy coded with *Black* as the reference group (Table 7). Additionally, each continuous variable was standardized (converted to z-scores).

Table 7

Dummy Coding for the Race Categorical Variable

Race	Dummy Coding		
	(1)	(2)	(3)
Black	0	0	0
East Indian	1	0	0
Mixed Race	0	1	0
Other Races	0	0	1

The CXC, CSEC Science grades for Biology, Chemistry, Mathematics and Physics were re-coded from overall grades (Grade I to Grade VI) to profile grades (A to

F) where Grade I = A, Grade II = B, Grade III = C, Grade IV = D, Grade V = E, and Grade VI = F (CXC, 2014). Each student's combined science and math grade was then converted as follows: A = 4, B = 3, C = 2, D = 1, E = 0, and F = 0 and the student's grade point average (GPA) was determined by computing the mean score. All other student attribute variables were analyzed as coded in Table 4.

For research question three, the *IIS* subscales (interaction with faculty, faculty concern for student development, academic and intellectual development, institutional and goal commitments, and peer interaction) were the independent variables, with intent to re-enroll as the dependent variable. Three items from the faculty concern for student development subscale were re-coded (1=5, 2=4, 4=2, 5=1). These items were “*few of the faculty members I have had contact with are generally interested in students,*” “*few of the faculty members I have had contact with are generally outstanding or superior advisors,*” and “*few of the faculty members I have had contact with are willing to spend time outside of class to discuss issues of interest and importance to students.*” One item was re-coded (1=5, 2=4, 4=2, 5=1) in the academic and intellectual development subscale. This was “*few of my courses this semester have been intellectually stimulating,*” and three items were re-coded (1=5, 2=4, 4=2, 5=1) from the peer interaction subscale. These items were: “*it has been difficult for me to meet and make friends with other students,*” “*few of the students I know would be willing to help me if I had a personal problem,*” and “*most students at UWI have values and attitudes different from my own.*” On the institutional goal and commitment scale, the last item, “*It is likely that I will enroll at UWI in the fall 2015 semester*” was not used in the data analysis since this item is synonymous with the dependent variable. Since each subscale has a different number of items, the mean score

of each subscale were used in analyzing the data. The higher mean indicates a more positive outcome.

In research question four, descriptive statistics were used to determine what perceptions first-year STEM students at UWI had about the nature of the academic advising they received on the developmental-prescriptive advising (DPA) continuum, and student's satisfaction with academic advising. However, in determining the nature of advising, since the developmental and prescriptive ends of the item continuum of the *AAI* were randomly placed on both the left and right side of each item pair, prior to reviewing the data, some items were re-coded. Tables 8 and 9 summarize how the *AAI* was coded and scored. Table 8 defines how the items were coded. In questions 1, 3, 4, 5, 9, and 13 the A through H scale was recoded so that H = 1 to A = 8. For all other questions the coding A through H remained as A = 1 to H = 8.

Table 8

Scoring the AAI: Coding the Questions

Question	Code
1, 3, 4, 5, 9, 13	H=1, G=2, F=3, E=4, D=5, C=6, B=7, A=8
2, 6, 7, 8, 10, 11, 12, 14	A=1, B=2, C=3, D=4, E=5, F=6, G=7, H=8

After coding items 1-14, the sum of each scale and subscale was computed. Table 9 describes how the range of scores for the total scale (DPA) and the three separate subscales (PE, ADM, SC) were interpreted. The Developmental-Prescriptive Advising scale is the sum total of the three subscales (Personalizing Education, Academic

Decision-Making, and Selecting Courses). According to Winston and Sandor (2002), the higher the score is, the more developmental the approach to academic advising.

Table 9

Scoring the AAI: Interpreting the Scores

Scale/Subscale	Items	Range	Interpreting Scores	
			Prescriptive	Developmental
Personalizing Education	1, 3, 4, 5, 8, 9, 10, 13	8-64	8-32	33-64
Academic Decision-Making	6, 7, 11, 14	4-32	4-16	17-32
Selecting Courses	2, 12	2-16	2-8	9-16
Developmental-Prescriptive Advising	1-14	14-112	14-56	57-112

Student satisfaction with academic advising in research question 4b was described using five items reported on a 4-point Likert-type scale (Table 4), where 1=Strongly Disagree, 2=Disagree, 3=Agree, and 4=Strongly Agree. Each item was scored and assessed separately and the frequency, mean, and standard deviation for each item were computed. According to Winston and Sandor (2002), higher mean scores (3 - 4) implied satisfaction with the overall approach to academic advising that students received and/or particular characteristics of that advising; lower mean scores (1 - 2) indicated dissatisfaction with academic advising.

Role of Researcher

The researcher played a very active role in collecting the data for the study since she made plans and organized the collection of data from the Caribbean in the U.S. She

travelled to the Caribbean islands, Barbados and Trinidad from the U.S. to collect the data. Prior to the trip, she contacted at least one individual at each institution, initially, to find out the feasibility of conducting the study and later getting advice on how best to proceed.

Prior to conducting the research, the study proposal was submitted to the Institutional Review Board (IRB) in Human Subject Protection office at the University of Louisville, and The University of the West Indies, Cave Hill. The proposal summarized the purpose of the study, research questions and hypotheses, methodology, survey instrument, and participant's role, along with the consent letter. The University of the West Indies, St. Augustine did not have an IRB in Human Subject Protection office so a letter of proposal was submitted to the Registrar's office outlining the purpose of the study, the research questions, and how the information that goes into the final product will be treated. The IRB approved the research study at the University of the Louisville and the University of the West Indies, Cave Hill campus.

Study Limitations

This study is limited in several ways. First, the study used Tinto's (1975, 1993) model, which was partially validated by Pascarella & Terenzini (1980) in a U.S. university to investigate students in a Caribbean university system. The researcher used Tinto's model because there is very little research on student retention and persistence in a Caribbean university so models derived from a Caribbean tertiary level student population were not available. Subsequently, the scales and subscales used did not appear to be appropriate to the campus culture in examining STEM student's retention issues for

the two UWI campuses investigated. Moreover, the education system, organizational structure (mission, culture and governance) differed in the Caribbean territories from that of the U.S. education system. This limitation is tempered somewhat because the researcher was educated in the Caribbean and the United States and knowledgeable about both systems.

Second, the sample size may affect the accuracy and replicability of the study. Logistic regression generally requires large sample sizes in order to produce “accurate, replicable population parameter estimates... small samples produce substantial volatility in parameter estimates” (Osborne, 2014, p. 349). In this population with a small sample size ($N = 293$), the range of the confidence interval was relatively wide, when predicting the effect of campus on re-enrollment status, indicating poor precision.

Third, using surveys only to collect data introduced self-reported data as a limitation of the study. Dillman (2007) points out that in self-reporting surveys students will chose their responses on the Likert scale quickly with as little contemplation as possible. Furthermore, pen and paper surveys were considered the most efficient way of collecting the data. However, transcribing data from a paper survey may introduce error into the results.

Fourth, the investigated variables only begin to reflect the complexity of the model used and there may be other factors which contributed to student withdrawal on each campus that was not considered. Furthermore, the construct used in this study to determine student retention was based on the student’s intent to re-enroll at the institution in their second semester and student’s intent to re-enroll is not synonymous with re-enrollment status and may not perfectly correlate with the student’s actual re-enrollment

behavior in the spring semester. In the study, voluntary withdrawal does not differentiate between students who dropped out, stopped out for a period of time and returned to the university at a later date, or students who transferred to another university.

Fifth, the findings must be generalized cautiously. The study was only conducted in two of the three main UWI campuses and the traits specific to the institutions in the study could be a threat to external validity or generalization of the findings to other student populations in the Caribbean region, particularly Mona campus, the flagship campus of the UWI. Additionally, the study concentrated on only one cohort of students in this university system, that is STEM majors, and they might not be representative of other student cohorts in other majors. Subsequently, the findings of this study may need to be replicated in various settings. Additionally, selection bias was assumed to be present since students were non-randomly assigned at the two institutions and the method of data collection was different on both campuses.

Sixth, statistical conclusion validity may have occurred due to the inapplicability of the academic advising measure. It was assumed that the *AAI* would accurately measure the advising approach and the student's satisfaction with the advising they were experiencing on the campuses, but the majority of the respondents stated that it was not applicable to their program. Furthermore, some students found the *AAI* instrument confusing. As a result, the number of responses for the developmental-prescriptive advising and student satisfaction with academic advising variables was less than the responses for the other variables.

Seventh, the internal validity of the study may have also been compromised by a history threat since the procedures during the study might have affected one campus but

not the other (Teddlie & Tashakkori, 2009). Although purposive and non-random sampling were employed on both campuses, at the Cave Hill campus in Barbados the researcher distributed the surveys in a controlled environment and was available to answer any questions the respondent had, particularly about the *AAI*, while at the St. Augustine campus in Trinidad since student service personnel and students distributed the surveys, the researcher was not present. Randomly assigning individual students would have improved internal validity but this was not practical at both campuses.

Eighth, the sample from the St. Augustine campus was an under representation of the first year STEM student population while the sample from the Cave Hill campus was an over representation of the STEM student population.

Finally, the effects of researcher bias may be inherent in the study. The researcher is a graduate of this university system and her views and perceptions may affect the inferences made of the results. Employing a second external researcher to replicate the study would alleviate this limitation.

CHAPTER 4

RESULTS

This chapter presents the research findings. The current study explored issues pertaining to first-year STEM students' persistence and retention at a public university system in the Caribbean during the fall 2014 semester. The chapter is organized by the four specific research questions and their corresponding hypotheses discussed in Chapter 3. Descriptive statistics and logistic regression analyses are outlined for research questions one, two, and three. Following are the analysis and outcomes of research question four. Prior to analyzing the data, the researcher reports the tests performed for data cleaning and assumptions and examines the reliability of the instrument used.

The conceptual model for the first year STEM Caribbean student's institutional departure was amended to exclude *enrollment status* and *academic advising* as predictor variables of student's decision to re-enroll the second semester (Figure 3). Of the data collected only 2% of the students were enrolled part-time, and the natural log of the probability of the event/probability of the non-event was too small to be significant. In relation to the *academic advising* variable, STEM students indicated that they were unable to complete the developmental-prescriptive advising questionnaire in the *Academic Advising Inventory* (AAI). Only 47% of the sample attempted part 1 of the AAI. Subsequently, adding the advising variables simultaneously to the logistic regression model reduced the odds ratio and power of the other predictor variables.

Figure 3: Amended Conceptual Model for First Year STEM Caribbean Students'

Institutional Departure

Data Cleaning and Assumptions

Preceding the analysis of the variables using logistic regression, data cleaning was explored for the continuous variables on the *Institutional Integration Scale (IIS)*. According to Osborne (2014), data points that are visually separated from the rest of a distribution are potentially concerning and should be inspected for error and removed. In a normal distribution, data points that fall outside ± 3 standard deviations are likely candidates for examination for error (Osborne, 2014). In the study all variables had standardized residuals values between ± 3 . The DFBetas of the slopes of each continuous variable were also explored for outliers. The *institutional and goal commitments* variable had zDfbetas which were believed to have influential cases that may affect the model. One case with zDfbetas less than -5 was removed and the logistic regression model was re-analyzed.

Furthermore, the study was examined for missing or incomplete data. Missing data can lead to biased parameter estimates and reduction of statistical power (reduces the sample size or degrees of freedom) (Osborne, 2014). On examining the frequency and correlation analysis patterns of the missing data, it was concluded that the predictor variables with the highest percentage of missing data were *secondary school achievement* (9.7%) and *secondary school science and math GPA* (10%) and that the data were missing completely at random (MCAR). According to Osborne (2014), “random missingness may be problematic from a power perspective, but it does not potentially bias the results” (p. 364). The study relied on listwise deletions (complete case analysis), the default for SPSS, to control any missingness. Allison (2002) posits that complete case analysis is the

least problematic method for handling missing data if the percentage of missing data is not high and data are MCAR.

Testing for Linearity on the Logit

In this study, since there are 11 continuous predictor variables, the relationship between these continuous independent variables and the logit of the dependent variable should be linear (Field, 2009; Osborne, 2014). According to Field (2009) “any interaction that is significant indicates that the main effect has violated the assumption of linearity of the logit” (p. 296). In this study, the interaction between each of the following predictor variables and the log of each variable, were not significant: *secondary school science and math GPA* ($p = .08$), *degree aspiration* ($p = .51$), *parental education* ($p = .22$), *financial concern* ($p = .63$), and ($p = .21$), *interaction with faculty* ($p = .39$), *faculty concern for student development* ($p = .21$), *academic and intellectual development* ($p = .78$), *institutional and goal commitments* ($p = .32$), and *peer-group interaction* ($p = .85$). This indicated that the assumption of linearity of the logit has been met for these predictor variables. However, *secondary school academic science and math achievement* was significant ($p < .05$) and violated the assumption (see Appendix D, Table D1). Since this variable is a significant predictor variable of student reenrollment status, the researcher further tested it for a curvilinear relationship. There was no significant curvilinear effect for the *secondary school academic science and math achievement* variable.

Testing for Multicollinearity

The tolerance and variance inflation factors (VIF) values for each predictor variable were examined. In testing for multicollinearity, VIF values greater than 10 and tolerance values less than .01 are cause for concern. In this study all VIF values were less

than 10, and tolerance values for the variables were all greater than .1. This value indicates that the assumption multicollinearity has not been violated (see Appendix D, Table D2).

Testing for Independence of Errors

The Durbin-Watson test was further conducted for serial correlations between errors. Values less than 1 or greater than 3 are cause for concern since violation of this assumption leads to a Type I error. The Durbin-Watson was 2.01 so the errors are uncorrelated and the assumption of independence of errors was not violated (see Appendix D, Table D3). Logistic regression is robust to the assumptions of normal distribution of residuals and homoscedasticity due to maximum likelihood estimation.

Descriptive Statistics

This study consisted of first year STEM students attending the University of the West Indies, St Augustine and Cave Hill campuses, during the first semester, 2014. The sampling technique in the study was purposive sampling. The *UWI Survey of First-Year Students' Perceptions* instrument was distributed by the researcher and student services personnel. A total of 425 surveys were printed and approximately 400 were distributed. Undergraduate students on both campuses returned a total of 351 surveys (a response rate of 87.8%). Of these, 293 met the criteria stipulated in the study for an approximately 73.3% response rate. These surveys, representing 16.3% of the first-year undergraduate STEM population on both campuses, were subsequently used in the statistical analysis. Fifty eight (58) questionnaires were deemed invalid because the student was either an upperclassman ($n = 50$), the student declared a non-STEM major ($n = 4$), the instrument

was incomplete ($n = 3$), or the student was 17 years or under ($n = 1$). One hundred and eighteen (118) first year STEM students from the St. Augustine campus and 175 from the Cave Hill campus successfully completed the survey. The sample was approximately 8.3% of the STEM student population at the St. Augustine campus and 45.0% of the targeted population at the Cave Hill campus. Consequently, there was underrepresentation of the first-year STEM population at the St. Augustine campus. Overall, 97.9% ($n = 287$) of the sample were traditional aged students (between 18-24 years), 97.9% ($n = 286$) were enrolled full-time, and 62.0% ($n=181$) were first time college students. The enrollment status is representative of the target population in which 92% of STEM students registered full-time. The participants represented the following STEM majors: Agriculture (.7%), Applied Sciences (.3%), Biological Sciences (17.8%), Chemistry (12.3%), Computer Science (10.6%), Science/Math Education (.7%), Engineering (11.3%), Health Science (6.8%), Information Technology (2.1%), Medical Sciences (27.7%), Mathematics (3.8%), Physics (2.1%), and other Sciences (3.8%). This is representative of the distribution of majors in the target population at the Cave Hill campus in both the science and technology and the medical science sampling frames. The medical science sample represented 80% of their first-year population. However, at the St. Augustine campus the first-year STEM student population seems underrepresented in all of the three sampling frames (science and technology, medical science, engineering).

Of the STEM students participating in the survey on the two campuses, 240 (82.2%) indicated that they intended to re-enroll their second semester. This value exceeded the minimum number of events per variable (160) required for a logistic regression analysis to be conducted for this study (Peduzzi et al., 1996). Twenty-nine

(24.5%) STEM students at the St. Augustine campus and 23 (13.2%) STEM students at the Cave Hill campus revealed that they did not intend to re-enroll their second semester. One student abstained from answering this question.

The frequency of the variables used in the study for the first year STEM students at both campuses were as follows: 58.3% were female; 58.9% were Black, 21.2% mixed, and 15.4% East Indian; 74.0% achieved eight or more CXC, GCSE examinations; 95.8% had a GPA of 3.0 or greater; 78.0% aspired towards a graduate degree; 22.8% had parents with a first degree; 76.8 % lived off campus; and 50.8% had some financial concerns. Tables 10 and 11 present descriptive statistics for the sample by campus. Table 10 shows that the female sex was an overrepresentation of the STEM female population at the Cave Hill campus, and race was more accurately represented at the St. Augustine campus than the Cave Hill campus.

Table 10

Comparison of Sex and Race Statistics in the Population (Pop) versus the Sample

	St. Augustine		Cave Hill	
	Pop (%)	Sample (%)	Pop (%)	Sample (%)
Sex in STEM fields	Males (47)	Male (50)	Males (49)	Males (38)
	Females (53)	Females (50)	Females (51)	Females (62)
STEM Race/Ethnicity	Black (38)	Black (40)	Black (93)	Black (72)
	East Indians (40)	East Indians (29)	East Indians (1)	East Indians (6)
	Mixed (21)	Mixed (30)	Mixed (3)	Mixed (16)
	Others (1)	Others (2)	Others (3)	Others (6)
First-Year Students in STEM Fields	1,420	118 (8)	389	174 (45)

Comparing the mean scores of the continuous variables studied for the St. Augustine and the Cave Hill campuses showed the following: In relation to academic achievement, STEM students at both campuses had on average eight or more CXC, CSEC passes indicating a high level of achievement ($M = 4.14$). The STEM students' secondary school combined math and science GPA was also relatively high ($M = 3.47$). Additionally, students on both campuses aspired to attain at least a master's degree ($M = 3.37$) and most parents had at least some tertiary level education ($M = 3.92$). However, STEM students at Cave Hill had on average slightly higher educated parents than STEM students at St. Augustine. There were some financial concerns on both campuses but the students at Cave Hill, Barbados had slightly more concerns about their financial status. This was not surprising since the government of Barbados required students to pay tuition for the first time in the history of the university. The Pearson's correlations coefficients between each of the predictor variables are shown in Appendix C.

Table 11

Frequencies (%), Means (M), and Standard Deviations (SD) of Student Attributes of

First-Year STEM Students: St. Augustine and Cave Hill Campuses

Variable	St. Augustine			Cave Hill		
	N (%)	M	SD	N (%)	M	SD
Intend to Re-enroll						
Yes	89 (75.4)			151 (86.8)		
No	29 (24.5)			23 (13.2)		
Sex						
Male	59 (50)			61 (37.7)		
Female	59 (50)			109 (62.3)		
Race/Ethnicity						
Black	47 (39.8)			125 (72.3)		
East Indian	34 (28.8)			11 (6.4)		
Mixed	35 (29.7)			27 (15.6)		
Other Race	2 (1.7)			10 (5.8)		
Secondary School Achievement						
≤ 7 CXC	25 (21.6)			49 (29.0)		
≥ 8 CXC	91 (78.4)			120 (71.0)		
Cumulative Science GPA		3.54	0.47		3.40	0.44
< 3.0	7 (6.0)			5 (3.0)		
≥ 3.0	109 (94.0)			166 (97.0)		
Degree Aspiration		3.32	0.84		3.41	0.81
None/Other	4 (3.4)			8 (4.5)		
Bachelor's	18 (15.4)			23 (13.2)		
Master's/Doctor	95 (81.2)			93 (53.4)		
Parental Education		3.68	1.52		4.16	1.60
Primary/Secondary	36 (31.0)			44 (25.4)		
Some Tertiary	20 (17.2)			17 (9.7)		
Other Tertiary	18 (15.5)			23 (13.3)		
First Degree	25 (21.6)			41 (23.7)		
Postgraduate	17 (14.7)			48 (27.7)		

Table 11: *Frequencies (%)*, *Means (M)*, and *Standard Deviations (SD)* of Student Attributes of First-Year STEM Students: St. Augustine and Cave Hill Campuses

(Continued)

Variable	St. Augustine			Cave Hill		
	N (%)	M	SD	N (%)	M	SD
Off campus	75 (63.6)			150 (85.7)		
On campus	43 (36.4)			25 (14.3)		
Financial Concerns		1.65	0.63		1.87	0.67
None	51 (43.2)			52 (29.9)		
Some	57 (48.3)			92 (52.9)		
Major	10 (8.5)			30 (17.2)		

Selection bias often occurs when the sample does not accurately represent the population, affecting the external validity of the study. In this study there seemed to be a discrepancy between the representations of the sample for the two campuses. In the study the sample is a better representation of the population at the Cave Hill campus (45%) than at the St. Augustine campus (8%) (Table 11). This discrepancy may have resulted from the different method of data collection used on each campus and may impact the study by introducing distorted results which lead to inaccurate conclusions. For example, the findings revealed that parental education was higher on the Cave Hill campus than on St. Augustine campus and this is not supported by the literature. A possible explanation could be a result of the under representation of STEM first year students on the St. Augustine campus.

Psychometric Properties of the Instrument

The reliability and internal and external validity threats of the study were determined for *The UWI Survey of First-Year Students' Perceptions* survey. The data collected were entered into Statistical Package for the Social Sciences (SPSS) 22. Prior to analysis of the *Institutional Institution Scale (IIS)*, the mean scores of the items were computed for each participant (Caisson, 2007; Pascarella & Terenzini, 1980). One score was computed for each of the five sub-scales. The reliability of each subscale was also investigated using a Cronbach-alpha analysis (Fields, 2009). Reliability refers to consistency in measurement and validity is the extent to which the instrument measures what it claims to measure (Stevens, 2009) and the generalizability of the study's findings. The results for the *IIS* ranged from .83 to .67, with *faculty concern for student development* performing the highest and *academic and intellectual development* the lowest. The reliability coefficients of the *IIS* subscales are shown in Table 12. Similarly for the *Academic Advising Inventory*, one score was computed for the developmental-prescriptive advising scales (.78) and one for the *student satisfaction with academic advising* scale (.88). As previously mentioned, a reliability coefficient of .70 or higher is considered acceptable in social science research for a sub-scale to be considered reliable (Field, 2009). With the exception of the *academic and intellectual development*, all other subscales for this study were deemed reliable and relatively consistent with previous research findings (Table 12).

Table 12

Testing for Reliability Using Cronbach's Alpha Analysis

Variable	Cronbach's α	
	Present Study	Previous Research
Interaction with faculty	.74	.83
Faculty concern for student development	.83	.82
Academic and intellectual development	.67	.74
Institutional and goal commitments	.81	.71
Peer-group interaction	.73	.84
Developmental-prescriptive advising	.78	.78
Student satisfaction with advising	.88	N/A

Additionally, a post hoc analysis of statistical power was tested by the researcher using g*power statistical analysis for binary logistic regression (Faul, Erdfelder, Buchner, & Lang, 2009). In the g*power test, “statistical power is computed as a function of significant level α , sample size, and population effect size” (p. 1149). For research questions one and three, the statistical power for the *campus* and *institution and goal commitments* variables were computed as .99. Furthermore, in research question two, the power of the *secondary school science and math GPA* and the *parental education* variables were .93 and .89 respectively (see Appendix F). These analyses indicated that the study had a high external validity and a precise effect size that is generalizable to the overall targeted first-year STEM population at the UWI.

Binary Logistic Regression Analysis

One purpose of the study was to predict the student attributes and institutional experiences that contribute to student retention in first year students in science, technology, engineering, and mathematics (STEM) majors. Binary logistic regression analysis examined the relationship between first, student attributes and secondly, institutional experiences and STEM student re-enrollment status. All continuous variables were converted to z-scores prior to analysis and assumptions were met. The weighted means were used to analyze the data. Equation 2 shows how the model is constructed

Equation 2. General Form of the Logistic Regression Model for Campus Attended on Retention Status

$$\text{Logit}(\hat{Y}) = b_0 + b_1(\text{CAMPUS})$$

Campus versus Re-Enrollment Status

RQ 1: Does the campus students attended predict intent to re-enroll at the two UWI campuses: St. Augustine and Cave Hill, in first year STEM students?

Research question one explored whether there was a significant difference between the St. Augustine campus and the Cave Hill campus associated with students' intent to re-enroll the second semester.

First, the researcher evaluated the fit of the model. On entering *campus* into the model there was a significant improvement in model fit (null -2LL = 273.59, final -2LL = 267.78, $\chi^2 = 5.81$, $p < .05$) (see Appendix E, Table E2). The findings showed that the variable *campus* was a significant predictor of re-enrollment status. The overall accuracy of the prediction is 82.2%. As shown in Table 13, the odds of a student re-enrolling at the Cave Hill campus are 2.10 times that the odds of a student re-enrolling at the St.

Augustine campus (OR = 2.10, 95%CI = 1.15, 3.85). The confidence interval between these odds is relatively wide, indicating poor precision. However Osborne (2014) posits that wider confidence intervals are found in small sample sizes. When converted to conditional probabilities, students from Cave Hill campus have a 86.6% chance of reenrolling, while those at St. Augustine had a 75.6% chance of reenrolling, representing a relative risk ratio of 1.15. Equation 3 shows the mathematical equation for this model.

Equation 3. Logistic Regression Model for Campus Attended on Retention Status

$$\text{Logit}(\hat{Y}) = 1.13 + .74 (\text{CAMPUS}).$$

Table 13

Predictors of Campus Variable on STEM Students' Re-enrollment at the UWI

	B (SE)	Wald (df=1)	Odds Ratio (95% CI)		
			Exp(B)	Lower	Upper
Campus	.74 (.31)	5.76*	2.10	1.15	3.85
Constant	1.13 (.21)	28.13	3.10		

*Note: *p < .05*

Student Attributes versus Re-Enrollment Status

RQ2: What student attributes are associated with intent to re-enroll the following semester in first year STEM students at the UWI: St. Augustine and Cave Hill, controlling for campus?

Research question two investigated the student attributes that were associated with intent to re-enroll the second semester for first year STEM students at the St. Augustine and Cave Hill campus. Prior to analysis, *secondary school academic achievement, secondary school GPA, degree aspiration, parental education, and financial concerns* were converted to z scores (standard normal distribution). First, eight

predictor variables of student attributes on student re-enrollment status and the campus variable were entered into the equation simultaneously (Table 14). Equation 4 shows how the model was constructed.

Equation 4. General Form of the Logistic Regression Model for Student Attributes on Retention Status

$$\text{Logit } (\hat{Y}) = b_0 + b_1(\text{SEX}) + b_2(\text{RACE}) + b_3(\text{zSSACH}) + b_4(\text{zSSGPA}) + b_5(\text{zDEGASP}) + b_6(\text{zPEDU}) + b_7(\text{LIVE}) + b_8(\text{FINCON})$$

The results revealed that of the eight variables investigated, only *secondary school science and math GPA* and *parental education* were significant unique predictors of re-enrollment status. Entry of the student attribute variables into the model significantly improved model fit (null -2LL = 261.18, final -2LL = 239.48, $\chi^2 = 21.70$, $p < .05$) (see Appendix E, Table E8). The overall accuracy of the prediction is 81.5%. After controlling for all other variables in the analysis, including *campus*, a high level of secondary school science and math GPA was associated with an increase in student re-enrollment status ($b_3 = -.44$, $SE_b = .18$, $p < .05$). Specifically, as student's *secondary school science and math GPA* increased the odds of the student re-enrolling increased (OR = 1.55, 95% CI = 1.09, 2.20). When converted to conditional probabilities, assuming that all other variables are held constant, it was found that students with *secondary school science and math GPA* two standard deviations above the mean had a probability of 77.4% of re-enrolling, while students with *secondary school science and math GPA* two standard deviations below the mean had a 37.1% chance of re-enrolling. The relative risk of students two standard deviations above the mean re-enrolling compared with students two standard deviations below the mean is 2.08.

Similarly, *parental education* was a significant unique predictor of re-enrollment status (Table 14). After controlling for all other variables in the analysis, an increase in the level of parental education was associated with a decrease in student's re-enrollment status ($b_6 = -.46$, $SE_b = .19$, $p < .05$). Students with highly educated parents had an increased odds of not re-enrolling in the institution ($OR = .64$, $95\% CI = .44, .92$). When converted to conditional probabilities it was found that students with parental education two standard deviations below the mean have a 78.1% chance of re-enrolling, while students with parental education two standard deviations above the mean have a probability of 36.1% of re-enrolling. The relative risk of students two standard deviations below the mean re-enrolling compared with students two standard deviations above the mean is 2.16. Equation 5 shows the mathematical equation for the model.

Equation 5. Logistic Regression Model for Student Attributes on Retention Status

$$\text{Logit}(\hat{Y}) = .35 + .44 (zSSGPA) - .46 (zPEDU)$$

Second, an interaction effect was examined between the variable *campus* and each student attribute variable (See Appendix E, Table E15). On entering the interaction with campus into block two following the main effect, there was a non-significant model ($\chi^2 = 10.20$, $p = .42$), indicating that there is no significant differences between the campus the student attended and the student's attributes.

Table 14

Predictors of Student Attributes on STEM Students' Re-enrollment at the UWI

	B (SE)	Wald (df=1)	Odds Ratio (95% CI)		
			Exp(B)	Lower	Upper
Campus	1.21 (.40)	9.04*	3.34	1.52	7.33
Sex	.10 (.34)	.08	1.10	.57	2.14
Race (Black)		.52			
Black vs. East Indian	-.03 (.52)	.002	.98	.35	2.72
Black vs. Mixed	-.22 (.42)	.27	.80	.35	1.84
Black vs. Other races	-.44 (.85)	.26	.65	.12	3.44
Secondary school achievement	-.07 (.17)	.17	.93	.66	1.31
Secondary school science and math GPA	.44 (.18)	5.87*	1.55	1.09	2.20
Degree aspiration	-.18 (.22)	.71	.83	.54	1.28
Parental education	-.46 (.19)	5.91*	.63	.44	.95
Residency status	.43 (.44)	.98	1.54	.65	3.63
Financial concern	.12 (.18)	.43	1.15	.79	3.63
Constant	.35 (.89)	.16	1.43		

Note: * $p < .05$

Institutional Experiences versus Re-Enrollment Status

RQ3: What institutional experiences are associated with intent to re-enroll the following semester in first year STEM students at the UWI: St. Augustine and Cave Hill, controlling for campus?

Research question three explored the institutional experiences associated with STEM students' at the St. Augustine and Cave Hill campuses and intent to re-enroll the second semester, controlling for campus. Prior to analysis, the *IIS* subscales were standardized. Equation 6 shows how the logistic regression model was constructed.

Equation 6. General Form of the Logistic Regression Model for Institutional Experiences on Retention Status

$$\text{Logit } (\hat{Y}) = b_0 + b_1(\text{FACINT}) + b_2(\text{FACCON}) + b_3(\text{AID}) + b_4(\text{IGC}) + b_5(\text{PEER})$$

First, the mean scores and standard deviations for each *IIS* subscale were computed for each campus as shown in Table 15. At the St. Augustine campus, the STEM student's mean scores on subscales from greatest to least was *institutional and goal commitment* ($M = 4.30$), *peer-group interaction* ($M = 3.42$), *academic and intellectual development* ($M = 3.32$), *interactions with faculty* ($M = 3.18$), and *faculty concern for student development and teaching* ($M = 3.00$). Similarly, for the Cave Hill campus, the STEM student's mean scores on subscales from greatest to least were *institutional and goal commitment* ($M = 4.33$), *peer-group interaction* ($M = 3.29$), *academic and intellectual development* ($M = 3.21$), *interactions with faculty* ($M = 3.11$), and *faculty concern for student development and teaching* ($M = 3.07$). Both campuses showed *institutional and goal commitments* with the greatest mean score, indicating that students on both campuses agreed that it was important for them to graduate from UWI, they were confident that they made the right decision attending UWI, they had an idea what they wanted to major in, and getting good grades was important to them.

Table 15

Frequencies (%), Means (M), and Standard Deviations (SD) of Institutional Integration

Scale of First-Year STEM Students: St. Augustine and Cave Hill Campuses

Variable	St. Augustine			Cave Hill			Total		
	N	M	SD	N	M	SD	N	M	SD
Interactions with faculty	117	3.18	.85	172	3.11	.77	289	3.14	.80
Faculty concern for student development	116	3.00	.61	172	3.07	.66	288	3.04	.64
Academic and intellectual development	117	3.32	.61	171	3.21	.63	288	3.26	.62
Institutional and goal commitments	117	4.30	.83	170	4.31	.76	287	4.30	.79
Peer-Group Interactions	118	3.40	.52	174	3.29	.53	292	3.33	.53

Note: Likert Scale: 1 = *Strongly Disagree* to 5 = *Strongly Agree*

Five institutional integration variables were entered in to the model along with the institution variable (*campus*). Entering the student's institutional experiences into the model significantly improved model fit (null -2LL = 267.39, final -2LL = 237.43, $\chi^2 = 29.60$, $p < .001$) (see Appendix E, Table E17). The overall accuracy of the prediction is 81.0%. After controlling for all other variables in the analysis, student's *institutional and goal commitments* were a highly significant predictor of re-enrollment status. Table 16 shows that increased level of student's institutional and goal commitments were associated with an increase in student's re-enrollment status ($b_4 = .81$, $SE_b = .19$, $p < .001$). In other words, for every one unit change in the student's institutional and goal

commitments there is a .81 increase in the likelihood that the student will re-enroll in the institution. Additionally, the odds of students with a high level of commitment to the institution and high goal commitments re-enrolling in the institution are 2.26 times greater than the odds for students with lower levels of commitments (OR = 2.26, 95%CI = 1.56, 3.27). When converted to conditional probabilities, students with institutional and goal commitments two standard deviations, above the mean had a 94.6% chance of re-enrolling and students with institutional and goal commitments two standard deviations below the mean had a 40.6% chance of re-enrolling. The relative risk of students two standard deviations above the mean re-enrolling compared with those two standard deviations below the mean is 2.32. Equation 7 shows the mathematical equation for this research question.

Equation 7. Logistic Regression Model for Institutional Experiences on Retention Status

$$\text{Logit}(\hat{Y}) = 1.24 + .81(z\text{IGC})$$

The institutional and goal commitments findings confirm the literature. Braxton and Hirschy (2005) found that as the level of a student's institutional and goal commitments increase, the chances that the student will graduate from the institution increases. Moreover, researchers found that in commuter universities, the higher the student's degree of subsequent institutional commitment, the higher the chances of student's persistence (Braxton et al., 2014).

Table 16

Predictors of Academic and Social Integration Factors on Student Re-enrollment at UWI

	B (SE)	Wald (df=1)	Odds Ratio (95% CI)		
			Exp(B)	Lower	Upper
Campus	.78 (.34)	5.4*	2.19	.13	4.24
Interaction with faculty	.08 (.9)	.18	.92	.64	1.33
Faculty concern for students	-.17 (.18)	.95	.84	.60	1.19
Academic and intellectual development	-.1 (.20)	.26	.90	.60	1.34
Institutional goals and commitments	.81 (.19)	18.44**	2.26	.56	3.27
Peer-group interaction	-.13 (.18)	.50	.88	.62	1.25
Constant	1.24 (.24)	27.38	3.44		

*Note: *p < .05, **p < .001. Likert Scale: 1 = Strongly Disagree to 5 = Strongly Agree*

Moreover, an interaction effect was examined between the campus and each institution integration scale variable. On entering the interaction with campus into block two following the main effect, there was a non-significant model, indicating that there was not a significant association between the campus investigated and its students' institutional experiences.

Academic Advising Analysis

A second purpose of this study was to determine the nature of, and student's satisfaction with the academic advising STEM received during their first semester at the UWI. The approach faculty members used for advising were measured on a

developmental-prescriptive continuum. The means and standard deviations of the nature of advising and the student's satisfaction with the program were used to analyze the data.

Academic Advising on a Developmental-Prescriptive Continuum

RQ 4a: What perceptions do first year STEM students at the UWI have about the type of academic advising they received in relation to the nature of academic advising on a developmental-prescriptive continuum?

Research question 4a investigated the perceptions that first-year STEM students had about the approach to academic advising they received as measured by the Winston and Sandor (1972), *Academic Advising Inventory* (AAI). The developmental-prescriptive advising (DPA) approach was examined (Crookston, 1994). However, at both campuses, STEM students indicated that they were unable to complete the developmental-prescriptive advising questions in Section 1 of the AAI and they were asked by the researcher to make a comment on this decision. At the St. Augustine campus, only 56 students or 47.5% of the sample attempted the DPA while at the Cave Hill campus, 83 students or 47.4% of the sample attempted the 14 questions (Table 17). When asked by the researcher to comment on the decision to not complete the survey instrument, some students indicated that they were unaware of the intent and process of academic advising; some stated they had not been assigned advisors, while others said they had not yet met with an advisor. These findings are not consistent with the institution's advising mission and the posting on their website: "Students are assigned an advisor when enrolling at the university during Orientation Week" (UWI, St. Augustine, 2014-2015). Some students also pointed out that the *Academic Advising Inventory* did not provide an option for 'not true' and this limited their choices. Table 16 showed that, at both campuses, students

perceived the descriptions of the faculty’s approach to academic advising as being ‘slightly true.’

Table 17

Means and Standard Deviations (SD) of the Developmental-Prescriptive Advising Scale of First-Year STEM Students: St. Augustine and Cave Hill Campuses

Scale/Subscale	St. Augustine			Cave Hill		
	N	Mean	SD	N	Mean	SD
Developmental-Prescriptive Advising	56	4.34	.89	83	4.53	1.25
Personalizing Education	56	3.91	1.21	83	4.11	1.50
Academic Decision-Making	49	5.19	1.45	67	5.15	1.47
Selecting Courses	53	4.75	1.76	79	4.96	1.85

Note: Likert-type Scale: 1 = *very true* to 4 = *slightly true*; 5 = *slightly true* to 8 = *very true*

The overall *developmental-prescriptive advising* (DPA) scale revealed that STEM students at both campuses, who completed the AAI section of the survey, perceived the faculty advisors as using a more developmental approach to academic advising than prescriptive. However, on further exploration of this scale, the students at both campuses, particularly St. Augustine, perceived their advisor as using a more prescriptive academic advising approach in relation to *personalizing education* (Table 18). Personalizing education (PE) identifies student’s concerns about their overall educational experiences. These experiences may include career planning, extracurricular activities, goal setting, identification and utilization of resources on the campus, as well as personal issues. However, in PE, “the advisor is perceived as the expert” and “students are seen as primarily receivers of information” (Winston & Sandor, 2002, p. 11). These findings are

consistent with the conclusions of Allen and Smith (2008), who investigated faculty attitudes towards, and experiences with academic advising. Allen and Smith (2008) suggested that the faculty felt that it was their responsibility to meet with students for academic reasons only and they were not concerned with student's personal issues.

Additionally, the study found that at both institutions, students perceived that faculty advisors took a more developmental approach to *academic decision-making* (ADM) and *selecting courses* (SC). ADM items focused on whose responsibility it was (faculty advisor or advisee) for making and implementing academic decisions while SC items dealt with choosing appropriate courses and academic planning.

Table 18

Developmental-Prescriptive Advising Scores for First-Year STEM Students at UWI

Scale/Subscale	St. Augustine n = 43		Cave Hill n = 55	
	Prescriptive (%)	Developmental (%)	Prescriptive (%)	Developmental (%)
Developmental-Prescriptive Advising (DPA)	60 (48.7)	63 (51.2)	58 (36.9)	99 (63.1)
Personalizing Education (PE)	32 (76.2)	10 (23.8)	32 (60.3)	21 (39.6)
Academic Decision-Making (ADM)	8 (21.1)	30 (78.9)	9 (18.4)	40 (81.6)
Selecting Courses (SC)	20 (46.5)	23 (53.4)	17 (30.9)	38 (69.1)

Students' Satisfaction with Academic Advising

RQ 4b: What perceptions do first year STEM students at the UWI have about the type of academic advising they received in relation to students' satisfaction with academic advising?

Research question 4b investigated the STEM student's perception and satisfaction with the academic advising experience at St. Augustine and Cave Hill campuses.

However, only 98 surveys or 33.4% of the sample were completed for this question and subsequently used in its analysis. When asked to consider and respond to the academic advising they had participated in this year at the university, 41 students left all five statements unanswered. Table 19 shows that the mean scores for student's satisfaction with academic advising and its five items all hover around the average score (2.5) with St. Augustine students more slightly satisfied than students at the Cave Hill campus. This result indicates that overall about half the students participating in the study on each campus were dissatisfied with the academic advising program that they received. However, a little over half the student from the St. Augustine campus agreed that information provided by faculty advisors was accurate and that they were given adequate notice about important deadlines.

Table 19

Means and Standard Deviations (SD) of Student Satisfaction with Academic Advising of First Year STEM Students: St. Augustine and Cave Hill Campuses

Items	St. Augustine			Cave Hill		
	N	Mean	SD	N	Mean	SD
Student satisfaction with academic advising (SSA)	83	2.59	.75	141	2.44	.79
Overall satisfaction	82	2.48	.97	140	2.48	.99
Accuracy of information provided	82	2.73	.88	140	2.52	.96
Adequacy of notice about important deadlines	82	2.61	.91	139	2.49	.93
Availability of advising when desired	80	2.54	.96	139	2.43	.96
Amount of time available during advising sessions	81	2.58	.92	134	2.30	.96

Note: Likert scale: 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree

Summary of Results

Chapter 4 presents the four research questions and their results for the study.

Table 20 summarizes the key findings for each questions and whether the hypothesis was supported.

Table 20

Summary of Key Findings in the Study

RQ	Analysis	Variables (N)	Results
1	Logistic Regression	Campus (1)	<i>Campus</i> was significantly associated with re-enrollment status. Students are more likely to re-enroll at the Cave Hill campus. The hypothesis was supported.
2	Logistic Regression	Student Attributes (8)	Of the 8 variables investigated only two, <i>secondary school science and math GPA</i> and <i>parental education</i> were associated with re-enrollment status. As student's secondary school science and math GPA increases, the chances of re-enrollment increases while as parental education increases, the probability that a student re-enrolls decreases. The hypothesis was only partially supported.
3	Logistic Regression	Institutional Experiences (5)	Of the 5 subscales examined only one, <i>institutional and goal commitment</i> was associated with re-enrollment status. Student's institutional and goal commitments increase the likelihood that a student will re-enroll. The hypothesis was only partially supported.
4a	Descriptive Statistics	Advising approaches (1)	Advisors used a more prescriptive advising approach in personalizing education but a more developmental approach for academic decision making and selecting classes. The hypothesis was only partially supported.
4b		Student Satisfaction (1)	Students were uncertain about their level of satisfaction with the academic advising they received. The hypothesis was not supported.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

This chapter presents a summary of the study and important conclusions drawn from the data presented in Chapter 4 and reflect on these findings. It provides a discussion of implications for practice and recommendations for future research. The study examined the student attributes and perceptions of institutional experiences of first year STEM students at two campuses of the University of the West Indies: St. Augustine campus and Cave Hill campus on the student's intent to re-enroll at the university. The study further sought to determine the nature of, and student's satisfaction with the academic advising received during his or her first semester at the university. A survey instrument was distributed to STEM students at each university to ascertain their attitudes and perceptions. Binary logistic regression was used to analyze the data and provide the results.

Campus Attended and Re-enrollment Status

Research question one explored whether there was a significant difference between the St. Augustine campus and the Cave Hill campus in relation to student's intent to re-enroll the second semester. The results indicated that there was a significant association between the campus the student attended and student's intent to re-enroll the second semester. The chances of a student re-enrolling at the Cave Hill campus were greater than the chances of re-enrollment at the St. Augustine campus. These findings are

consistent with the literature. According to Tewarie (2010a), the St. Augustine campus has the higher stop out rate of the two campuses. Additionally, the campus a student attended was highly correlated to whether the student resided on campus or off campus. Both campuses tended to be commuter campuses but the Cave Hill campus had a higher percentage of students who lived off campus and their chances of re-enrolling were higher than the St. Augustine student. This outcome contradicted previous research findings. According to Pascarella and Terenzini (2005) and Whalen and Shelly (2010), students in STEM majors who lived on campus have a higher success rate than students who lived off campus since students living on campus were more likely to participate in extracurricular activities and form peer groups (social integration), which contributed to their persistence (Whalen & Shelley, 2010). Barbados is a smaller island (166 square miles, 12.1 miles long by 7.58 miles wide) than Trinidad and it is more practical for the first year local students to reside at home with parents and/or extended family members. Moreover, first year students from contributing countries attending Cave Hill, Barbados tend to live 1 to 3 miles off campus in neighboring environs due to the close proximity to the university. As a result, students living off-campus are equally as able to participate in the extra-curricular activities on campus as students who live on-campus which improves the student's chances of graduating (Astin & Oseguera, 2012; Whallen & Shelley, 2010).

Student Attributes and Re-Enrollment Status

Research question two investigated the association of the student attributes sex, race/ethnicity, secondary school academic achievement, secondary school science and mathematics GPA, degree aspiration, parental education, residency status, and financial

concerns, with intent to re-enroll the following semester for first year STEM students at the St. Augustine and Cave Hill campuses, controlling for campus. The findings indicated that there was no relationship between sex, race/ethnicity, secondary school achievement, degree aspiration, residency status, and financial concerns on student's intent to re-enroll the following semester for first year STEM students at the UWI. These findings did not support the student persistence and retention literature (Astin, 1993; Astin & Oseguera, 2012; Bean, 1980; Chen 2013; Pascarella & Terenzini, 1980; Tinto, 1993). These researchers suggested that student's demographic characteristics and enrollment factors are significant dimensions of student's re-enrolment status. There was no difference between race/ethnicity and student's re-enrollment status. One reason proposed for this was that, in the U.S. literature 'minorities and underrepresented' students are identified as being less likely to persist in the universities. In the Caribbean culture, this delineation does not exist between races. Caribbean people are generally classified by social class structure (Gordon, 1987). Additionally, the campus a student attended was highly correlated to the student's race or ethnicity. Students at the Cave Hill campus were predominantly Black. At the St. Augustine campus, even though the participants were mainly of the Black race, race and ethnicity was more evenly distributed across Black, East Indian, and mixed race. This distribution is similar to the ethnic group profile of both countries (Index Mundi, 2013a, Index Mundi 2013b).

Secondary school achievement and degree aspiration were also not significant predictors of re-enrollment status. The researcher suggested that Caribbean students, whether they plan to return to the university or not the following semester, had high secondary school achievement and high levels of motivation to attain a degree and that

some of the students in the study may have been transferring to another university or stopping out to work with the intent to return at a later date. There was also no significant association between financial concerns and student's retention status and there was no interaction effect between financial concerns and campus attended. The researcher purports that most students, in spite of the financial changes at the Cave Hill campus, would have made the decision to attend UWI knowing their financial status and whether they could support themselves for their first academic year. In other words, the effects of financial status on student retention would become more apparent at the beginning of student's second academic year more so than their second semester.

In this study the student's secondary school math and science GPA and his or her parent's level of education were significantly associated with re-enrollment status. A student with a high secondary school science and math GPA is more likely to re-enroll in the institution. Tinto's model of institutional departure (1993) demonstrated that academic integration is a key element of the student departure puzzle and secondary school GPA has been shown to provide insight into academic performance in the university as well as a strong positive predictor for student's persistence. Furthermore, researchers found that academic achievement in mathematics and science prior to entering the university was significantly associated with persistence across all STEM majors (Chen, 2013; Shaw & Barbuti, 2010). The researcher proposes that lower math and science scores in secondary school may have been the result of student's lack of motivation and student's anxiety in these subject areas, which is prevalent in Caribbean society. Recommendations are suggested for assisting these students later.

Surprisingly, students with highly educated parents were less likely to re-enroll. The literature contends that students with parents who are highly educated are more likely to receive encouragement and support from their parents which makes the student more likely to persist and graduate from a tertiary level institution than their first generation counterparts. However, there may be other events occurring and influencing this result or the culture of the region may have contributed to this finding. Moreover, the majority of the students who participated in the study had parents who had some tertiary education: St. Augustine (81.2%) and Cave Hill (74.6%), so the respondents were predominantly not first generation college students. One suggestion for these findings is the idea that both campuses were commuter campuses. Braxton et al. (2014) discovered that in commuter universities as the level of parental education increased, the likelihood of student persistence decreased. They suggested that more educated parents preferred their sons and daughters to attend residential universities. From a Caribbean cultural perspective, parental and family influences in career decision making and attaining a degree is very high. Highly educated parents, especially those who may have studied outside the Caribbean (North America or United Kingdom), would anticipate that their children will attend the UWI for their first semester or first year with the intention that they will be transferring to a university outside the Caribbean to complete their degree. Parental education was also negatively significantly correlated with the student's financial concerns ($r = -.18, p < .001$). Students whose parents were highly educated had less financial concerns. This is consistent with the literature (Chen, 2013). Nevertheless, more than half of the students on both campuses had 'some' to 'major' financial concerns (St. Augustine, 56.8%; Cave Hill, 70.1%). This supported previous research findings that

more than half of first year students studied had some financial concerns (Pryor et al., 2009). However, financial concerns were not a factor contributing to student's re-enrollment status on either campus. An interaction effect between these students attributes and campus found a non-significant model indicating that there is not a significant association between the campus the student attended and the student attributes.

The examination showed that 83.2% of the respondents had made the decision to re-enroll in the second semester and those who had made the decision to withdraw did not relate that choice to most of the factors identified by U.S. researchers. This researcher proposes that the one main reason for this conclusion is that the UWI is a highly selective institution where access is based on achievement and merit only, priority is given to students based on their educational abilities, and first year students compete for placement into the STEM fields at the institution (Roberts, 2003). The medical science and engineering programs particularly, since they are in high demand, are forced to be highly selective. In the U.S., access to higher education is more equitable and embraces measures which compensate for the inclusion of underrepresented and disadvantaged students as well as merit. High selectivity for access in the Caribbean contributes to cultural capital which is positively associated with student persistence (Berger, 2000; Braxton & Hirschy, 2005). Subsequently, at the UWI, students are more motivated to persist, whatever the circumstances. Also, a student who is contemplating stopping out may be encouraged by his or her peers to reconsider (Astin & Oseguera, 2012).

Secondly, the characteristics of the Caribbean student may have influenced these results. According to Roberts (2003), in the Caribbean university, students are expected

to take full responsibility for most of their learning. Furthermore, the sample selected by the researcher was comprised of first year students in science and technology, medicine, and engineering. These students are most likely considered the ‘elite’ on both campuses with highly educated parents who encouraged them to persist and graduate.

A third reason proposed for these findings is related to the culture of the Caribbean people. In the Caribbean territories where Caribbean identity is grounded in survival and assimilation, education is a pivotal factor in survival and social mobility, (Gordon, 1987; Hall, 2001) more than it in the U.S. society. As previously mentioned, the student’s cultural identity may affect the way he or she perceives degree attainment and his or her decision to return or stop out of the university. Consequently, graduating from the UWI becomes important regardless of demographic characteristics and enrollment issues.

Institutional Experiences and Re-enrollment Status

Research question three examined the Institutional and Integration Scales (IIS) adapted from Pascarella and Terenzini (1980). The findings suggested that interaction with faculty, faculty concern for student development, and academic and intellectual development, and peer interaction did not increase the chances of student’s persistence as indicated by the literature (Astin & Oseguera, 2012; Caison, 2009; Tinto, 2012). This could have resulted from the campus culture at both universities. For example, in the U.S. sports defines campus culture and is a bigger activity on many campuses than in the Caribbean. Sports build campus communities, and encourage interpersonal interactions between students as well as between faculty and students. Since both campuses are

predominantly commuter campuses, they may lack strong social communities, faculty interaction, and peer-group activities. According to Roberts (2003) in the Caribbean tertiary level education, personal interactions with peers are more distant and less supported and the student's relationships with their faculty are more impersonal than in the U.S. higher education system where faculty members play a more nurturing role. Interestingly, there was a strong, positive significant correlation between faculty interaction and all other academic and social institutional interactions investigated (see Appendix C).

The student's institutional and goal commitments were positively significant predictor of student's intent to re-enroll. This supported Tinto (1993) model which established that institutional and goal commitments are significant components in a student's decision to persist or withdraw from a tertiary institution. This theory has also been partially supported using predictive validity by other researchers (Astin & Oseguera, 2012; Braxton & Hirschy, 2005; Pascarella & Terenzini, 1980). Moreover, approximately 40% of the STEM students surveyed had previously attended a tertiary level institution. Subsequently, students might be more responsible, dedicated, and adept to the expectations in a university setting. Student's confidence that they made the right decision in attending the UWI and that graduating was important to them increased the chances that they will re-enroll. Furthermore, the campus culture has high expectations for student success and this is identified in the literature as encouraging student persistence and retention, particularly in the student's first year (Braxton & Hirschy, 2005; Tinto, 2012). Additionally, the study examined mathematics, science, medical science, and engineering students. The researcher proposes that most of the sample had

set short term and long term goals and the few who were probably in these majors as a result of their parent's influence, would be more likely to withdraw at the end of the first semester.

The Nature of and Satisfaction with Academic Advising

Research question 4a explored the nature and approach of academic advising and student's satisfaction with the academic advising process at the university. Many students seemed unaware of the intent and purpose of the academic advising process. Only 47% of the respondents completed the section on academic advising. Most of the remaining students commented that they did not receive academic advising beyond course selection at the beginning of the semester and in some cases the course selection process was done by faculty during a group session. According to Hall (2001), academic counseling is perceived differently by Caribbean people than U.S. residents.

The students who received academic advising at both campuses felt that the overall approach was developmental in nature. However, as anticipated, the faculty advisors tended to take a more traditional prescriptive approach rather than developmental in personalizing education. In the latter approach, the faculty is seen more as an authority figure (Crookston, 1994). Personalizing education refers to the total educational experiences of a student (Winston & Sandor, 2002). This result confirmed Tewarie's (2010a) findings that first year students at the UWI did not know who to turn to when they had non-academic concerns or were experiencing personal challenges. On the positive side, students who participated in academic advising felt that faculty were using a more developmental approach in the academic decision-making scales and the

selecting courses subscales. These task involved faculty monitoring student's academic progress, as well as advising students in selecting and registering for the appropriate courses and academic scheduling (Winston & Sandor, 2002).

Overall, first year STEM students at UWI seemed uncertain about their degree of satisfaction with the academic advising process. According to the UWI (2014) website, the purpose of academic advising at the university is to “help students, particularly new students, in planning, monitoring and successfully managing their chosen field of study, in relation to clear career objectives. Students are guided to accept responsibility for their learning, to be informed of the services provided for them, to access information, and to be managers of their time” (UWI, 2014, para. 1). The UWI website implies that academic advising is part of the culture of the institution and it is the student's responsibility to know the advising process but the student's comments indicated otherwise. The results verified that faculty advisors assisted first-year students with academic planning and monitoring pertaining to their major and career, but unfortunately this service seemed to be only available to a small group or specific majors within the STEM fields on the campuses. There seemed to be some disconnect between what the institution identified as the faculty advisor's responsibilities, as indicated on their website, and the student's expectations. This is consistent with the results founded by Allen and Smith (2008).

Implications of the Study

The results of this study have implications for research, theory, and practice particularly for first-year students who need guidance and direction in the environs of a new university. The study is important for institutional researchers and higher education professionals conducting student retention research. Further research on the factors

associated with student persistence and retention on each of the two campuses: St. Augustine and Cave Hill, and developing theories specific to this Caribbean STEM student population is needed. Additionally, administrators, faculty, and student service personnel at each campus can draw on the outcomes of the study to inform practice by designing and implementing interventions and programs for STEM students who are at risk of stopping out of the university. For example, with the knowledge that secondary school math and science grades affect persistence, personnel can organize tutoring centers or supplemental instruction for students who may need assistance, especially in mathematics. Additionally, assigning peer mentors for first-year students campus-wide may not only provide them with a sense of belonging at the university but also create connections and peer interactions for academic assistance and social relations if needed.

Student services at the UWI are more “formalized and institutionalized” (Roberts, 2003, p. 28) than in the U.S. universities. The study sought to inform student services personnel on learning outcomes and objectives for the first year initiatives program. One purpose of an effective first year initiative program is to help students make connections at the university. At the UWI, first year programs strive to facilitate the personal, academic, career, and social success of all first year students. First year experience workshops are held weekly for all first year students. However, students are not mandated to attend these workshops. At the Cave Hill campus, for example, with over 1,700 first year students campus-wide, only about 15 to 20 students attended the first year experiences workshop. Since institutional and goal commitments was a contributor to student persistence, focusing on making connections with faculty, peers and the campus as a whole should affect student persistence and retention. Assigning the first year

workshops as a required course for all full time, first year students has been shown to help students make these connections during their first year of college (Dahlgren, 2012). Moreover, goals setting and prioritizing may be an important topic to discuss in a first year seminar class. Setting goals will not only help to motivate students but also provide them with targets to work towards, a sense of accomplishment when they do achieve the goals, and assist students in managing their priorities. Coaching students on strategies for successful time management, scheduling, and planning are also integral to setting goals. Furthermore, focusing on the development of effective and efficient study habits and test taking skills may assist students who transitioned from secondary school with a low science and math GPA. Faculty members teaching first-year seminar courses have the advantage that they can encourage student's participation and involvement in campus activities. This level of involvement is usually difficult to achieve on commuter campuses but offering students incentives, awards, and recognition for participation may contribute to student's institutional commitment and subsequent persistence.

The positive, significant correlation between campus and financial concern is disheartening. Administrators at the Cave Hill campus should implement needs based scholarships and grants for STEM students experiencing financial concerns. One other interesting significant correlation existed between the student's sex and degree aspiration where females in STEM fields generally had higher degree aspirations than males. Members of the faculty and student services personnel should consider providing workshops and summer camps with interactive activities to encourage secondary school Caribbean males to pursue STEM fields even though the study shows that gender does not significantly affect student persistence and retention in STEM majors.

One program, identified and investigated in the study was academic advising. University administrators, faculty members, and student services personnel should embrace a commitment to an effective academic advising program on each of the two campuses which cater not only to student's academic experiences but encompasses the student's personal situations and decision-making skills. This commitment should reflect and relay the importance of an effective and efficient academic advising program not only to the student, but to all stakeholders and the institution as a whole. With this end in mind, administrators should develop a set of clear goals and objectives, clarify the role faculty members and student service personnel will play in the decision-making process, and discover ways to motivate faculty to strive to deliver a high quality academic advising program.

First, create a small task force of about four members (Dean of science and technology, an assistant professor, director of student services, student services representative) led by a well-respected full time faculty member to explore, monitor, and coordinate the academic advising process and to spearhead new ideas and direction for a well-structured academic advising program based on an effective and efficient faculty advising model. The model should embrace the mission, vision and values of the university system and be appropriate and applicable to the student population being served on each campus. Kennemer and Hurt (2013) summarized characteristics from the literature that have been determined to be essential for effective academic advising.

Benchmarking, by researching effective academic advising programs in other Caribbean institutions, particularly the flagship campus, would provide initial thoughts and insight and the committee can determine how best they can adapt this model to their

campus. To get administrators and faculty full buy-in, the task force should provide faculty with valuable information and sound research on effective academic advising practices: the advantages and positive outcomes, especially as they pertain to student persistence and retention at a tertiary level Caribbean institution. Other recommendations for research for the task force are outlined in the following section.

Second, administrators should offer incentives, recognition, and rewards to faculty in an effort to motivate them to accept academic advising as not just an added responsibility that increases their already heavy workload. These incentives may be tangible or intangible and may include time off, funding to attend professional development workshops, a reduced schedule, providing faculty with authority, and/or personal and professional support (Hossler, Zinkin, & Gross, 2009; Wallace, 2011). Hossler et al. (2009) argue that a criticism of why faculty advising practices do not provide high quality advising is due to a lack of incentives and system disincentives.

Next, administrators should offer a position to one full time faculty member to take on the role and responsibilities of the faculty advisors in Science and Technology and Medicine on each campus as well as Engineering at St. Augustine campus. First-year students should be encouraged by student service personnel to meet with their academic advisors on a regular basis and not only at the beginning of the semester. The researcher proposes that administrators should prepare faculty advisors with the tools and resources needed for effective advising, including accurate and timely information to share with students. They should articulate procedures and expectations for each advising session, as well as supply faculty with resources for students experiencing challenges. Having

knowledge of campus activities and student involvement opportunities to share with students would also increase institutional commitment.

Moreover, faculty advisors, especially the newer faculty, at each campus should be trained in the pedagogy of academic advising including techniques of developmental approaches to advising (Allen & Smith, 2008; Crookston, 1994, 2009; Cuseo, 2002). The university should provide funding for professional development so academic advisors can attend workshops and conferences, particularly to attend the regional and annual conferences held by the National Academic Advising Association (NACADA) whose mission is to enhance the educational development of college students both in the U.S. and internationally.

Alternately, the university system may employ professional academic advisors whose exclusive role is to assist students in not only selecting courses but with their growth and development during the college years and designing meaningful educational goals and plans, with frequent contact between advisor and advisee. Furthermore, ongoing evaluation and assessment of the effectiveness of the implemented academic advising process and also its effect on student persistence and retention should be ongoing. Providing information and the resources to engage effectively during the advising process should exhibit the institutions commitment to delivering a high quality advising program, clarify and understand student's perception of academic advising and clearly articulate what advising is and the advising process.

Recommendations for Future Research

Research on this area of student persistence and retention has increased in recent years. However, research specifically focusing on this population: STEM students in the Caribbean, remains almost nonexistent. The following recommendations are aimed at closing the gap in the literature on this topic at the UWI or any tertiary level education institution in the Caribbean region:

1. This study relied on a survey of STEM student's perception of the factors they perceive are influencing their decision to re-enroll in the university. Using this study as a pioneer study, as it was intended; researchers can explore a mixed methods design and conduct follow up research.
2. A qualitative approach design is recommended for research questions one, two and three to explore and identify specific reasons and factors associated with this particular population of STEM students in the Caribbean. Conducting focus groups among faculty members, student services personnel and students would provide additional insight about the dynamics of this university system.

Additionally, interviewing the Campus Registrar (his office is responsible for Student Affairs) and Director of Student Services at each campus would explore the perceptions and views of the administrators. Two questions suggested by Wallace (2011) are: (i) What value do administrators, faculty, and students place on faculty advising at the UWI? (ii) What structures at UWI could better inform and encourage faculty participation in advising? After thorough investigations, the researcher would be able to develop a theory that is unique to the Caribbean tertiary level system.

3. To explore research questions two and three further, conduct a longitudinal research over a span of a one academic year period (first semester 2014 and second semester, 2015) and review student's records at the beginning of the spring semester, 2015 and fall semester, 2015 as the re-enrollment status variable.
4. Replicate the study with a larger sample size, extending the population to students external to STEM fields. This approach would make the findings more generalizable to the campus population and provide better implications for practice to administrators and students service personnel.
5. The study showed that the campuses student's attended were predominantly commuter campuses. A new study should be conducted using the theory of student persistence in commuter universities as the conceptual framework (Braxton et al., 2004; Braxton et al., 2014). This study would examine the following student attributes: motivation, self-efficacy, empathy, affiliation needs, control issues, and anticipatory socialization as well as support, community, and family on student persistence.
6. The *Academic Advising Inventory* used in research question four may need updating so that it is more applicable to the needs of diverse and international college and university students. Additionally, the 8 point range for each item is not a suitable Likert scale since it does not include a 'not true' option for respondents. Designing an instrument for more diverse and international groups of students with a more user friendly range is suggested.

Conclusions

Student persistence and retention are now one of the leading challenges faced by colleges and universities. At the University of the West Indies (UWI)), the premier university system in the Caribbean, retention rates of first-year science, technology, math, and engineering students (STEM) students have been declining gradually over the last ten years, and this decline is cause for concern. STEM graduates provide the human capital needed to keep these developing nations competitive on the money market and internationally. Additionally, increasing student stop outs after their first year affect the university since student retention is necessary for financial management and to maintain academic programs, particularly on campuses where the contributions of the governments have decreased (Tewarie, 2010a).

The UWI has three main campuses and this study focused on student persistence in two of its campuses: the St. Augustine Campus in Trinidad and Tobago and the Cave Hill campus in Barbados. This study fills a gap in the persistence and retention literature for first year STEM students since there is very little research or literature related to this student population in the Caribbean tertiary education system. It is a pioneering study and provides a foundation for other researchers.

The focus of the study was to explore STEM student's attitudes and perception on issues deemed by the literature to contribute to student persistence and retention (Tinto, 1993, Pascarella & Terenzini, 1980, Cuseo, 2002). Student attributes and institutional experiences that are associated with student retention in first year STEM students were examined at these two UWI campuses. The nature and student satisfaction with one institutional experience, academic advising, was further explored in STEM students.

The researcher employed a quantitative design in the form of a survey. Sixteen predictor variables, including *campus*, and one categorical dependent variable were used. The dependent variable was intent to re-enroll in the second semester. Data from the surveys were analyzed using binary logistic regression, a research method specifically design for categorical dependent variables (Field, 2009; Osborne, 2014).

The results of the study revealed that the campus was a significant predictor of re-enrollment status. STEM students at the Cave Hill campus were more likely to re-enroll than those at the St. Augustine campus. However, only two of the students attributes examined were significant predictors of student retention in this population and these variables were not associated with the campus. These were *secondary school math and science GPA* and *parental education*. Of the five institutional experiences investigated only one was a significant predictor of student's re-enrollment status. This was *institutional and goal commitments*. Since the statistical power of these models were high, both the effects of the null findings and significant findings of this study are supported as being accurate.

Students indicated that they were not receiving academic advising and they were not fully satisfied with the faculty advising program at the institution. Recommendations were presented to improve academic advising on both campuses. These recommendations included offering incentives, recognitions, or rewards to faculty advisors or employing full time professional advisors whose role would be solely advising. Additional recommendations asked researchers to replicate the study using a mixed research design approach and extend it to the campus population external to STEM majors. On reflection, using the theory of student persistence in commuter universities (Braxton et al., 2004;

Braxton et al., 2014) as a conceptual framework for the study may have been more applicable to this Caribbean STEM student population than Tinto's (1993) model.

Additionally, the study was only conducted over one semester at the UWI and explored first year STEM student's intent to re-enroll the following semester. A longitudinal study conducted over the 2014-2015 academic year, followed by a review of student records to determine the student's actual re-enrollment status in January 2015 and again in October 2015 might have provided the researcher with more comprehensive conclusions.

Overall, addressing student retention issues will need a multidisciplinary approach which engages the entire campus (Braxton et al., 2004). Changing traditions and the culture of the campus towards solutions for student persistence and retention should be gradual, but with clear and effective instructions and information.

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APPENDICES

A: The UWI Survey of First-Year STEM Students' Perspectives

B: Lists of STEM Preliminary and Introductory Courses at UWI Cave Hill

C: Correlation of Predictor Variables

D: Assumptions Tables

E: Logistic Regression Tables

F: G*Power Statistical Analysis Output

APPENDIX A

Examining the Perceptions of Incoming Students to Determine Retention Factors at the University of the West Indies: Implications for Academic Advising

Dear Student:

You are being invited to participate in a research study by answering the attached survey about the factors of retention at the University of the West Indies. There are no known risks for your participation in this research study. The information collected may not benefit you directly. The information learned in this study may be helpful to others. The information you provide will inform administrators, student affairs practitioners and academic advisors at UWI whether students' background characteristics and their perceptions of the institution influence student retention at the institution. Your completed survey will be stored at University of Louisville. The survey will take approximately 10-12 minutes to complete.

Individuals from the Department of Education at the University of Louisville, the Institutional Review Board (IRB), the Human Subjects Protection Program Office (HSPPO), and other regulatory agencies may inspect these records. In all other respects, however, the data will be held in confidence to the extent permitted by law.

Taking part in this study is voluntary. By completing this survey you agree to take part in this research study. You do not have to answer any questions that make you uncomfortable. You may choose not to take part at all. If you decide to be in this study you may stop taking part at any time. If you decide not to be in this study or if you stop taking part at any time, you will not lose any benefits for which you may qualify.

If you have any questions, concerns, or complaints about the research study, please contact: Dr. Amy Hirschy at (502) 852-0628 or Joy A. Cox at (502) 432-8279. If you have any questions about your rights as a research subject, you may call the Human Subjects Protection Program Office at (502) 852-5188. You can discuss any questions about your rights as a research subject, in private, with a member of the Institutional Review Board (IRB). You may also call this number if you have other questions about the research, and you cannot reach the research staff, or want to talk to someone else. The IRB is an independent committee made up of people from the University community, staff of the institutions, as well as people from the community not connected with these institutions. The IRB has reviewed this research study. If you have concerns or complaints about the research or research staff and you do not wish to give your name, you may call 1-877-852-1167. This is a 24 hour hot line answered by people who do not work at the University of Louisville or contact the Office of Research, the University of the West Indies, Cave Hill Campus, Barbados, researchethics@cavehill.uwi.edu.

Sincerely,
Amy Hirschy, Ph.D.

Joy A. Cox, Ph.D. Candidate

THE UWI SURVEY OF FIRST-YEAR STEM STUDENTS' PERSPECTIVES

Kindly assist us in improving your undergraduate experience here at The University of the West Indies by filling out the following student questionnaire. Please attempt to answer all questions honestly and accurately. The survey has two parts: Part one asks students about their general experiences at the institution and part two asks about academic advising in particular. Thank you for your cooperation.

Part I

Institution: **Cave Hill** ☐

St. Augustine ☐

Please tell us a little about yourself.

1. What is your sex?

- ☐ Male
- ☐ Female

2. How old will you be on December 31st, 2014?

- ☐ 17 or younger
- ☐ 18-24
- ☐ 25 or older

3. Is this your

- ☐ First year at UWI?
- ☐ Second year at UWI?
- ☐ Third year at UWI?
- ☐ Fourth year at UWI?
- ☐ Other _____

4. Since leaving secondary school, have you taken courses at any other tertiary institution (e.g. community college)?

- ☐ Yes
- ☐ No

5. Are you enrolled as a:

- ☐ Full-time student?
- ☐ Part-time student?

6. In what year did you graduate from secondary school?

- ☐ 2013 or after
- ☐ 2012
- ☐ 2011
- ☐ 2010 or before

7. What is the highest academic degree you plan to obtain?

- ☐ None
- ☐ Bachelor's degree
- ☐ Master's degree
- ☐ Doctoral degree
- ☐ Other _____

8. Where do you currently live?

- ☐ Home/Off Campus
- ☐ Residence Hall/ Campus student housing

9. How many CXC, CSEC examinations did you achieve with a grade 3 or better?

- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10 or more

10. What is your highest CXC, CSEC Biology grade?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ Did not take Biology

11. What is your highest CXC, CSEC Chemistry grade?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ Did not take Chemistry

12. What is your highest CXC, GSEC Mathematics grade?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ Did not take Mathematics

13. What is your highest CXC, CSEC Physics grade?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ Did not take Physics

14. What is the highest level of formal education obtained by at least one of your parents?

- ☐ Primary school
- ☐ Secondary school
- ☐ Some tertiary
- ☐ Tertiary other than university
- ☐ University first degree
- ☐ Postgraduate degree

15. How is your first year's educational expenses covered? (check all that apply)

- ☐ Family resources (parents, relatives, spouse etc.)
- ☐ My own savings/resources
- ☐ Grants and scholarships
- ☐ Loans (GAIT Loans, Student Revolving Funds, etc.).
- ☐ Job/Work

16. Do you have any concerns about your ability to finance your tertiary education this academic year?

- ☐ No concerns (I am confident that I will have sufficient funds)
- ☐ Some concerns (but I probably will have enough funds)
- ☐ Major concerns (not sure I will have enough funds to complete college)

17. What is your ethnicity/race?

- ☐ Black/African
- ☐ East Indian
- ☐ Native Indian
- ☐ Chinese
- ☐ Hispanic/Latino
- ☐ Mixed
- ☐ Portuguese
- ☐ Caucasian/White
- ☐ Other _____

18. I **intend to return** to UWI in the spring 2015 semester (second semester).

1-----2-----3-----4

Strongly disagree.....strongly agree

19. What is your declared undergraduate major?

- ☐ Agriculture
- ☐ Applied Science
- ☐ Biological Science
- ☐ Chemistry
- ☐ Computer Science
- ☐ Science/Math Education
- ☐ Engineering
- ☐ Health Science Professional
- ☐ Information Technology
- ☐ Medicine
- ☐ Mathematics
- ☐ Physics
- ☐ Other _____
- ☐ Other Technical _____

20. I intend to re-enroll in my current major in the spring 2015 semester (second semester).

1-----2-----3-----4

Strongly disagree.....strongly agree

21. Please indicate your level of agreement with each of the following statements on **interacting with peers** (Mark one answer for each item).

1= Strongly Disagree

2= Disagree

3= Neither Agree or Disagree

4= Agree

5= Strongly Agree

	1	2	3	4	5
Since coming to UWI I have developed close relationships with other students.	☐	☐	☐	☐	☐
The student friendships I have developed at UWI have been personally satisfying.	☐	☐	☐	☐	☐
My interpersonal relationships with other students have had a positive influence on my personal growth, attitudes, and values.	☐	☐	☐	☐	☐
My interpersonal relationships with other students have had a positive influence on my intellectual growth and interest in ideas.	☐	☐	☐	☐	☐
It has been difficult for me to meet and make friends with other students.	☐	☐	☐	☐	☐
Few of the students I know would be willing to help me if I had a personal problem.	☐	☐	☐	☐	☐
Most students at UWI have values and attitudes different from my own.	☐	☐	☐	☐	☐

22. Please indicate your level of agreement with each of the following statements on **interacting with your faculty** (Mark one answer for each item).

1= Strongly Disagree 4= Agree	2= Disagree 5= Strongly Agree	3= Neither Agree or Disagree					
			1	2	3	4	5
My out-of-classroom interactions with faculty have had a positive influence on my personal growth, values and attitudes.	☐	☐	☐	☐	☐	☐	☐
My out-of-classroom interactions with faculty have a positive influence on my intellectual growth, values, and attitudes.	☐	☐	☐	☐	☐	☐	☐
My non-classroom interactions with faculty have a positive influence on my career goals and aspirations.	☐	☐	☐	☐	☐	☐	☐
Since coming to UWI I have developed a close, personal relationship with at least one faculty member.	☐	☐	☐	☐	☐	☐	☐
I am satisfied with the opportunities to meet and interact informally with faculty members.	☐	☐	☐	☐	☐	☐	☐

23. Please indicate your level of agreement with each of the following statements on **faculty** (Mark one answer for each item).

1= Strongly Disagree 4= Agree	2= Disagree 5= Strongly Agree	3= Neither Agree or Disagree					
			1	2	3	4	5
Few of the faculty members I have had contact with are generally interested in students.	☐	☐	☐	☐	☐	☐	☐
Few of the faculty members I have had contact with are generally outstanding or superior advisors.	☐	☐	☐	☐	☐	☐	☐
Few of the faculty members I have had contact with are willing to spend time outside of class to discuss issues of interest and importance to students.	☐	☐	☐	☐	☐	☐	☐
Most of the faculty I have had contact with are interested in helping students grow in more than just academic areas.	☐	☐	☐	☐	☐	☐	☐
Most of the faculty members I have had contact with are genuinely interested in the students.	☐	☐	☐	☐	☐	☐	☐

24. Please indicate your level of agreement with each of the following statements (Mark one answer for each item).

1= Strongly Disagree	2= Disagree	3= Neither Agree or Disagree	4= Agree	5= Strongly Agree
I am satisfied with the extent of my intellectual development since enrolling in UWI.	☐	☐	☐	☐
My academic experience has a positive influence on my intellectual growth and interest in ideas.	☐	☐	☐	☐
I am satisfied with my academic experiences at UWI.	☐	☐	☐	☐
Few of my courses this semester have been intellectually stimulating.	☐	☐	☐	☐
My interest in ideas and intellectual matters has increased since coming to UWI.	☐	☐	☐	☐
I am more likely to attend a cultural activity (for example, a concert, lecture, or art show) now than I was before coming to this university.	☐	☐	☐	☐
I have performed academically as well as I anticipated I would.	☐	☐	☐	☐

25. Please indicate your level of agreement with each of the following statements (Mark one answer for each item)

1= Strongly Disagree	2= Disagree	3= Neither Agree or Disagree	4= Agree	5= Strongly Agree
It is important for me to get a bachelor's degree.	☐	☐	☐	☐
I am confident that I made the right decision choosing to attend UWI.	☐	☐	☐	☐
I am satisfied with my choice of major.	☐	☐	☐	☐
It is important for me to graduate from UWI.	☐	☐	☐	☐
Getting good grades is important to me.	☐	☐	☐	☐
It is likely that I will re-enroll at UWI in the fall 2015 semester (next academic year).	☐	☐	☐	☐

PART II- Section A

ACADEMIC ADVISING INVENTORY

Winston & Sandor (1984)

Section A of this inventory describes how you and your advisor approach academic advising. Even if you have had more than one advisor or have been in more than one type of advising situation this year, please respond to the statements in terms of your **current situation**.

There are 14 pairs of statements in section A.

You will be asked to make TWO decisions about each pair in order to respond:

(1) Decide which **ONE** of the two statements most accurately describes the academic advising you received this year, disregard the other statement, and then...

(2) Decide how accurate or true the statement you decided on is (from *very true* to *slightly true*).

PLEASE ANSWER ALL QUESTIONS AND ANSWER AS ACCURATELY AS POSSIBLE

EXAMPLE:

My advisor plans my schedule.		My advisor and I plan my schedule together.
A-----B-----C-----D	OR	E----- -----G-----H
very true.....lightly true		slightly true.....very true

EXPLANATION: In this example, the student has chosen (1) the statement on the right as more descriptive of his or her academic advising experience this year, and (2) determined that the statement is toward the slightly true end (response F).

1. My advisor is interested in helping me learn how to find out about courses and programs for myself.	OR	My advisor tells me what I need to know about academic courses and programs.
A-----B-----C-----D		E-----F-----G-----H
very true.....lightly true		slightly true.....very true
2. My advisor tells me what would be the best schedule for me.	OR	My advisor suggests important considerations in planning a schedule and then gives me responsibility for the final decision.
A-----B-----C-----D		E-----F-----G-----H
very true.....lightly true		slightly true.....very true
3. My advisor and I talk about vocational opportunities in conjunction with advising.	OR	My advisor and I do not talk about vocational opportunities in conjunction with advising.
A-----B-----C-----D		E-----F-----G-----H
very true.....lightly true		slightly true.....very true

<p>4. My advisor shows an interest in my outside-of-class activities and sometimes suggests activities.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR My advisor does not know what I do outside of class.</p> <p>E-----F-----G-----H slightly true.....very true</p>
<p>5. My advisor assist me in identifying realistic academic goals based on what I know about myself, as well as about test scores and grades.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR My advisor identifies realistic academic goals for me based on my test scores and grades.</p> <p>E-----F-----G-----H slightly true.....very true</p>
<p>6. My advisor registers me for classes.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR My advisor teaches me how to register myself for classes.</p> <p>E-----F-----G-----H slightly true.....very true</p>
<p>7. When I'm faced with a difficult situation, my advisor tells me my alternatives and which one is best for me.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR When I'm faced with difficult decisions, my advisor assists me in identifying alternatives and in considering the consequences of choosing each alternative.</p> <p>E-----F-----G-----H slightly true.....very true</p>
<p>8. My advisor does not know who to contact about other-than-academic problems.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR My advisor knows who to contact about other-than-academic problems.</p> <p>E-----F-----G-----H slightly true.....very true</p>
<p>9. My advisor gives me tips on managing my time better or on studying more effectively when I seem to need them.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR My advisor does not spend time giving me tips on managing my time better or on studying more effectively.</p> <p>E-----F-----G-----H slightly true.....very true</p>
<p>10. My advisor tells me what I must do in order to be advised.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR My advisor and I discuss our expectations of advising and of each other.</p> <p>E-----F-----G-----H slightly true.....very true</p>

<p>11. My advisor suggests what I should major in.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR</p>	<p>My advisor suggests steps I can take to help me decide on a major.</p> <p>E-----F-----G-----H slightly true.....very true</p>
<p>12. My advisor uses test scores and grades to let me know what courses are appropriate for me to take.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR</p>	<p>My advisor and I use information, such as test scores, grades, interests, and abilities, to determine what courses are most appropriate for me to take.</p> <p>E-----F-----G-----H slightly true.....very true</p>
<p>13. My advisor talks with me about my other-than –academic interest and plans.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR</p>	<p>My advisor does not talk with me about interests and plans other than academic ones.</p> <p>E-----F-----G-----H slightly true.....very true</p>
<p>14. My advisor keeps me informed of my academic progress by examining my files and grades only.</p> <p>A-----B-----C-----D very true.....slightly true</p>	<p>OR</p>	<p>My advisor keeps informed of my academic progress by examining my files and grades and by talking to me about my classes.</p> <p>E-----F-----G-----H slightly true.....very true</p>

PART II-Section B

In section B of this inventory consider the academic advising you have participated in at this college this year and respond to the following five statements.

1=Strongly Disagree	2=Disagree	3 = Agree	4 = Strongly Agree			
			1	2	3	4
15. I am satisfied in general with the academic advising I have received.			☐	☐	☐	☐
16. I have received accurate information about courses, programs, and requirements through academic advising.			☐	☐	☐	☐
17. Sufficient prior notice has been provided about deadlines related to institutional policies and procedures.			☐	☐	☐	☐
18. Advising has been available when I needed it.			☐	☐	☐	☐
19. Sufficient time has been available during advising sessions.			☐	☐	☐	☐

THANK YOU FOR YOUR CO-OPERATION

APPENDIX B

E-mails and lists of STEM Preliminary and Introductory Courses at UWI, Cave Hill

From: joy.cox@louisville.edu
To: Deputy Dean, Faculty of Science and Technology
Sent: Monday, November 03, 2014 4:15 PM
Subject: Research study at UWI

Greetings,

I am a Barbadian national and a graduate of UWI. I am currently a doctoral student in the College Student Personnel program at the University of Louisville, KY collecting my data and, on track to graduate in the spring 2015 semester. My research examines the attitudes and perceptions of first year science and technology students and the relationship with student persistence and retention, particularly focusing on academic advising approaches.

I am seeking your assistance in collecting data for a research study. I am currently visiting Barbados to collect the data.

I have received IRB approval (attached) to distribute the survey to first year students during regularly scheduled classes during the month of November, 2014. I will in Barbados and on the campus from November, 4 -11 2014.

The questionnaire takes about ten (10) minutes to complete.

Joy A. Cox, PhD Candidate
College Student Personnel
University of Louisville, KY

Sent: Wednesday November 05, 2014 1:26 PM
To: Faculty
Subject: Research study at UWI

Dear All,

Ms. Cox is a Barbadian national pursuing her PhD studies at the University of Louisville, U.S. She has obtained ethics approval from our Institutional Review Board to carry out this research here at Cave Hill UWI during a specific timeframe (Nov 4-11 2014). The ethics approval is attached. She will need to have access to your students so as to disseminate a survey that will take about 10mins to complete. She will be contacting you to determine the most appropriate time for her to access your students during a lecture slot (Table 1). We would appreciate your assistance in facilitating this research during this week and the next.

Kind regards,

Deputy Dean, Faculty of Science and Technology

Table B1

Classes contacted to visit at UWI, Cave Hill Campus

	Section	Course Title
Faculty of Science and Technology	BIOL 1020	Biodiversity of Life I and II
	BIOL 1025	Biology Lab
	BIOL 0051	Preliminary Biology
	COMP 1105	Computer Programming I
	CHEM 1010	Fundamentals of Chemistry
	CHEM 0651	Preliminary Chemistry
	ELEC 1120	Basic Electronics
	MATH 0101	Preliminary Math
	MATH 1101	Basic Math I
	MATH 1120	Calculus I
	PHYS 1100	Mechanics
Faculty of Medical Sciences	MDSC 1000	Fundamentals of Disease Lab I
	MDSC 1103	Fundamentals of Disease Lab II

THE UNIVERSITY OF THE WEST INDIES

FACULTY OF MEDICAL SCIENCES

Formerly The School of Clinical Medicine and Research

Cave Hill Campus and Queen Elizabeth Hospital
Bridgetown, Barbados

In reply please quote
our reference

Pre-Clinical, Cave Hill Campus:

Tel.: (246) 417-4000/4694/4703 Fax: (246) 438-9170

Clinical, Queen Elizabeth Hospital:

Tel.: (246) 429-5112 or 437-8335 Fax: (246) 429-6738

PBX: (246) 436-6450 Ext: 6229/6239

15 October 2014

Ms. Joy A. Cox
College of Education and Human Development
University of Louisville
9905 South 3rd Street
Louisville, KY 40292
USA

Dear Ms. Cox,

Re: Examining the perceptions of first year students on retention factors at the University of the West Indies: Implications for academic advising

I write on behalf of the University of the West Indies-Cave Hill/Barbados Ministry of Health Research Ethics Committee/Institutional Review Board to convey approval of the above proposal subject to the following minor revisions:

1. The consent form should provide contact information for the IRB (417-4847). A template for consent statements is available in the forms section on our website: www.cavehill.uwi.edu/researchethics.
2. Exclude students under 18 years of age.

Please note that ethical approval does not imply endorsement of your research design.

This approval is effective **from the date of this correspondence for one year**.

Please remember that you must also secure approval from any individual site or organization, *i.e.*, the relevant ministry, agency, or company, if this is required.

If you have not already done so, please forward your certificate of completion for ethics training at www.citiprogram.org to Kristina.bryant@cavehill.uwi.edu.

All research data and forms must be kept for no less than **five years** after completion of the approved project. Conditions of storage are subject to data security procedures outlined in your proposal. When your research is complete (even if earlier than the approval period ends), please notify the Board in writing to officially close your protocol.

If you anticipate the duration of data collection to exceed one year, please send a letter to the Board at least one month prior to the expiration date. You should indicate why you want the research to remain open (*e.g.*, additional accrual necessary for more robust results, funding from an outside source to continue). Continuation is contingent on Board approval.

Please remember that any changes to the protocol will require the submission of a revised protocol via a complete application to the IRB before implementation of the revision.

You must report any unanticipated adverse event experienced by a research subject within five days to the Chair of the IRB through this letterhead address or via e-mail to kristina.bryant@cavehill.uwi.edu.

The Committee wishes you the best of luck in your research endeavors. Please feel free to contact us at any time should you have questions or concerns. I remain,

Yours sincerely,

Chair

CC:

Deputy Chair, Graduate Studies
Office of Research, IRB File

APPENDIX C

Correlation of Variables used in Study

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 .CAMPUS	.13*	-.21**	-.14*	-.05	.04	.17**	-.25**	-.15*	-.08	.07	-.08	.01	.08	.08	-.07
2.SEX	—	-.06	-.01	.03	.18**	-.04	-.05	.17**	-.01	-.09	.02	.05	-.03	-.05	-.04
3.RACE		—	.22**	.06	-.03	.05	-.12	-.09	.17**	.071	.03	.05	-.01	.02	.02
4.SSGPA			—	.27**	.12*	.12	-.01	-.17**	.03	.18**	.09	.09	.20**	-.06	.001
5.SSACH				—	.07	.06	.05	-.03	.002	.02	.04	.01	.03	-.16	.03
6.DGASP					—	.06	-.05	.02	.04	-.01	.06	.03	.06	-.08	.04
7.PEDU						—	.04	-.24**	.02	-.04	-.02	.03	.10	.02	-.01
8.LIVE							—	-.11	-.06	-.02	.08	.07	.14*	-.002	.05
9.FINCON								—	-.06	-.05	-.09	-.02	-.12*	.14	-.07
10.FACINT									—	.22**	.34**	.25**	.28**	.23**	.27**
11.FACCON										—	.22**	.08	.12*	.16	.09
12.AID											—	.49**	.32**	.07	.15*
13.IGC												—	.34**	.09	.16*
14.PEER													—	.21*	.17*
15.DPA														—	.35**
16.SAA															—

Note: * $p < .001$ (two-tailed), ** $p < .05$ (two-tailed)

APPENDIX D

ASSUMPTIONS

Table D1

Testing for Linearity on the Logit

Variable	B	S.E.	Wald df=1	Sig.	Exp(B)
SSGPA	-29.611	17.614	2.826	.093	.000
DGASP	-3.309	4.350	.579	.447	.037
PEDU	-3.287	2.482	1.754	.185	.037
FINCON	1.749	3.267	.287	.592	5.748
FACINT	2.464	2.931	.707	.401	11.753
FACCON	-9.853	7.567	1.696	.193	.000
AID	1.494	5.225	.082	.775	4.456
IGC	-1.403	2.937	.228	.633	.246
PEER	.845	7.148	.014	.906	2.328
SAA	.117	2.942	.002	.968	1.124
LnSSACH by SSACH	-1.833	.778	5.559	.018	.160
LnSSGPA by SSGPA	13.973	7.985	3.062	.080	1170393.52
DGASP by LnDGASP	1.359	2.049	.440	.507	3.892
LnPEDU by PEDU	1.310	1.060	1.529	.216	3.708
FINCON by LnFINCON	-.998	2.064	.234	.629	.369
FACINT by LnFACINT	-1.233	1.435	.738	.390	.292
FACCON by LnFACCON	4.312	3.453	1.560	.212	74.620
AID by LnAID	-.722	2.523	.082	.775	.486
IGC by LnIGC	1.323	1.332	.986	.321	3.754
LnPEER by PEER	-.886	3.298	.072	.788	.412
LnSSA by SAA	-.016	1.618	.000	.992	.985
Constant	55.898	29.797	3.519	.061	188914943780 0363700000

Table D2

Testing for Multicollinearity

Variable	Collinearity Statistics	
	Tolerance	VIF
CAMPUS	.696	1.438
SEX	.850	1.177
RACE	.846	1.182
SEC SCHOOL	.903	1.107
ACHIEVEMENT		
SS SCIENCE GPA	.778	1.285
DEGREE ASPIRATION	.902	1.108
PARENTAL	.824	1.214
EDUCATION		
RESIDENCY	.786	1.272
FINANCIAL	.884	1.132
CONCERNS		
FACINT	.693	1.443
FACCON	.809	1.237
AID	.670	1.493
IGC	.711	1.407
PEER	.757	1.322
SAA	.870	1.149

Note: Dependent Variable: Re-enroll in UWI

Table D3

Model Summary for Independence of Errors

Model	Durbin-Watson
1	2.014

Note: Dependent Variable: Re-enroll in UWI

APPENDIX E

LOGISTIC REGRESSION TABLES

Research Question 1

Table E1

Classification Table for Block 0 of Logistic Regression Analysis

Observed		Predicted		
		RE-ENROLL IN UWI		Percentage
		NO	YES	Correct
RE-ENROLL IN UWI	NO	0	52	.0
	YES	0	240	100.0
Overall Percentage				82.2

Note_a : Constant is included in the model.

Note_b : The cut value is .500

BLOCK 1: Method = Enter

Table E2

Omnibus Tests of Model Coefficients for Block 1 of Logistic Regression Analysis

	Chi-square	df	Sig.
Step	5.810	1	.016
Block	5.810	1	.016
Model	5.810	1	.016

Table E3

Model Summary for Block 1 of Logistic Regression Analysis

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
267.778 ^a	.020	.032

Note: Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table E4

Classification Table for Block 1 of Logistic Regression Analysis

Observed		Predicted		
		RE-ENROLL IN UWI		Percentage Correct
		NO	YES	
RE-ENROLL IN UWI	NO	0	52	.0
	YES	0	240	100.0
Overall Percentage				82.2

Note: The cut value is .500

Table E5

Variables Included in the Equation of Block 1 for Logistic Regression Analysis

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
CAMPUS	.743	.309	5.760	1	.016	2.101	1.146	3.854
Constant	1.133	.214	28.131	1	.000	3.103		

Note: Variable(s) entered on step 1: CAMPUS.

Research Question 2

Table E6

Classification Table for Block 0 of Logistic Regression Analysis

		Predicted		
		RE-ENROLL IN UWI		Percentage
Observed		NO	YES	Correct
RE-ENROLL IN UWI	NO	0	50	.0
	YES	0	226	100.0
Overall Percentage				81.9

Table E7

Categorical Variables Coding for Race Predictor Variable

RACE	Frequency	Dummy Coding		
		(1)	(2)	(3)
BLACK	162	.000	.000	.000
INDIAN	44	1.000	.000	.000
MIXED	58	.000	1.000	.000
OTHER	12	.000	.000	1.000

BLOCK 1: Method = Enter

Table E8

Omnibus Tests of Model Coefficients for Block 1 of Logistic Regression Analysis

	Chi-square	df	Sig.
Step	21.696	11	.027
Block	21.696	11	.027
Model	21.696	11	.027

Table E9

Model Summary for Block 1 of Logistic Regression Analysis

	Cox & Snell R	Nagelkerke R
-2 Log likelihood	Square	Square
239.481	.076	.124

Note: Estimation terminated at iteration number 5
because parameter estimates changed by less than
.001.

Table E10

Classification Table for Block 1 of Logistic Regression Analysis

		Predicted		
		RE-ENROLL IN UWI		Percentage
Observed		NO	YES	Correct
RE-ENROLL IN UWI	NO	2	48	4.0
	YES	3	223	98.7
Overall Percentage				81.5

Note: The cut value is .500

Table E11

Variables Included in the Equation of Block 1 for Logistic Regression Analysis

Variable	B	S.E.	Wald df=1	Sig.	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
CAMPUS	12.06	.401	9.041	.003	3.339	1.522	7.329
SEX	.095	.339	.079	.779	1.100	.566	2.136
RACE			.514	.916			
RACE(1)	-.025	.523	.002	.962	.975	.350	2.718
RACE(2)	-.219	.422	.269	.604	.804	.352	1.837
RACE(3)	-.437	.853	.262	.609	.646	.121	3.439
ZSSACH	-.072	.173	.174	.676	.930	.662	1.306
ZSSGPA	.435	.179	5.902	.015	1.546	1.088	2.196
ZDGASP	-.151	.179	.707	.401	.860	.605	1.222
ZPEDU	-.455	.187	5.906	.015	.635	.440	.916
LIVE	.432	.437	.977	.323	1.541	.654	3.630
ZFINCON	.118	.180	.428	.513	1.125	.791	1.600
Constant	.354	.886	.160	.689	1.425		

BLOCK 2: Method = Enter

Table E12

Omnibus Tests of Model Coefficients for Block 2 of Logistic Regression Analysis

	Chi-square	df	Sig.
Step	8.847	10	.547
Block	8.847	10	.547
Model	30.543	21	.082

Table E13

Model Summary for Block 2 of Logistic Regression Analysis

	Cox & Snell R Square	Nagelkerke R Square
-2 Log likelihood	230.634 ^a	.105
		.171

Note: Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Table E14

Classification Table for Block 2 of Logistic Regression Analysis

			Predicted		
			RE-ENROLL IN UWI		Percentage
Observed			NO	YES	
			Correct		
Step 1	RE-ENROLL IN UWI	NO	5	45	10.0
		YES	2	224	99.1
	Overall Percentage				

Note: The cut value is .500

Table E15

Variables Included in the Equation of Block 2 for Logistic Regression Analysis

	B	S.E.	Wald	Sig.	Exp(B)
			df=1		
CAMPUS	-19.716	26725.387	.000	.999	.000
SEX	-.183	.468	.153	.696	.833
RACE			.321	.956	
RACE(1)	-19.461	26725.387	.000	.999	.000
RACE(2)	-19.316	26725.387	.000	.999	.000
RACE(3)	-19.655	26725.387	.000	.999	.000
ZSSACH	.013	.252	.003	.958	1.013
ZSSGPA	.470	.252	3.482	.062	1.599
ZDGASP	-.060	.247	.058	.810	.942
ZPEDU	-.205	.254	.652	.420	.815
LIVE	.548	.552	.985	.321	1.730
ZFINCON	.591	.280	4.449	.035	1.805
CAMPUS by SEX	.638	.707	.815	.367	1.893
CAMPUS * RACE			.017	.999	
CAMPUS by RACE(1)	20.284	26725.387	.000	.999	644400853.659
CAMPUS by RACE(2)	20.281	26725.387	.000	.999	642267235.114
CAMPUS by RACE(3)	20.395	26725.387	.000	.999	720381742.075
CAMPUS by ZSSACH	-.062	.356	.031	.861	.940
CAMPUS by ZSSGPA	-.090	.377	.057	.811	.914
CAMPUS by ZDGASP	-.182	.365	.248	.619	.834
CAMPUS by ZPEDU	-.517	.391	1.742	.187	.597
CAMPUS by LIVE	-.223	1.011	.048	.826	.800
CAMPUS by ZFINCON	-.944	.394	5.748	.017	.389
Constant	20.170	26725.387	.000	.999	574791355.647

Research Question 3

Table E16

Classification Table for Block 0 of Logistic Regression Analysis

Observed			Predicted		
			RE-ENROLL IN UWI		Percentage
			NO	YES	Correct
Step 0	RE-ENROLL IN UWI	NO	0	51	.0
		YES	0	233	100.0
	Overall Percentage				

Note a. Constant is included in the model.

Note b. The cut value is .500

Block 1: Method = Enter

Table E17

Omnibus Tests of Model Coefficients for Block 1 of Logistic Regression Analysis

		Chi-square	df	Sig.
Step 1	Step	29.959	6	.000
	Block	29.959	6	.000
	Model	29.959	6	.000

Table E18

Model Summary for Block 1 of Logistic Regression Analysis

Step	-2 Log likelihood	Cox & Snell R	Nagelkerke R
		Square	Square
1	237.428 ^a	.100	.164

Note: Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table E19

Classification Table for Block 1 of Logistic Regression Analysis

Observed			Predicted		
			RE-ENROLL IN UWI		Percentage
			NO	YES	Correct
Step 1	RE-ENROLL IN UWI	NO	6	45	11.8
		YES	9	224	96.1
	Overall Percentage				81.0

Note: The cut value is .500

Table E20

Variables Included in the Equation of Block 1 for Logistic Regression Analysis

	B	S.E.	Wald df=1	Sig.	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
ZFACINT	-.080	.187	.181	.670	.923	.639	1.333
ZFACCON	-.172	.177	.945	.331	.842	.595	1.191
ZAID	-.105	.204	.264	.608	.901	.604	1.343
ZIGC	.814	.190	18.441	.000	2.257	1.557	3.272
ZPEER	-.128	.180	.502	.479	.880	.618	1.253
CAMPUS	.784	.337	5.409	.020	2.190	1.131	4.242
Constant	1.235	.236	27.383	.000	3.440		

APPENDIX F

G*POWER STATISTICAL ANALYSIS OUTPUT

Research Question 1: Campus versus Re-Enrollment

z tests - Logistic regression

Analysis: Post hoc: Compute achieved power

Input:

Tail(s)	= Two
Odds ratio	= 2.10
Pr(Y=1 X=1) H0	= 0.76
α err prob	= 0.05
Total sample size	= 293
R ² other X	= 0
X distribution	= Normal
X parm μ	= 0
X parm σ	= 1

Output:

Critical z	= 1.9599640
Power (1- β err prob)	= 0.9995565

Research Question 2: Student Attributes versus Re-enrollment

Secondary School Science and Math GPA

z tests - Logistic regression

Analysis: Post hoc: Compute achieved power

Input:

Tail(s)	= Two
Odds ratio	= 1.55
Pr(Y=1 X=1) H0	= 0.37
α err prob	= 0.05
Total sample size	= 287
R ² other X	= 0
X distribution	= Normal
X parm μ	= 0
X parm σ	= 1

Output:

Critical z	= 1.9599640
Power (1- β err prob)	= 0.9341429

Parental Education

z tests - Logistic regression

Analysis: Post hoc: Compute achieved power

Input:

Tail(s)	= Two
Odds ratio	= 0.63
$\Pr(Y=1 X=1)$ H0	= 0.22
α err prob	= 0.05
Total sample size	= 289
R ² other X	= 0
X distribution	= Normal
X parm μ	= 0
X parm σ	= 1

Output:

Critical z	= -1.9599640
Power (1- β err prob)	= 0.8911301

Research Question 3: Institutional Effectiveness versus Re-Enrollment Status

Institutional and Goal Commitments

z tests - Logistic regression

Analysis: Post hoc: Compute achieved power

Input:

Tail(s)	= Two
Odds ratio	= 2.26
$\Pr(Y=1 X=1)$ H0	= 0.41
α err prob	= 0.05
Total sample size	= 287
R ² other X	= 0
X distribution	= Normal
X parm μ	= 0
X parm σ	= 1

Output:

Critical z	= 1.9599640
Power (1- β err prob)	= 0.9999954

CURRICULUM VITAE

Joy A. Harewood Cox

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Louisville, KY 40258
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EDUCATION

- Doctor of Philosophy** (College Student Personnel): Examining the Perceptions of First-Year STEM Students on Retention Factors at the University of the West Indies
University of Louisville, Louisville, KY **Spring 2015**
- Master of Education (M.Ed.)** (School Counseling) **Dec 2008**
University of Louisville, Louisville, KY
- MBA in Education** **Jul 2002**
University of Leicester, Northampton, England
- Diploma in Education** **Jun 1987**
University of the West Indies, Cave Hill Campus, Barbados
- Bachelor of Science** (Biology) **Jun 1985**
University of the West Indies, Cave Hill Campus, Barbados

PROFESSIONAL EXPERIENCE

- Graduate Assistant, College Student Personnel Program** **Aug 2012- present**
University of Louisville, Louisville, KY
- Teaching Assistant: "Applied Multiple Regression" (ELFH 702), Spring 2015
 - Teaching Assistant: International Service Learning "Seminar of Student Services in the Caribbean" (ECPY 697), Spring 2013 and Spring 2014
 - Research Assistant: Dr. Michael Cuyjet, Professor, University of Louisville, 2012-2014
 - Planning and organizing Preview Weekend Program for prospective graduate students
 - Representing College Student Personnel (CSP) program on the DSO (Doctoral Student Organization) committee and GAPSA (Graduate Association Professionals in Student Affairs)
- Academic Advisor** **Sept 2007- July 2014**
Indiana University Southeast, New Albany, IN
- Delivered advising to individual underrepresented students, particularly with transitioning to college issues
 - Designed curriculum, implemented, and assessed a course for students on academic suspension seeking reinstatement, resulting in a decrease in probationary numbers
 - Initiated, created curriculum, and taught a career advising course in the School of Natural Sciences in collaboration with career services, resulting in 94% of the students expressed more confidence about their career choices

- Monitored academic progress of at-risk students using an early alert system to improve student persistence
- Developed and conducted workshops for new academic advisors campus-wide
- Hired and trained three academic advisors and office staff
- Discussed majors with prospective students after completion of interest inventories
- Mentored twelve freshmen students ensuring a smooth transition from high school to college
- Oriented and trained faculty on a variety of academic advising topics including new student support techniques and first-year orientation

TEACHING EXPERIENCE

Adjunct Faculty

Aug 2008- April 2012

Indiana University Southeast, New Albany, IN

- “Strategies for Success in College and Life” (EDUC-X100) for students on academic probation with 95% success rate
- “Pathways: First Year Seminar II” (COAS-S154)
- “First Year Seminar I” (COAS-S100)
- “Career Advising in Science Fields” (NATS-S200)
- “Humans and the Biological World” (BIOL-L100)

High School Science Teacher

Aug 2004-Jun 2007

Butler Traditional High School, Louisville, KY

- Taught grade 9 Integrated Science and grade 10 Biology
- Sponsored the Minority Teachers Recruitment Program (MTRP)
- Sponsored Gospel Choir for minority students

Biology Faculty

Aug 2002-Jun 2004

Barbados Community College, St. Michael, Barbados

- Tutored Biology to students seeking an Associate Degree in Natural Sciences

OTHER EXPERIENCES

VP Student Affairs Internship

Fall 2014 - present

University of Louisville, KY

- Assessing student learning outcomes for ISLP
- Researching International Service Learning Programs at benchmark institutions
- Assisted with service learning classes in Education and Engineering

School Counseling Practicum

Fall 2008

Butler Traditional High School, Louisville, KY

- Counseled juniors and seniors about transitioning to college
- Presented at workshop for Seniors College Night
- Attended college visits with seniors
- Organized DARE to CARE can collection project

PROFESSIONAL AFFILIATIONS

NACADA (National Academic Advising Association) (2008- Present)

Presentations:

- Cox, J. A. (2014). "Strategies for Success in College for Students on Academic Probation." Workshop presented at the national conference for National Academic Advising Association (NACADA)
- Cox, J. A. (2013). "Hot Topics on Probation, Dismissal and Reinstatement Issues." Workshop presented at the national conference for National Academic Advising Association (NACADA)
- Gerhke, S. & Cox, J. A. (2012). "Probation, Dismissal, Reinstatement Hot Topic, co-presenter, national conference for National Academic Advising Association (NACADA)
- Cox, J. A. & Gohmann, D. M. (2011). "Survivor: The Academic Jungle", Poster presentation, presented at national conference for NACADA

Publications:

- Cox, J. A. (2014). In S. Gehrke & S. Braun. *Advising students on academic probation* (pp.27-28). NACADA Pocket Guide Series. Manhattan, KS: National Academic Advising Association
- Cox, J. A. (2013, December). Teaching coping skills to first year college students on academic probation. *Academic Advising Today* 36(4). Manhattan, KS: National Academic Advising Association
- Cox, J. A. (2012). International transfer students [Monograph]. In T.J. Grites and C. Duncan (Eds.). *Advising student transfers: Strategies for today's realities and tomorrow challenges* (pp. 66-67). Manhattan, KS: National Academic Advising Association
- Cox, J. A. (2012). Workforce and Unemployed [Monograph]. In T.J. Grites and C. Duncan (Eds.). *Advising student transfers: Strategies for today's realities and tomorrow challenges* (pp. 61-62). Manhattan, KS: National Academic Advising Association

Offices & Committees:

- **Chair, Probation Dismissal Reinstatement Interest Group (2012- present)**
- Commission & Interest Group Division Committee (2012- present)
- **Diversity Committee (2012-2014)**

Grants & Awards:

- Research Grant, the National Academic Advising Association (NACADA) to fund doctoral dissertation (\$3,400)
- Emerging Leaders Mentoring Program (2010-2012) NACADA award recipient (\$1,500)

Indiana Academic Advising Network (IAAN)

2008-2012

Presentations:

- Cox, J. A. (2012). "Academic Advising Techniques"; "Advising International Students," & "Advising Scenes for Learning & Reflection," New Advisor Orientation & Training Workshop, Indiana University Southeast
- Cox, J. A. (2011). "Advising Week: Captain Advisor", Indiana Academic Advising Network (IAAN)
- Cox, J. A. (2008). "Advanced Advising: How Academic Advisors can assist high school counselors to meet the postsecondary needs of students" at Indiana Academic Advising Network (IAAN)

College Personnel Association of Kentucky (CPAK)	2013-present
Awards:	
• 2013 CPAK Graduate Case Study Competition Runner-up	
Southern Association for College Student Affairs (SACSA)	2014-present

UNIVERSITY LEADERSHIP & COMMITTEES

Indiana University Southeast

- **President IUSAC** (Indiana University Southeast Advising Council) **2010-2011**
- Registrar: **Academic Suspension Committee**, 2012-2014
- Restructuring of **academic advising committees**, **January – March, 2012**
- **Search Committees** for three academic advisors and one advising office assistant
- Center for Mentoring: **Collegiate Summer Institute committee** to plan programs and curriculum for first generation and minority students transitioning from high school to college **2009-2012**
- Financial Aid: **Satisfactory Academic Progress (SAP) committee**, **2009-2011**
- **Search Committee**: Director of Career Development Center, **2011**
- Financial Aid: **Scholarship committee**, **2009-2011**
- Campus Life: **Freshman Orientation committee** **2009-2011**
- **Transfer Orientation committee** to address the specific needs of transfer students

University of Louisville

- **Search Committee** for Assistant Professor, College Student Personnel, Department of Educational and Counseling Psychology, College of Education & Human Development, **November, 2014**
- **Executive committee** for Doctoral Student Organization August **2014-2015**