THOMPSON RIVERS UNIVERSITY
Institutional Planning & Analysis

International Academic Success

Institutional Planning & Analysis

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August 2010

Prepared for: Senate International Affairs Committee

Executive Summary

This study was requested by the Senate International Affairs Committee. The research questions included:

1. What factors affect the cumulative GPA (CGPA) of International students at TRU?
2. What factors affect the retention of International students at TRU?
3. Are Student Success Courses among the significant factors for GPA and retention?

The study included 6,051 International students who were enrolled at TRU from 1999/00 to 2009/10 (117 of whom took Student Success Courses). Participation in the Student Success Courses was not found to have a significant effect on either cumulative GPA or retention. The most significant factor affecting cumulative GPA was first term GPA; the most significant factor affecting student retention was cumulative GPA.

Table 1: Top Five Predictors for Educational Success for International Students

Variable	*Effect*
Factors Affecting Cumulative GPA	
First Term GPA	positive
Tourism	positive
Gender (female)	positive
Country of Origin (Europe)	positive
Africa	negative
Factors Affecting Retention	
Cumulative GPA	positive
Diploma	negative
Country of Origin (Europe)	negative
Certificate	negative
Age	negative

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Introduction

Purpose of the Study

The Senate International Affairs Committee (SIAC) requested that Institutional Planning & Analysis (IPA) design and conduct a study that examines factors for the academic success of International students. Of particular interest were Student Success courses (STSS). See Appendix A for the original study proposal.

Research Questions:

1. What factors affect the cumulative GPA (CGPA) of International students at TRU?
2. What factors affect the retention[1] of International students at TRU?
3. Are Student Success Courses among the significant factors for GPA and retention?

International Student Profile

The records of 6,051 International students (who were enrolled at TRU between fall 1999 and winter 2010) were included in the analysis. Of this group, 117 had taken at least one STSS course throughout the study period (Table 2). A greater proportion of STSS students were male (61% as compared to 56% of non-STSS students). An additional 14 students enrolled in STSS courses and then withdrew before completing the course; these students were not included in the experimental group.

Table 2: Student Records Included in the Study

	Null	Male	Female	Grand Total
Did not take STSS	106	3,302	2,526	5,934
STSS		71	46	117
Grand Total	106	3,373	2,572	6,051

Students included in the study came from nearly one hundred different countries. Top countries of origin included: China (2,492), Japan (498), India (422), Korea (530), Saudi Arabia (344), and Taiwan (330). Accordingly, the most populous world region for International students in this study was East Asia, followed by South East Asia, West Asia, and Europe (Table 3).

[1] Retention is defined as a student either earning a credential or continuing studies at TRU. Non-exchange students who leave TRU without earning a credential are counted against the retention rate.

Table 3: Students by World Region

	Did not take STSS	STSS	**Grand Total**
East Asia	4,196	56	4,252
Europe	313	21	334
Africa	163	20	183
West Asia	411	8	419
Central America	116	6	122
South East Asia	457	*	459
South Central Asia	139	*	141
South America	86	*	87
North America	43	*	44
Other	10		10
Grand Total	5,934	117	6,051

*N < 5 are masked to preserve student confidentiality

The majority (56%) of students included in the study were enrolled in baccalaureate programs, and another 25% were enrolled in diploma programs (Table 4). 40 percent of students were enrolled in a School of Business and Economics bachelors program.

Table 4: International Students by Division and Type

	BACC	DIPL	CERT	DEVL	ASSO	GRAD	NONE	**Grand Total**
School of Business & Economics	2,421	795	5			25		3,246
Student Development		165	872	117				1,154
Faculty of Science	620	6	5	*	19			654
School of Advanced Technology & Mathematics	33	454	*	7				495
Faculty of Arts	289	8		*	7			307
School of Tourism	39	84	29					152
Visiting							13	13
School of Nursing	*			12				13
Unspecified				12				12
School of Social Work	*		*					*
School of Education		*						*
School of Trades & Technology			*					*
Grand Total	3,404	1,514	914	155	26	25	13	6,051

*N < 5 are masked to preserve student confidentiality

The majority of STSS students (68%) were enrolled in baccalaureate programs as well, and most took either Science or Business programs (Table 5).

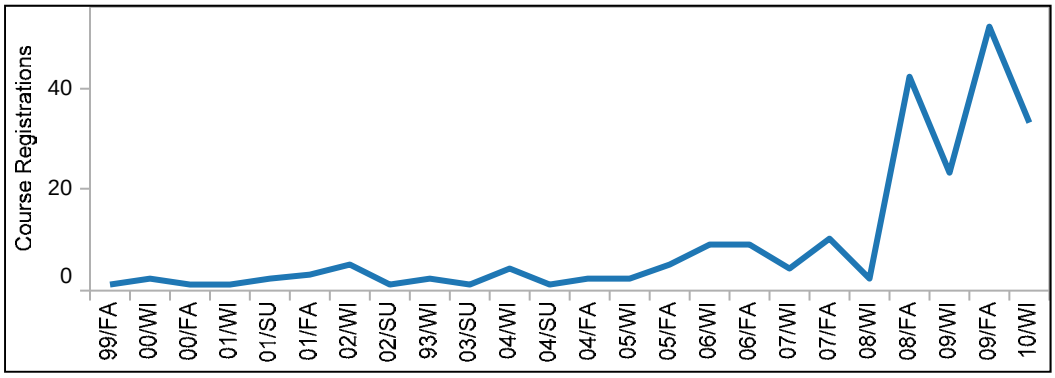
Table 5: STSS Students by Division and Program Type

	BACC	DIPL	CERT	DEVL	GRAD	NONE	Grand Total
School of Business & Economics	34	*			*		39
Student Development			7	8			15
Faculty of Science	28	*					29
School of Advanced Technology & Mathematics	*						*
Faculty of Arts	11	*					12
School of Tourism	5	*					9
Visiting						12	12
Grand Total	79	10	7	8	*	12	117

*N < 5 are masked to preserve student confidentiality

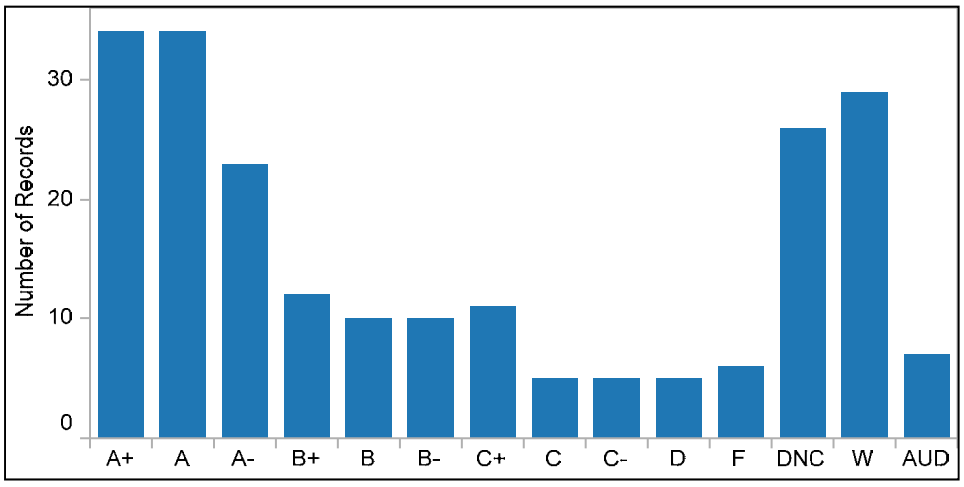
STSS course registrations per term ranged from 1 to over 40 (Figure 1). Recent years have experienced a significant increase in STSS registrations. It should be noted that a change in course offerings occurred in 2006: 3-credit courses were split into three 1-credit courses. This may account for some of the increases in registration.

Figure 1: STSS Course Registrations by Term



The grades achieved in STSS courses range from F to A+, with the largest group (42%) of students achieving grades in the "A" range (Figure 2). A combined 14% of students either did not complete or failed the courses (resulting in a grade of 0), and another 13% withdrew from the courses and did not achieve a grade. These students were not included in the experimental group.

Figure 2: STSS Course Grade Distributions



Although the majority (54%) of STSS students took only one course, 28% took two courses and 16% took three courses (Table 6).

Table 6: Number of STSS Courses Taken per Student

	1	2	3	4	5	Grand Total
Headcount	63	33	19	*	*	117
% of Total	54%	28%	16%	* %	* %	100%

*N < 5 are masked to preserve student confidentiality

How are STSS Takers Different than non-STSS Takers?

Demographics

The student profile of the STSS group was different than that of students who did not take these courses. The STSS group differed from the overall population in the following ways:

- fewer East Asian students,
- more African students,
- more European students,
- younger students,
- more male students,
- more recent average starting year,
- much higher count of ESAL courses, and
- higher average ESAL level in the first semester.

Due to these differences, a case control group was created for the purposes of comparing student outcomes between students who attended and did not attend STSS. The control group was matched on the following variables (where possible): start term, citizenship, gender, age group, division, program type, and first term GPA range. The resulting control group was identical to the STSS group, except for a slightly higher proportion of Business students.

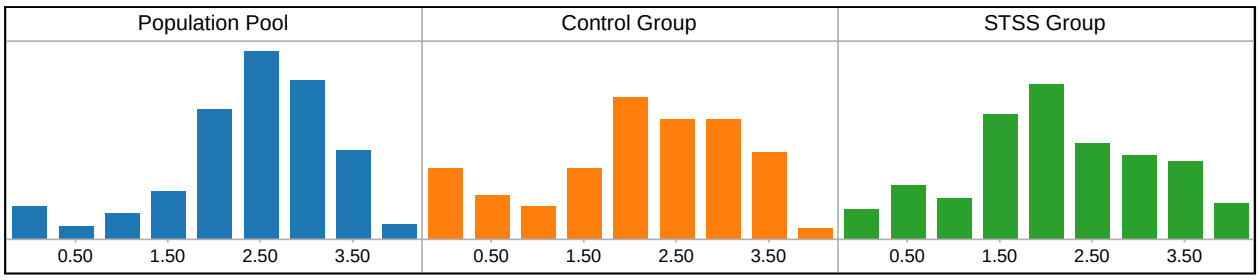
Grades

Overall, students in the study achieved a CGPA of 2.62 (Table 7). Students who took STSS tended to have a lower CGPA (-0.29) than students who did not, however they had the same average CGPA as the case control group (students who were similar demographically, but who did not take STSS). STSS students also tended to have a lower first term GPA (approximately -0.33). STSS, however, was not found to be a predicting factor for CGPA ($p > .05$). Figure 3 displays the CGPA distributions of the population pool, control group, and STSS group. The left distribution of the STSS Group CGPA (Figure 3) is likely due to the direction of students on academic probation into the STSS courses (i.e. the students enrol in STSS because they have lower grades; they do not achieve lower grades because they enrol in STSS courses).

Table 7: Cumulative GPA of Population, Control, and STSS Students

	# Students	Avg. CGPA
Population Pool	5,806	2.63
Control Group	128	2.32
STSS Group	117	2.36
Grand Total	6,051	2.62

Figure 3: Grade Distributions of STSS Students and the Overall Population



Retention Rates

Historically, International students have experienced a slightly lower retention rate than domestic students[2]. Overall, 44% of students in this study left TRU without earning a credential, and 56% either earned a credential or were still enrolled at TRU in winter 2010. Students who took STSS were found to have a slightly lower retention rate than the control group, and a slightly higher rate than the entire population. However, STSS was not found to be a significant factor in predicting retention.

Table 8: Retention Rates of Population, Control, and STSS Students

	# Students	Avg. Retention
Population Pool	5,806	56.0%
Case Control	128	57.8%
STSS	117	57.4%

[2] See: IPA (2009). Baccalaureate Retention Fall09.

Methodology

This study used quantitative methods to determine what factors affect the academic success of International students. Cumulative GPA and retention were used as outcome variables. A dataset of possible predicting factors was constructed by IPA (Appendix B). The records of 6,051 International students who were enrolled between the fall of 1999 and the winter of 2010 were included. Students are coded as being International by the registrar's office. Students were considered to be part of the experimental (STSS) group if they had earned a grade in at least one STSS course during this period. Students who withdrew from the course were excluded from the study. Exchange students were also excluded from this study, as they are not expected to graduate from TRU. Student T-tests and chi-square tests were used to compare differences in educational outcomes and other descriptive variables between the population pool, the control group, and the STSS group. ANOVAs were also computed to determine major outcomes differences between divisions and world regions of origin.

The dataset was analysed using inferential statistical methods. A stepwise multiple linear regression model was fitted to predict cumulative GPA. A fixed linear regression model was also fitted. The models were similar, and the stepwise model was selected as the final predicting equation. Categorical variables such as world region of citizenship and division were coded into indicator variables. A binary logistic regression was also calculated in order to create a model that predicted student retention. A student was considered to be retained if they had earned a credential or if they were still enrolled at TRU in the winter of 2010. Students were considered to not have been retained (attrition) if they left TRU without earned a credential. Exchange students were not included in the retention analysis. In order to further explore the relationship between CGPA and retention, probabilities and residuals were saved from the final logistic regression model. A simple fixed linear regression was then calculated for CGPA and probability of retention (see Figure 4).

A case control sample was created for the purposes of comparing academic outcomes between students who take, and who do not take, STSS courses. Because of the inherent bias in the STSS sample (students either self-select or are guided into the course) they were not expected to be a representative sample of the entire data set. This was tested with t-tests and chi-square tests. Because of some major differences between the two groups (see How are STSS Takers Different than non-STSS Takers), a case control sample was created based on the following variables:

- first term GPA,
- gender,
- age group,
- citizenship,
- division,
- degree type, and
- first term at TRU.

Using stratified random selection, a control group was created that was nearly identical to the STSS group (with the exception of attendance in STSS courses, and a slight overrepresentation of business in the control group). This group was used to compare educational outcomes with the STSS group (see How are STSS Takers Different than non-STSS Takers).

Data was analysed using PASW 18 and Tableau.

Results

Factors Affecting Cumulative GPA

Factors Affecting Cumulative GPA for All International Students

The strongest factor predicting CGPA was first term GPA. On its own, first term GPA was a significant factor for predicting CGPA: $R^2 = .62$, $F(1, 6049) = 9935.82$, $p < .001$. When first term GPA is combined with other significant factors, the multiple regression model resulting from the study can explain 65% of the variance in the CGPA of International students. For every one unit increase in first term GPA (i.e. from 2.00 to 3.00) the average student's CGPA will increase by .60. Other significant factors (in order of effect size) include: Tourism, Gender, Europe, Africa, number of terms on probation, Development, Business, Start Year, and Age[3].

Table 9: Factors Affecting Cumulative GPA

Summary of Multiple Regression Analysis for Variables Predicting Cumulative GPA (N=6051)

Variable	*B*	*SE B*	*β*
Gender	***.132	.015	.072
Age	***.010	.002	.054
Start Year	***.016	.003	.055
First Term GPA Range[a]	***.599	.007	.739
Europe	**.105	.031	.027
Africa	*-.092	.042	-.017
Business	**.045	.017	.024
Tourism	***.208	.047	.036
Development	**-.055	.022	-.024
# Terms on Probation	***-.061	.003	-.145
R^2		.651	
F		1096.87	

Note: $R^2 = .65$ ($p < .001$).
Gender coded as 0 for *male* and 1 for *female*. Europe, Africa, Business, Tourism, and Development coded as 1 for *yes* and 0 for *no*.
[a] First Term GPA Range is the integer of the student's actual first term GPA.
*$p < .05$. **$p < .01$. ***$p < .001$.

Factors affecting first term GPA

Although first term GPA was the strongest factor for predicting CGPA, a model predicting first term GPA was not generated from the study data. Available factors resulted in a very weak model for predicting

[3] The coefficients in Table 9 (*B*) show the size of the effect on CGPA for a 1-unit increase in the variable. Positive coefficients indicate that an increase in the variable results in an increase in CGPA, while negative coefficients indicate an inverse relationship.

first term GPA (explaining less than 10% of the variance in first term GPA). Taking STSS in the first term also did not contribute to this model. Variables that are thought to contribute to first term GPA include: quality of high school education, delay between previous academic training and attendance at TRU, and socio-economic factors.

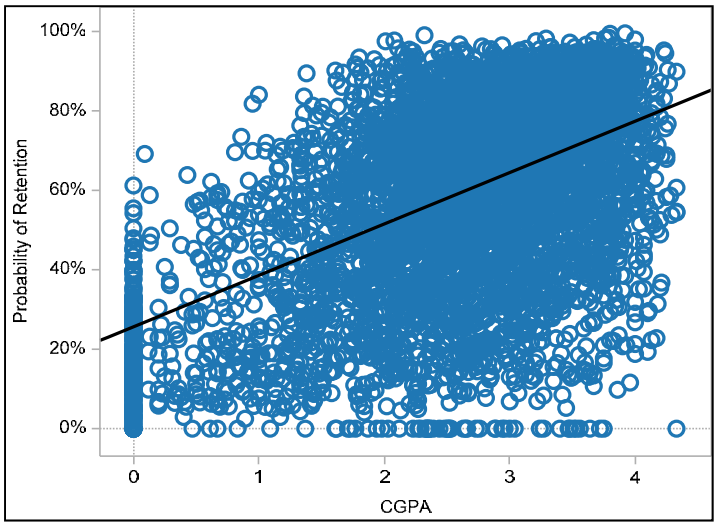
Factors Affecting Retention

Although it is acknowledged that a certain amount of attrition is expected at the post secondary level, it was the aim of this study to try to determine what factors predicted retention, thereby enabling intervention to reduce these occurrences.

Factors Affecting Retention for All International Students

Of course, the most significant factor in predicting retention is CGPA. The higher a student's CGPA, the more likely they are to be retained (**Figure 4**). A binary logistic regression model that included CGPA as the only variable was significant, and predicted retention with 64% accuracy: χ^2 (1, N = 6051) = 111.46, p < .001[4]. This relationship exists partly because of the Satisfactory Academic Progress policy, which states that students may be involuntarily un-enrolled from TRU if their academic performance is consistently below a certain standard. However, the relationship between CGPA and retention exists for students who have CGPAs above this cut-off as well: χ^2 (1, N = 6051) = 88.49, p < .001.

Figure 4: The Relationship between CGPA and Likelihood of Retention



[4] That is, the model predicts, based on a set of characteristics, whether a student will be retained or will leave without a credential, and the model is correct in about 64% of cases.

The model resulting from this study classifies 69.3% of cases correctly, and is a significant predictor of retention: χ^2 (12, N = 6051) = 426.4, p < .001. CGPA, as has been demonstrated, is a very strong predictor of retention. On average, when a student's CGPA increases by 1, their likelihood of retention would increase by 2.3 times. Other variables, in order of effect size, include: Diploma, Europe, Certificate, Start Year[5], Age, Terms on Probation, Business, Africa, ESAL, South East Asia, and Tourism[6].

Table 10: Factors Affecting Retention for International Students

Summary of Logistic Regression Analysis for Variables Predicting Retention (N=6051)

Predictor	*B*	*SE B*	e^B
Cumulative GPA	.832***	.071	2.298
Age	-.063***	.018	.939
Start Year	-.418***	.038	.659
ESAL	1.254***	.146	3.503
South East Asia	1.254***	.198	3.528
Africa	.964***	.258	2.622
Tourism	1.393***	.351	4.028
Certificate	-.519*	.213	.595
Diploma	-.902***	.153	.406
Terms on Probation	.101**	.024	1.107
Europe	-.595**	.185	.551
Business	.412**	.119	1.510
Constant	836.483		
χ^2	426.399		
df	12		
Retention rate (%)	56.06		

Note: Gender coded as 0 for *male* and 1 for *female*. ESAL, South East Asia, Africa, Tourism, Certificate, Diploma, Europe, and Business coded as 1 for *yes* and 0 for *no*.
*p < .05. **p < .01. ***p < .001.

[5] This variable should be interpreted in the context of the retention calculations. If a student makes a return from a stopout (i.e. takes a semester or more off, but then comes back to TRU) they are counted as retained. The more recently the student has began studies at TRU, the less time they have had to make a return and therefore the higher the attrition rates for those cohorts.

[6] The odds ratios in Table 10 (e^B)Table 9 show the change in the likelihood of retention for a 1-unit increase in the variable. Odds ratios greater than 1 indicate an increase in the likelihood of retention, while odds ratios <1 show a decrease in the likelihood of retention. For example, a student who is in a diploma program only 40% as likely to be retained at TRU than if they were retained in a non-diploma (and non-certificate) program.

Conclusions

This study has confirmed that previous academic performance is the strongest predictor of future academic performance. It has also found that taking STSS courses had a neutral effect on both cumulative GPA and retention, while previous strong academic performance and being enrolled in either Tourism or Business are positive for both outcomes. In terms of programming, students in baccalaureate programs tend to have more positive outcomes. Students from Europe, despite achieving higher CGPAs, are more likely to leave TRU without having completed a credential. This is also true for older students; cumulative GPA, as well as likelihood of attrition, increases with age. Students from Africa, however, are much more likely to be retained despite achieving lower CGPAs. Students who take at least one ESAL course are also more likely to be retained[7]. As first term GPA is the greatest predictor of CGPA, it is recommended that interventions for academic success be made within the first academic term at TRU.

[7] This is true even if ESAL credentials are not considered for retention.

Appendix A: Research Plan

International Students Academic Success Study-What Factors Affect the Academic Success of International Students?

Requested by: Cameron Beddome on behalf of the Senate International Affairs Committee

June 11, 2010

Research Problem:

The Senate International Affairs Committee (SIAC) has expressed an interest in examining the efficacy of certain Student Success courses (code: STSS) in helping International students succeed academically.

Research Questions:

1. What factors significantly affect the academic success of International students at TRU?
2. Are the Student Success courses among the significant factors for this academic success?

Methodology:

This study will use quantitative methods to determine what factors affect the academic success of International students. A dataset of possible factors has been constructed by IPA (Appendix A). All International student records from the summer of 2005 to the winter of 2010 will be included.

The dataset will be analysed using inferential statistical methods, including (but not limited to): factor analysis, linear regression analysis, and means testing. Records may be divided into subgroups, as appropriate.

The results of this analysis will be written up as a formal report, and will be made accessible to members of SIAC and the TRU community as appropriate. As the study is focused on gaining practical insights on the subject on International academic success, a summary report of the study's conclusions will be made available which will use a minimum of statistical language.

Plan Timelines:

June 2010: IPA will formulate the study methodology and create the data set. The SIAC working committee will informally approve the research plan.

August 2010: IPA will conduct the statistical analysis and produce a report

September 2010: IPA will report the results to SIAC

Clarification of Terms:

Academic success will be measured with cumulative GPA. Pending an examination of the data, a fixed time period will be established for the calculation of GPA. This term will be determined based on the inclusion of maximum records in the model (for example, if most students take Student Success courses in the first fall term, a first year cumulative GPA may be calculated, whereas if most students take Student Success courses in the first winter term, a two-year GPA may be calculated). Limiting the calculation of cumulative GPA to a fixed term will help control for students attending TRU for varying lengths of time.

The cumulative GPA level at which a student will be considered to have achieved "success" will not be strictly defined; however, passing grades at the "C" level will be loosely considered to be an achievement of academic success. The use of a scaled dependent variable (cumulative GPA) allows for the prediction of incremental increase in success, rather than the prediction of a "pass/fail" scenario.

Reporting of Study Results:

The results of the study will be reported to SIAC as its primary audience, and the results will be given to SIAC for use in future decision making. As this study has not been subject to ethics approval, the results are intended for the TRU community only; the study methods or results may not be published in a formal academic journal.

Appendix B: Variables Included in the Analysis

Variable	Description	Type
Age	Approximate age calculated as 2010-birth year	scale
Age Group	Calculated according to TRU Factbook groupings	scale
Case	Control group or STSS group (or null)	binary
Cumulative GPA (CGPA)	The cumulative GPA as calculated in the Student Information System	scale
Degree Type	The level of the program in which the student was first enrolled (i.e. baccalaureate)	binary (dummy)
Division	Division in which the student was first enrolled at TRU	binary (dummy)
ESAL	Student did or did not take at least one ESAL course in the study period	
ESAL Count	Number of ESAL courses taken (not total credits)	scale
ESAL Level	Average level of ESAL courses taken in the first term (5-9)	scale
Exchange	The student was enrolled in an exchange program. These students were excluded.	Binary
First term at TRU	First term the student took courses at TRU (includes summer terms)	scale
First term GPA range	The integer of the term GPA of the first term at TRU (i.e. 2.33= 2).	scale
Gender	Male, female, or unspecified. Males coded 0, females coded 1	binary
Retention Attrition	The student either earned a credential or was enrolled at TRU in winter 2010 (1) or left TRU without earning a credential (0). For complete methodology, see: IPA (2009) *Baccalaureate Retention and Attrition 2009 Briefing Notes*.	binary
Start Year	Academic year in which the student began at TRU. Denoted according to the first year (i.e. 1999-2000 is coded as "1999")	scale
STSS	Student did or did not earn at least one grade in an STSS course in the study period	binary
STSS Average Grade	Average GPA of STSS course grades as per TRU policy ED 3-5	scale
STSS Count	Number of individual courses taken by a student (not total credits; see footnote	scale
STSS First Term	The first term in which the student took an STSS course	scale
STSS Time Lapse	The number of terms between when a student started at TRU and when they took STSS	scale
STSS Voluntary STSS Involuntary	If the student achieved a term GPA below the probationary level (1.5) in the term before they took the STSS course, it was assumed that they were asked to enrol. These students were coded as "involuntary" STSS takers	binary
Terms on Probation	The number of terms in which a student achieves a term GPA of < 1.50.	scale
Total Terms	Total number of terms the student was/has been at TRU (does not include summer terms)	scale
World Region	Based on citizenship country codes. Divided into world regions based on the united nations World Macro Regions and Components www.un.org	binary (dummy)

International Academic Success Study Summary

THOMPSON RIVERS UNIVERSITY
Institutional Planning & Analysis

August 2010 Prepared for: Senate International Affairs Committee Prepared by: Kristen Hamilton, Matthew Kennedy, Dorys Crespin-Mueller

Research Questions:

- **What factors affect the cumulative GPA of International students at TRU?**
- **What factors affect the retention of International students at TRU?**
- **Are STSS Courses among the significant factors for GPA and retention?**

Study Data:

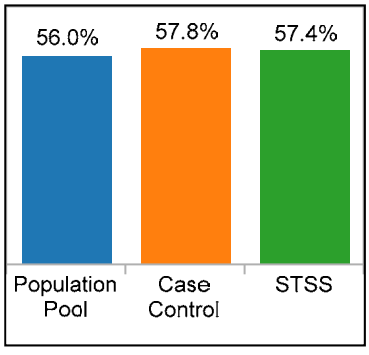
Population Pool	5,806
Control Group	128
STSS Group	117
Grand Total	6,051

TRU International students, 1999/00 – 2009/10

Study Methods:

These results were obtained through statistical analysis, including linear regression (predicting cumulative GPA), binary logistic regression (predicting attrition), and means testing (control sample comparisons).

Retention Rates:



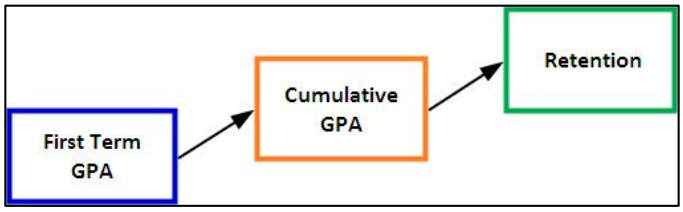
Main Factors that Predict Increased Cumulative GPA

- achieving a higher first term GPA
- being in a Tourism program
- being female
- country of origin (Europe)
- country of origin (Africa- negative effect)

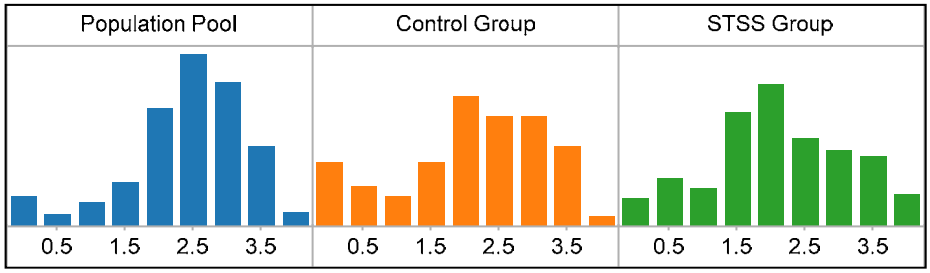
Main Factors that Predict Decreased Retention

- being enrolled in a diploma program
- country of origin (Europe)
- being enrolled in a Certificate program
- being older
- (students with higher CGPAs have higher retention rate)

The GPA – Retention Process:



Cumulative GPA distributions:



The Bottom Line: STSS was not found to be a significant predictor of either CGPA or retention. Students that achieve good grades in the first semester are much more likely to have positive academic outcomes. Interventions will probably be most effective if they are made in the first year at TRU.