

K-12 Non-graduate Success and Pursuing Public Post-secondary Studies

By

Brent Douglas Munro
B.A., University of Victoria, 2004

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K-12 NON-GRADUATES AND POST-SECONDARY STUDIES

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Abstract

Failure to graduate from high school presents a serious problem to society reaching far beyond the education sphere. However, some high school non-graduates return to post-secondary institutions and successfully complete degrees, diplomas, and other credentials. Unfortunately, little is known about such individuals. Research on K-12 non-graduates tends to focus on retention within the K-12 system examining factors such as race, socioeconomic status, and the structures and organization of schooling. Regrettably little if any consideration is given to the future educational experiences and achievements of the K-12 non-graduates that return to post-secondary studies consequently creating a gap in the literature.

This study examines administrative and achievement data of individuals who have not graduated from the British Columbia (BC) K-12 educational system and later re-entered the BC public post-secondary system. Specifically, this study identifies the percentage of non-graduates who go on to post-secondary studies and examines the year over year enrollment data for trends, the commonalities in the types of K-12 courses taken and associated achievement levels, the types of post-secondary programs selected, and concludes with a brief exploration of potential predictors, such as gender, home language, and previous academic performance.

Overall the research findings on the study population provided some interesting results in terms of the proportions, composition, K-12 academic achievements, and program pursuit within the post-secondary system. Most notably was the proportions of non-graduates entering into

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post-secondary studies remaining stable over time, the K-12 academic achievements were average and did not include many at the higher end of the achievement spectrum, all attended a college, institute, or teaching-intensive university and not a research-intensive university, and there was a fairly even distribution across the programs that the study population opted to enroll in at their respective post-secondary institutions.

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Introduction

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Statement of the problem

It has been acknowledged throughout the literature that not graduating secondary (or high) school presents a serious problem to society far beyond the education sphere (Bost & Riccomini, 2006; Christenson & Thurlow, 2004; Christle et al, 2007; Dunn et al, 2004; Eisenman, 2007; Fashola & Slavin, 1998; Fortin et al, 2006; Lan & Lanthier, 2003; Matthews, 2006; Romi & Marom, 2007; Zvoch, 2006). Such problems include an overall lack of basic knowledge and social skills required to function in society, an over dependency on social safety nets such as social assistance income, higher levels of delinquent behaviours, higher levels of depression and anxiety, and prolonged low levels of achievement. However, two questions remain unanswered:

1. What do those at risk of becoming non-graduates of the formal Kindergarten to Grade 12 system (K-12) require in order to be able to be successful?
2. Is attaining post-secondary enrolment and a post-secondary credential considered “being successful” if a K-12 credential has not been achieved?

While the notion of not graduating and being viewed as “successful” may seem unusual it is a question deserving of an answer. According to reports produced by the British Columbia (BC) Ministry of Education (MED) roughly 20% of the K-12 school population does not receive the standard BC graduation certificate¹. In essence, the fundamental question could be boiled down to “what is success?” Unfortunately, much of the literature dealing with not graduating school focuses on retention and generally ignores other forms of success.

¹ <http://www.bced.gov.bc.ca/reports/pdfs/graduation/prov.pdf>

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Review of the literature

Little is known about individuals who do not graduate from the K-12 education system but later enroll in a post-secondary institution. Research on K-12 non-graduates tends to focus almost exclusively on the K-12 system or surrounding influences, such as race (Osborne & Walker, 2006), socioeconomic factors (Crosnoe & Huston, 2007; Fortin et al, 2006), and structural / organizational factors (Baker et al, 2001; Hardre & Reeve, 2003), but typically does not look forward to examine future educational experiences and achievements. It should be noted that there are rare examples within the literature, such as Matthews (2006), where educational pursuits following disappearance from K-12 education are examined; however such studies tend to focus on gifted students who leave early in order to pursue post-secondary studies. Additionally, there are rare studies such as that of Fashola and Slavin (1998) that examine “dropouts” in relation to K-12 school retention and post-secondary studies however such studies still focus on programs which purport to “fix” the students, that is, fit the student into the existing system through a variety of strategies, prior to leaving school. This limited collection of studies usually involve small sample case studies or research using highly aggregated data (Barrington & Hendricks, 2001; Bear et al, 2006; Lee & Ip, 2003), such as summary data at the state / provincial or national level in which the data may not be mutually exclusive across different variables. Additionally, summary data does not always provide the level of detail required to examine specific groups of individuals. For example, a researcher would not be able to determine characteristics of a group of non-graduates using summary data on the average achievement of those that wrote a standardized assessment compared to the total number of non-graduates at the state or provincial level as the two summary data groupings are not mutually exclusive or not specifically identified for aggregation. The use of aggregate data

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in an effort to obtain a sufficiently large enough study population is in itself is not problematic, but it is by no means required for the purposes of this study as case level data do exist to track and examine students in both the K-12 education system and the public post-secondary education system within BC.

Within the literature, non-graduates are most commonly referred to as “dropouts”. Not surprisingly, the definition of “dropout” varies greatly. One study for example defined a potential “dropout” as students with less than a 2.0 GPA and having missed more than 15 days of school by the end of their sophomore (or second) year of high school (Nowicki et al, 2004) while another, due to the nature of the study, defined it in six different ways (Fashola & Slavin, 1998).

Most of the existing non-graduate research appears to focus on a single component of success: academic success, be that either completion of secondary schooling or achievement on a given standardized assessment. While academic success is critical for completing K-12 schooling, other facets or types of success may be equally important. Despite not graduating from the K-12 system individuals may achieve success in a number of ways such as by gaining employment, completing non-formal training, or completing formal post-secondary studies. Understanding non-graduates and understanding that success for such individuals may take many forms will have consequences for the education system as a whole, including the K-12 system and beyond. A predominant theme in the literature is the evaluation of programs and strategies targeted at *potential* non-graduates with the goal of “fixing” students so they better fit into the K-12 education system (Bost & Riccomini, 2006; Gleason, & Dynarski, 2002; Nowicki et al, 2004). Unfortunately however, within this theme the focus is on K-12 performance and little attention has been given to individual ability (Zhang, 2004), or more specifically the potential abilities of a given individual beyond that of the academic curriculum found within the K-12 education

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system. The problem however with this “fix it” approach is that it does not take into account the variety of factors leading to K-12 non-completion, academic reasons being just one type.

Programs and strategies may need to reflect the complex reality of school non-completion.

Another line of research focuses on mature students in the post-secondary world.

Typically these students are adults, over the age of 20. Although entrance requirements for mature students vary greatly across institutions it is common for institutions to require that the individual be out of formal schooling for a minimum number of years². It should be noted, however, that the research on the school experiences and success of individuals returning to post-secondary as mature students appears to be limited (Rowan-Kenyon, 2007). However, much like the K-12 research, there has been a research focus on post-secondary non-completion and retention (McGaha & Fitzpatrick, 2005).

Along this vein of post-secondary retention and completion it is safe to state that Vincent Tinto, while not considered the founder of retention studies, is arguably considered one of if not the most influential voices of four-year US college and university attrition studies (it should be noted that subsequent research has expanded to include two-year US colleges but the primary focus remains on the institutions with four-year programs). In his initial 1975 theoretical work, *Dropout from Higher Education: A Theoretical Synthesis of Recent Research*, Tinto “developed an important explanatory model of the student persistence/ withdrawal process in postsecondary institutions” (Pascarella & Chapman, 1983, p. 87). Following this, Tinto’s 1987 foundational work, *Leaving College: Rethinking the Causes and Cures of Student Attrition*, he developed a model to predict the attrition process in the post-secondary sector. Tinto contended that student

² As stated entrance requirements vary greatly and with respect to time away from full-time formal education the University of British Columbia (UBC) requires at least four years while Simon Fraser University (SFU) requires that the applicant be aged 23 or older and have attempted less than one year of post-secondary course work. Information on the UBC requirements may be found at <http://www.students.ubc.ca/calendar/index.cfm?tree=2,290,0,0#17004> . Information on the SFU requirements may be found at <http://students.sfu.ca/admission/requirements/index.html>.

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retention is a function of the quality of integration and interactions with academic and social systems within the higher education institution of a student. From his initial theoretical model to his foundational work a great many researchers utilized the work of Tinto by extending the “explanatory power of Tinto's theoretical model... through a multi-institutional validation” (Pascarella & Chapman, 1983, p. 89) and through the addition other factors such as student perceived locus of control (Guarino & Hocevar, 2005), to cite just a two. Tinto himself even proceeded to update his foundational model in 1993. On the whole though, as Tinto (2006) points out “[s]tudent retention is one of the most widely studied areas in higher education” (p. 1).

In terms of this study however, retention is not the focus and thus analysis and discussion of this area are not included. As previously stated, the intention of this study is to examine one of the alternate pathways to higher education and given the study population (non-graduates of secondary school), it would confound the study to include such analysis of retention patterns and correlates as this study is focused on a lack of retention in one system (non-graduation from secondary schools) followed by enrolment in another (post-secondary institutions). Simply stated, including this analysis would demand an inclusion of a theoretical, philosophical, and practical discussion on whether or not retention in and completion of the K-12 system is important if there is a future pursuit of post-secondary studies and given the focus of this study it is not included. However, that said, future studies could investigate the retention in post-secondary studies of this study group.

Overall, it is important to note that the majority of research on post-secondary enrolment for K-12 graduates tends to focus on graduates who enter immediately following graduation (Rowan-Kenyon, 2007). This trend could in part also be related to the lack of research on non-graduates who enter post-secondary studies as such individuals are unable to enter immediately.

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The British Columbia context

In general, the BC K-12 education system is not “streamlined” where students are enrolled into a specialized program, such as business or natural science, in preparation for post-secondary studies. There are of course exceptions such as specialty private academies specifically designed for such a purpose. In addition, students opting to attend a public post-secondary institution in BC have a variety of options that include enrolling in a college or university for an applied vocational program or for a theoretical/research programs.

BC is unique in that there is the capability to follow students, in terms of individual enrolment occurrences and of individual academic achievements, through their entire time within the K-12 education system, as of September 1992, as well as their time within the post-secondary system through the use of BC’s Personal Education Number (PEN). Every school within BC collects an established set of information on each student enrolled in their institution. This information is submitted to the BC MED at least twice each school year on September 30th and February 1st but may be up to five times a year depending on the type of program and schooling involved. Schools with students involved in a distance education program for example collect and submit information at five points throughout the school year. Since its inception in 1992, the reliability of the PEN has grown to between 95 and 96%.

As a result of this unique information set, research that examines the entire K-12 career and respective achievement as well as public post-secondary choices and achievements is available without relying on costly and time consuming surveys and / or interviews with the target study population. Moreover, because of this unique information set, personal information such as the names of the target study population need not be provided to researchers as it is

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possible to match data from the two systems using the PEN, or a consistent anonymous transformation of the PEN.

For the purposes of this study, an encrypted version of the PEN is used in the linking and analysis of the BC K-12 and post-secondary data. The BC PEN has been identified in legislation, the *School Act*³, as being personal information despite it being a mathematically generated number and not containing any identifier, link, or reference to the individual so as a result an encrypted version is used to ensure the consistent and unique identification of individuals across the school years and across the two education systems, K-12 and post-secondary. Further, all reported results will be aggregated according to the MED policy on the *Protection of Personal Information when Reporting on Small Populations*⁴ (effective November 16, 2009) to establish a sufficient level of privacy protection.

Purpose and study population

The purpose of this study is to follow the post-secondary trajectories of BC students who did not attain the BC K-12 graduation credential in order to understand: how much of the K-12 student population these students make up; the traits (variables) related to those that opt to return to formal education; and finally when and how these students enter the post-secondary system. The educational achievement of the study population will be measured up to the point of disappearance from the K-12 system. The term “disappearance” will be used as opposed to “dropout” or any other similar term as there is no concrete or consistent method to determine if a student has actually dropped out of school within BC. In terms of BC educational administrative

³ <http://www.bced.gov.bc.ca/legislation/schoollaw/revisedstatutescontents.pdf>

⁴ http://www.bced.gov.bc.ca/policy/policies/persinfo_foi_smallpop.htm

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data (i.e., demographic and enrolment data) one can only surmise if a given student has not appeared in the system at a given data collection point.

For the purposes of this study, only individuals who have “disappeared” and not graduated with a BC K-12 credential and have attended a minimum of one year of BC public post-secondary studies are included. Non-graduates are explicitly defined as those individuals who have attended grade 8 in BC, present for a minimum of three consecutive years in a BC school, and that have not obtained either of the following provincially issued BC K-12 graduation certificates, the BC Dogwood Diploma or the BC Adult Dogwood Diploma, are not international students, and have enrolled in a post-secondary institution without one of the specified K-12 graduation credentials. It is important to note that individuals meeting the above criteria and have graduated in another jurisdiction are identified through the post-secondary system and are excluded from this study.

Non-graduates are defined in this manner and restricted for three primary reasons. First, non-graduates are restricted to those who were present in grade 8 at any point over their BC educational career as an individual in grade 8 is typically between the ages of 13 and 14 which place them close to the legal age to leave school. Further, grade 8 is the final year of elementary schooling and the beginning of significant educational program changes. Grade 9 forward constitutes a shift from a prescribed program as found in elementary school to a semi-flexible or choice based program in secondary school (there is still prescribed curriculum and mandatory courses but there are course choice / selection options available to students). This shift may present a challenge for those individuals at risk of disappearing.

Second, non-graduates are restricted to those who have spent at least three consecutive years in a BC school in order to mitigate against individuals that appear only for a short period of

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time and / or have left the BC K-12 education system for legitimate reasons as opposed to those that have disappeared. Legitimate reasons for leaving may include such reasons as being on a short term study exchange program or moving to another province or country for parental employment purposes such as contract work or short-term military postings.

Finally, non-graduates must not have not ever received either of the following provincially issued BC K-12 credentials, the BC Dogwood Diploma or the BC Adult Dogwood Diploma. Individuals who return to complete a K-12 credential as a stepping stone to post-secondary studies will be excluded from this study. It should be noted that BC public post-secondary institutions are authorized to issue the BC Adult Dogwood Diploma and due to differing data collection systems the recipients of this credential by a BC public post-secondary institutions are not identified or included within this study.

Further to this, to be included in the study population individuals must have at least one registration occurrence in a BC public post-secondary institution following their last appearance in the BC K-12 system. The minimum of one registration occurrence within the BC public post-secondary sector was selected for two primary reasons, data availability and the structure of post-secondary studies. Due to the data sets used in this study some desired variables such as post-secondary semester or term are not consistently available, consequently a variable indicating the post-secondary school year will be used to determine and assign the year of enrolment. Related to this is the second reason, program structure within the BC post-secondary system. It is possible for individuals to complete their public post-secondary studies within a single semester or term or even within a single academic year, depending on the program selected therefore individuals could potentially be excluded based solely on the post-secondary program selected. So in order to include the greatest number of individuals the minimum required occurrence

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within the public-post secondary data is one enrolment at any point over the post-secondary school years examined within this study.

Finally, to be included in this study, individuals must not be identified as “international students” within the BC K-12 system. Such individuals will be excluded from this study as the focus is not on international students who may have enrolled in school to complete English equivalencies or to participate in an exchange program. This final restriction is included to remove those individuals not captured under the minimum three consecutive years criteria.

Research questions

Four research questions are examined:

- 1) What percentage of K-12 non-graduates go on to enroll in post-secondary studies and are the percentages consistent year over year?
- 2) What K-12 programs, courses, and levels are completed by K-12 non-graduates entering the post-secondary system (i.e., description of the K-12 academic performance of students who do not complete grade 12 and later return to post-secondary programs)?
- 3) What are the types of post-secondary programs that K-12 non-graduates register in?
- 4) Are there any potential predictors for individuals that do not graduate from the K-12 system but go on to post-secondary studies and if so what are those predictors?

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Methods

Research design overview and sampling strategy

This study is a quantitative examination of existing administrative and achievement data on non-graduate students that go on to pursue post-secondary studies. This group of individuals is unique because: (a) they did not complete a BC K-12 education and (b) they opted to take atypical pathways to BC public post-secondary studies. It is expected that most non-graduates will be adults due to the legal requirements associated with K-12 school attendance (i.e., must be in school until age 16) and due to entrance requirements for mature students in post-secondary institutions.

Initially it was unknown how many of the potential study candidates would remain once the study population selection criteria have been applied. The study proceeded however based on an internal BC Ministry of Education (MED) preliminary investigation which revealed over 5,000 potential study candidates across multiple years of K-12 data, the 1994/1995 school year forward, and six years of post-secondary data, 2002/2003 through the 2008/2009 school year⁵.

Extreme case sampling, which is a purposeful examination of outliers (Creswell, 2008), was employed to target participants who fit the study population selection criteria and all individuals meeting the selection criteria were then included in the study. The decision to include the entire population of disappeared individuals meeting the selection criteria, as opposed to sampling, was intended to help mitigate against potentially small participant numbers once all of the selection criteria have been applied.

⁵ On site viewing access was granted to an unpublished BC Ministry of Education internal report in November 2008. A request for notification of publication of the internal report has been made and as of the completion of this study no public publication has occurred.

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Methods and considerations for dealing with missing data

It was initially acknowledged that there may be a fundamental challenge contained within this study: missing data could prove to be a primary issue. In one respect it was fundamental to the study in order to determine which of the individuals could be considered a non-graduate. However, it was also expected that both administrative and achievement data required for analysis would contain some missing elements due to the nature of the study population. In this first case, missing data (non-graduation) were to serve as the primary basis for selecting the study population while in the second case missing data could prove to be problematic and thus would have to be accounted for and dealt with accordingly.

It has been acknowledged throughout the literature that missing data are a common problem for virtually all quantitative research including those which use social science data (Maier, 2002; Peugh & Enders, 2004; Pigott, 2001; Segawa, 2005) and given the target study population it was inevitable that missing data would exist and would need to be dealt with appropriately. Consequently a strategy for how the missing data required for analysis would be handled was required. As missing data are such a pervasive problem there are a variety of methods which could be employed, including deciding to ignore it.

Missing data may be the result of data collection issues, such as refusal to answer a question, forgetting to answer, absenteeism, or the result of data management issues such as lost data, lost files, or transposition errors, or the result of external factors such as time constraints, lack of interest – especially in longitudinal research, moving accommodations, or divorce (Pigott, 2001; Segawa, 2005; Winglee et al., 2001; Zoppé et al., 2001). It should be noted, however, that for this study name changes due to marriage or divorce are accounted for through the BC PEN. Again, the BC PEN once assigned to an individual remains with that individual

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throughout their time in the entire BC public education sphere and changes of names are tracked and retained by the BC MED. While this listing of reasons for missing are certainly not exhaustive it could potentially apply to the target study population. However, it is not the purpose of this study to investigate the rationale behind the missing data. For this study missing data could prove to be an issue and with respect to the data required for analysis, the missing data were to be dealt with appropriately depending on the magnitude (that itself had to be evaluated).

While there are no clear best methods, due to the dependency on the data itself, the literature does provide some recommended cautions for consideration prior to deciding on a method to deal with missing data. First is to do a pre-investigation. The research literature appears to be in complete agreement on this matter as a critical step (Peugh & Enders, 2004; Pigott, 2001; Roth, 1994). The concept is a simple one, get to know the data and know the magnitude of the problem before making a decision on a strategy and method of dealing with missing data. This step could be started by running descriptive statistics on each variable in the dataset such as frequencies, means, and standard deviations. As each variable could potentially have different magnitudes of missing values it would also be important to examine each case or situation variable. The purpose of examining each case is to determine the magnitude of complete, or rather incomplete, cases.

Second, it is strongly encouraged that any and all assumptions about the data, the process of how missing data were handled, and the rationale for the method selected be clearly documented (Peugh & Enders, 2004; Pigott, 2001; Roth, 1994). In their methodological review of research published in the *Review of Educational Research*, Peugh and Enders (2004) found that the “methods used to handle missing data were, in many cases, difficult to ascertain because

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explicit descriptions of missing-data procedures were rare” (p. 537). Peugh and Enders (2004) did note, however, that very recent research, 2003 and onward, appears to be shifting towards the documentation of the missing data methods employed. The likely cause however is not due to a simple change in research practice and attitude but rather is likely due to the recommendation put forward by the APA Task Force on Statistical Inference, which recommended that “[b]efore presenting results, report complications, protocol violations, and other unanticipated events in data collection ... [including]... missing data, attrition, and nonresponse” (Wilkinson & Task Force on Statistical Inference, 1999, p. 597 as cited in Peugh & Enders, 2004).

Next, ensure that the sample size is sufficient for the proposed analysis. Depending on the type and nature of research and the population being studied, sample sizes can and do vary. Studies of behaviour for example routinely use smaller samples due to the nature of behaviour research (Thum, 1997). By ensuring an appropriate sample size the researcher will be in the best position to have an appropriate distribution of cases and variation between cases and / or values. If the sample size is too small there will be issues or concerns with the robustness of the data itself, specifically with the outliers (Thum, 1997).

In addition to ensuring that the study sample is of sufficient size, greater than 50 individuals, another strategy is to tailor the analysis so that any analysis is performed on groupings of appropriate size. For example, study populations could be analyzed in groups across years rather than as individual cohorts within a given year.

In conjunction with sample size is the notion that more data will help to compensate for small samples. It is generally agreed that more data will not “solve” the problem of having small samples regardless of whether or not there is missing data (Wainer, 1993). In short, only the relevant data should be used.

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Finally, and as previously stated, there are a number of ways to deal with missing data and the decision on which method to use is dependent on the type of missing data as well as the magnitude of the problem. In the simplest of terms, the method should be appropriate to the type and magnitude of the problem. Roth (1994) provides an early summary of what would be considered an appropriate method based on the magnitude of the missing data in *Table 1*.

Table 1

Suggested missing data techniques according to amount and pattern of missing data

Amount of missing data	Missing completely at random	Pattern	
		Missing at random	Non-missing at random
1-5%	1) Pairwise	1) Hot-deck	1) ML
	2) Any technique	2) ML	2) Hot-deck
		3) Regression	3) Regression
6-10%	1) Pairwise	1) Hot-deck	1) ML
	2) Regression	2) ML	2) Hot-deck
	3) Hot-deck	3) Regression	3) Regression
11-15%	1) Pairwise	1) Hot-deck	1) ML
	2) Regression	2) ML	
	3) Hot-deck	3) Regression	
16-20%	1) Pairwise	1) Hot-deck	1) ML
	2) Regression	2) ML	
	3) Hot-deck		

- Definitions:
- i) Hot-deck - the replacement of a missing value with an actual value from a similar case within the existing dataset.
 - ii) ML (maximum likelihood) - assumes data is normally distributed then estimates the parameters of the data which are then used to estimate missing values.
 - iii) Missing completely at random - the cause of the missing data is not dependent on other data in the model, it is unrelated.
 - iv) Missing at random - data that is missing is dependent on other data in the model.

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While it is obvious that Roth's summary predates current thought in some respects it is worth explicitly noting this fact for clarity. Current thought on the matter is to avoid traditional methods or techniques such as pairwise or listwise deletion when possible (and applicable) for model-based methods (Peugh & Enders, 2004; Pigott, 2001; Roth, 1994).

Since the method of dealing with missing data should be appropriate to the type and magnitude of the problem what conclusions could be drawn for this or any research prior to viewing the data? As there was no clear or definitive answer to such a question the first step was to develop a strategy for how the missing data required for analysis would be handled.

Study strategy for dealing with missing data

The method selected for dealing with missing data will have varying impacts on the data. Within the confines of this study on non-graduate K-12 students, if missing data required for analysis are not dealt with objectively prior to the analysis and results will likely be rendered unreliable or biased at best. As the analysis relies exclusively on administrative and achievement data, missing assessment data for example could potentially have an enormous impact. Analysis would prove to be difficult if the inability to sum items in an assessment in order to derive a total or scale score were removed (Segawa, 2005).

As previously stated there are a variety of methods for dealing with missing data. The methods range from the extremely simple, such as deleting each case that has missing data, to the more complex model-based methods (Peugh & Enders, 2004; Pigott, 2001; Roth, 1994) consequently a strategy was needed prior to viewing the data. A three option high level strategy was developed based on simplicity of the method and the magnitude of missing data.

The first option in the high level strategy was to exclude cases with missing data from the analysis. If the study population size could prove to be sufficient, greater than 50 cases per

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school year, and the rate of missing data relatively low enough, as per Roth's (1994) suggested proportions, to support the proposed analysis then only complete cases would be used.

The second option in the high level strategy was to utilize *Mean Imputation or Mean Substitution*, which is the process of substituting a mean for the missing data. The appeal of this method is its simplicity. Missing data are replaced and the data are analyzed as a complete set. The largest problem however with this method is that it does not provide new data and leads to an underestimate of error (the standard error would be noticeably smaller using mean substitution as a result of adding no new information to the data while increasing the sample size) (Jashidian & Bentler, 1999; Peugh & Enders, 2004; Pigott, 2001).

The third option was to utilize *Regression Imputation or Regression Substitution*, which is similar to *Mean Imputation* in that values are predicted and filled in. *Regression Imputation* is different however in that linear regression is used to predict what the missing score should be on the basis of other variables that are present for the individual (Peugh & Enders, 2004). This method, like *Mean Imputation*, replaces data and in this case new is data added however the standard error will be affected with the increased sample size.

In the end it was decided that despite the noted issues with *Regression Imputation or Regression Substitution* method it would be the preferred option in the strategy with one caveat, that there were only a handful of cases affected in the data file. The decision to use this option was again based on the assumption that missing data would be a significant factor in this study given the target study population. However, if the magnitude of missing data were large, 20% or more of the data file, then the first or second option would be utilized. The decision on which of the first two options to select would then fall to the study population size. If the study population size were sufficient, greater than 50 cases per school year, to exclude the cases with missing data

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then the analysis would proceed using only complete cases. If the study population size became too small, less than 50 individuals per post-secondary school year, then the second option would be used and missing values would then be imputed and analyzed.

Data sources

For this study existing administrative (i.e., demographic and enrolment data) and achievement (i.e., assessment data) data were used. The pre-existing data were obtained through a formal request to the Student Transitions Project (STP) Steering Committee and consequently no data collection instruments were required. The formal data request specified which variables were requested and conformed to the existing data standards of the STP. See *Appendix 1 – BC K-12 Administrative Data*, *Appendix 2 – BC K-12 Achievement Data*, and *Appendix 3 – BC Public Post-secondary Administrative Data* for complete variable request listing. The STP is a partner group⁶ made up of representatives from the BC Ministry of Education (MED), the BC Ministry of Advanced Education and Labour Market Development (ALMD), and representatives from all public BC universities, colleges, and institutes.

Additional BC K-12 administrative and achievement data not covered by STP were required and was consequently requested from MED. The additional administrative data included each occurrence of enrolment by school year and by school, and included a number of supplemental support / program flags. For a complete list of the administrative data refer to *Appendix 1 – BC K-12 Administrative Data*. The additional achievement data included, where applicable, the respective achievement score and / or achievement level of the individual on the assessment (or assessment component). For a complete list of the achievement data refer to

⁶ The partner group is a joint collaboration called the Student Transitions Project (STP). A formal data request was made to the STP Steering Committee which has the authority to grant access to varying levels of data. Further information on the project can be found at http://www.aved.gov.bc.ca/student_transitions/.

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Appendix 2 – BC K-12 Achievement Data. It should be noted that in the case(s) where no achievement data is available a null value was requested.

The BC public post-secondary administrative and achievement data were obtained, as mentioned, through the STP. Administrative data included each public post-secondary registration occurrence. For a complete list of the administrative data refer to *Appendix 3 – BC Public Post-secondary Administrative Data.*

Research methods

It was expected that the data obtained for this study would be relatively clean in that the data for each variable would be coded consistently for known values (e.g., “yes” values would be coded consistently as “yes” and not some values coded as “yes” and others as “y” within the same variable). This expectation was based on the use of pre-existing data for the study but it was acknowledged that some cleanup and recoding would be required. It was anticipated that three types of recoding would be required. First, that minimal recoding would be required to change null or true missing data value to a value which could later be counted and analyzed. It was expected that this would generally apply to the administrative data. For example, if the data contained values only when the Aboriginal status in each year is equal to “yes” or “no” then the data will be recoded to change the null or true missing data value to “unspecified”.

Second, recoding would be required when only partial data existed so that the data could be used and not removed from the analysis. It was expected that this would generally apply to the achievement data. For example, if an individual has a course mark and a final mark for Grade 12 English but no exam mark the missing mark could be computed using the standard set forth by MED for final grading where the final mark is a blend of the course mark and exam

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mark, 60% and 40% respectively⁷. It was, as mentioned, expected that this type of recoding, the recoding of missing data to an actual computed value, would be critical to the study as it was anticipated that there could potentially be a significant degree of missing data due to the nature of the study and the target study population, as outlined throughout this report.

The final type of recoding required would be to recode or calculate new variables. It was expected that some new variables would be required during the analysis of the data in order to examine the relationship between the K-12 administrative and achievement data and the related public post-secondary data as well as between groups of individuals within the study population. For example, it was expected that a new variable would be needed to determine if there is any relationship between any of the available data and the number of years which have passed between enrollments in the two education systems. So in this example a variable called *years disappeared* which calculates the time between disappearance from the K-12 system and first appearance in the public post-secondary system would have been created.

In order to answer the four research questions of this study the initial analysis involved producing and reviewing some descriptive statistics using SPSS⁸. Descriptive statistics were computed to serve two purposes: first to better understand the data and to determine the magnitude of missing data; second to determine which if any variables would need recoding; and third to serve as a measure of change between the raw data provided and the recoded / calculated data. The descriptive statistics used included frequency counts, means, ranges, standard deviations, and variance for both the administrative and achievement data.

The initial analysis performed determined that missing data would not prove to be an issue as the size of complete case level data was more than sufficient (i.e., greater than 50 cases

⁷ <http://www.bced.gov.bc.ca/exams/specs/grade12/en/2009.htm>

⁸ <http://www.spss.com/software/statistics/>

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per year) to proceed using just complete cases for three of the four research questions. An initial overall non-graduate population of 194,508 (any individual without a graduation credential and at least one enrolment occurrence in the BC K-12 education system) and the initial study population of 20,616 (any individual without a graduation credential and at least three years of enrolment in the BC K-12 education system where one enrolment year must include grade 8) were discovered. Further investigation of the descriptive statistics subsequently pointed to the need to reduce the both populations to 178,470 and 19,410 respectively. It was decided that the data for the 2008/2009 post-secondary school year would not be included in this study as it contained only partial year data, specifically, only data from the fall term and not complete year data.

It was also determined that some minimal recoding of the data would be required. The data adjustments included recoding of string variables such as school year to numeric variables and the creation of new variables to flag the defined study population. Overall, the required recoding involved two of the three anticipated actions outlined above. The second expected recoding action for or generation of data to account for missing data was not required.

In addition to the descriptive statistics a regression analysis was used to answer research question four. Initial investigation determined that 401 cases were available for the regression analysis. The analysis for this research question required participation in two provincially developed assessments, one in grade 7 and one in grade 12, so consequently the number of available cases dropped considerably. A regression analysis was used on both the administrative and the achievement data in order to examine the relationship between achievement on a standardized grade 7 reading assessment and achievement on the grade 12 English examination. The analysis was conducted on the group of 401 non-graduates as a whole as well as on gender

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(male, n = 217 and female, n = 184) and those with a home language of English compared to non-English (n = 279 and n = 122 respectively). The intention of using regression for the analysis was to explore if there were any potential predictors for individuals that do not graduate and yet go on to post-secondary studies.

Potential ethical issues

It was not anticipated that there would be any substantive ethical issues related to this study. As outlined, this study made use of existing administrative and achievement data from both the BC K-12 system and the BC public post-secondary system and was requested with an encrypted version of the PEN to avoid any need for the provision of personal information and to ensure that a consistent and unique study identification number was provided. As stated previously, the BC PEN has been identified in legislation, the *School Act*⁹, as being personal information despite it being a mathematically generated number and not containing any identifier, link, or reference to the individual.

Additionally, all data obtained for this study did not require additional consent as the K-12 data was originally obtained by MED under the BC *School Act Section 170.1*¹⁰ and obtained by the Ministry of Advanced Education and Labour Market Development (ALMD) under the *University Act Section 27 (6)*¹¹, *Royal Roads University Act Section 10*¹², *Thompson Rivers*

⁹ BC School Act <http://www.bced.gov.bc.ca/legislation/schoollaw/revisedstatutescontents.pdf>

¹⁰ BC School Act <http://www.bced.gov.bc.ca/legislation/schoollaw/revisedstatutescontents.pdf>

¹¹ BC Universities Act http://www.bclaws.ca/Recon/document/freeside/--%20u%20--/university%20act%20%20rsbc%201996%20%20c.%20468/00_96468_01.xml#FOUND-NOTHING

¹² Royal Roads University Act http://www.bclaws.ca/Recon/document/freeside/--%20r%20--/royal%20roads%20university%20act%20%20rsbc%201996%20%20c.%20409/00_96409_01.xml#FOUND-NOTHING

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*University Act Section 7*¹³, and the *College and Institute Act Section 41.1 (4)*¹⁴. It should also be noted that consent and use of the post-secondary data are a condition of enrollment in the BC public post-secondary sector so again consent has been granted. However, given the nature of the study there could have been sensitivities surrounding the acquisition of individual case level data due to a potential stigma associated with not graduating from the K-12 system. That said, the additional precautions of first obtaining encrypted study identifiers and second, only reporting aggregated results in accordance with MED policy¹⁵ assists in reducing some potential issues surrounding this data.

On this basis an ethics waiver was applied for in place of a full ethics review. Due to this study not requiring the use of personal information, not requiring contact with any of the target study population, and not collecting data and instead making use of pre-existing data an ethics waiver was granted. A copy of the approved ethics waiver has been included; see *Appendix 4 – Ethics Waiver*.

Research Findings

The research findings of this study proved to be as anticipated in most cases. There were, however, a few interesting pieces discovered that are worth noting. To recap, the study population includes only individuals who have “disappeared” from the BC K-12 education system, have been present for a minimum of three consecutive years in a BC school including grade eight, have not obtained a provincially issued BC K-12 graduation certificates, and have

¹³ Thompson Rivers University Act http://www.bclaws.ca/Recon/document/freeside/--%20t%20--/thompson%20rivers%20university%20act%20%20sbc%202005%20%20c.%2017/00_05017_01.xml#FOUND-NOTHING

¹⁴ BC College and Institute Act http://www.bclaws.ca/Recon/document/freeside/--%20c%20--/college%20and%20institute%20act%20%20rsbc%201996%20%20c.%2052/00_96052_01.xml#FOUND-NOTHING

¹⁵ http://www.bced.gov.bc.ca/policy/policies/persinfo_foi_smallpop.htm

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attended a minimum of one year of BC public post-secondary studies. Further to that, as previously stated, this study excluded individuals that had met the above criteria and had graduated in another jurisdiction through identification in the post-secondary system.

Research questions

As indicated at the outset of this study four research questions were examined:

- 1) What percentage of K-12 non-graduates go on to enroll in post-secondary studies and are the percentages consistent year over year?
- 2) What K-12 programs, courses, and levels are completed by K-12 non-graduates entering the post-secondary system (i.e., description of the K-12 academic performance of students who do not complete grade 12 and later return to post-secondary programs)?
- 3) What are the types of post-secondary programs that K-12 non-graduates register in?
- 4) Are there any potential predictors for individuals that do not graduate from the K-12 system but go on to post-secondary studies and if so what are those predictors?

Research findings question 1: What proportion of non-graduates go on pursue post-secondary studies?

In terms of the overall enrolment the relative proportion total non-graduates has generally continued to increase since the 2002/2003 rising approximately 1% by the 2007/2008 post-secondary school year. With the exception of the 2004/2005 school year the year over year increase of total non-graduates ranges from 0.07 to 0.48. *Table 2* outlines the year over year proportions and increases of the total post-secondary enrolments.

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*Table 2**Total BC non-graduate enrolments by post-secondary enrolment year*

Post-Secondary Enrolment Year	BC Non-graduate Post-Secondary Enrolment	Total Post-Secondary Enrolment	BC Non-graduate Enrolment as Percent of Total Post-Secondary Enrolment
2002/2003	26,758	339,183	7.89
2003/2004	27,339	343,373	7.96
2004/2005	27,959	355,107	7.87
2005/2006	29,869	368,005	8.12
2006/2007	32,668	379,832	8.60
2007/2008	33,877	383,983	8.82
Total	178,470	2,169,483	8.23

Note that the figures in *Table 2* include all enrolments in the BC public post-secondary system including those individuals with multiple enrolments (those enrolling in subsequent school years at an institution different than their first appearance in the post-secondary system) and those enrolled in continuing education or developmental programs / courses.

In terms of the population as defined in this study the total study population was equal to 19,410 and the numbers by post-secondary school year ranged from 2,871 to 3,707. It was discovered that the proportions of non-graduates entering into post-secondary studies remains stable at approximately 0.90% of the entire post-secondary enrolment population per year (including both graduate and non-graduate enrolment), ranging from 0.84% in 2003/2004 to 1.03%, in 2002/2003. However, while the study population remains stable in terms of enrolment proportions, it is considerably lower than that of all non-graduates, 1.03% in 2002/2003 for the study population and 7.96% for every non-graduate enrolment occurrence for the same year. The cause for the considerable reduction is the removal of multiple enrolments and removal of

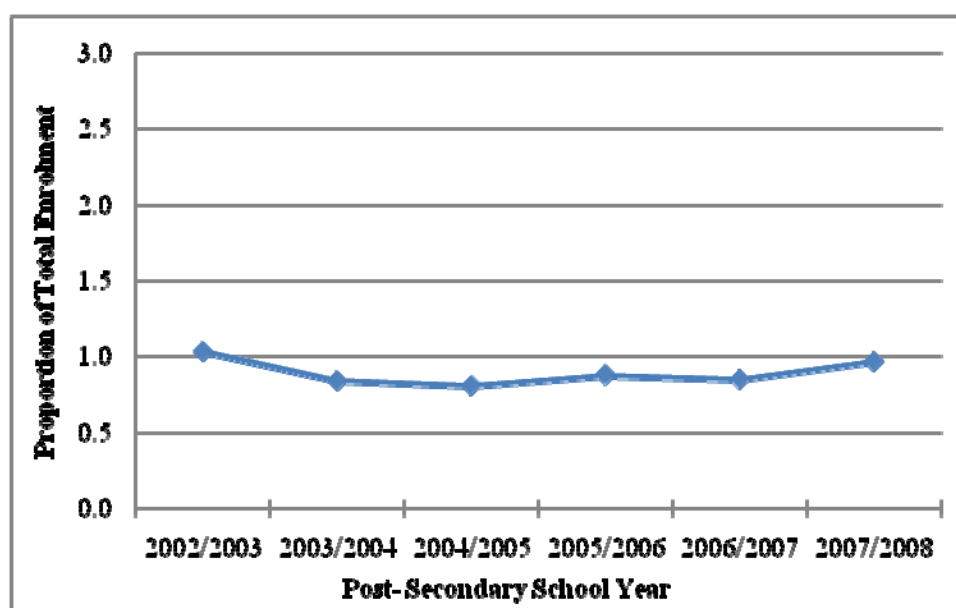
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continuing education and developmental programs / courses from the study population. *Figure 1* illustrates the relatively stability of non-graduate enrolment over time, as defined in this study.

The year by year numbers and proportions used in *Figure 1* and discussed are provided in *Table 3 Non-graduate enrolment (study population) of Appendix 5 Results*.

Figure 1

Proportional non-graduate enrolment



What is interesting to note is the relative stability of the study population over time in terms of proportional representation (note that this excludes multiple enrolments). While increases are seen in overall non-graduate enrolments the study population remains relatively stable in both numbers and proportional representation. Only two of the six post-secondary school years examined show study population numbers below 3,000 (2871 in 2004/2005 and 2,878 in 2003/2004). However, the relative stability in enrolment year over year is not necessarily surprising. Given that the study population excludes individuals enrolled in

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continuing education or developmental courses / programs it was expected that the year over year numbers would remain stable due to post-secondary institutional policies which limit the number of “mature” students registered each year. The University of Victoria for example limits the number of “mature” students admitted each post-secondary school year (unfortunately the maximum number of “mature” students admitted each post-secondary school year is not stated by the institution as the number is dependent on the availability of institutional resources)¹⁶.

Research findings question 2: What is the K-12 academic performance of the study population?

The K-12 program types examined for the study population were involvement in any of the following three programs: (1) English as a second language program (ESL); (2) French immersion program; and (3) special education programs. In BC K-12 ESL programs¹⁷ are provided to individuals who require additional English language training beyond what is provided as part of the regular curriculum. ESL programs in BC are supplemental programs provided to students. French immersion programs¹⁸ in BC come in two forms, early immersion and late immersion where early immersion begins in kindergarten or grade 1 and late immersion begins in grade 6. For the purposes of this study no distinction is made between early and late French immersion. French immersion programs differ however from ESL programs in that French immersion are provided as additional language. Conversely, ESL programs are provided to reduce a deficit in language. Finally special education programs¹⁹ in BC are provided to students who require supplemental support. Supplemental supports include physical

¹⁶ <http://registrar.uvic.ca/undergrad/admissions/requirements/special.html>

¹⁷ <http://www.bced.gov.bc.ca/esl/policy/guidelines.pdf>

¹⁸ http://www.bced.gov.bc.ca/policy/policies/french_immersion.htm

¹⁹ <http://www.bced.gov.bc.ca/specialed/>

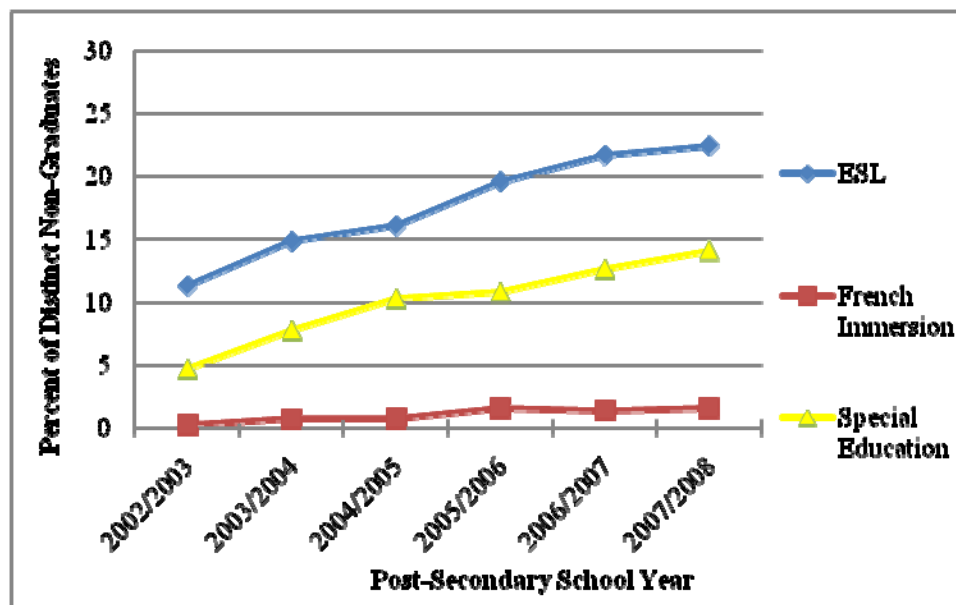
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supports, behavioural supports, and learning supports (where learning supports include both deficits in learning and “gifted” programs).

The non-graduates in the three program types outlined above were examined to describe the magnitude in each program. *Figure 2* below portrays the relative proportions of participation in each of the three K-12 programs. The year by year numbers and proportions used in *Figure 2* and discussed below are provided in *Table 4 Non-graduates by K-12 program type* of *Appendix 5 Results*.

Figure 2

Proportions of non-graduates by K-12 program type



The results of this investigation were both expected and surprising. It was expected that there would be few individuals within the study population (non-graduates) that had participated in a K-12 French immersion program due to the nature of the program, to provide additional language training. This expectation was based on MED documents indicate that individuals that

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have participated in such a program as students tend to graduate at considerably higher levels than both the general K-12 student population²⁰ and those not in a French immersion program.

Grade 4 and 7 Foundation Skills Assessment (FSA) data were examined as part of this research question. It was discovered that a considerable portion of the study population participated in this BC standardized assessment. For the grade 4 reading assessment approximately 18% of the study population (n = 3,459) participated. For the grade 7 reading assessment approximately 32% of the study population (n = 6,196) participated. A substantial size difference between study population participation in the two assessments is to be expected due to two factors, the definition of the study population and the implementation year of the assessments. The definition of the study population specified at least three years in the BC K-12 system including grade 8 so it follows that a greater proportion of the study population would be in the system in grade 7 as compared to grade 4. In terms of the assessment administration, the first year of the assessment was in 1999/2000 for both grades so the portion of the study population that participated in the grade 4 assessment has had fewer years to leave K-12 and enroll in post-secondary studies. The result was that the grade 7 assessment included two more years of assessment data than did the grade 4 assessment for the study population.

The achievement results of the assessments, as seen in *Figure 3* and *Figure 4*, were analyzed using the three achievement categories of “below expectations”, “meeting expectations”, and “exceeding expectations”. In general the categories align with where an individual is in terms of the knowledge expected for the grade level²¹.

²⁰ <http://www.bced.gov.bc.ca/reporting/docs/ski09.pdf>

²¹ http://www.bced.gov.bc.ca/perf_stands/using.htm

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Figure 3

FSA reading achievements grade 4 1999/2000 – 2004/2005

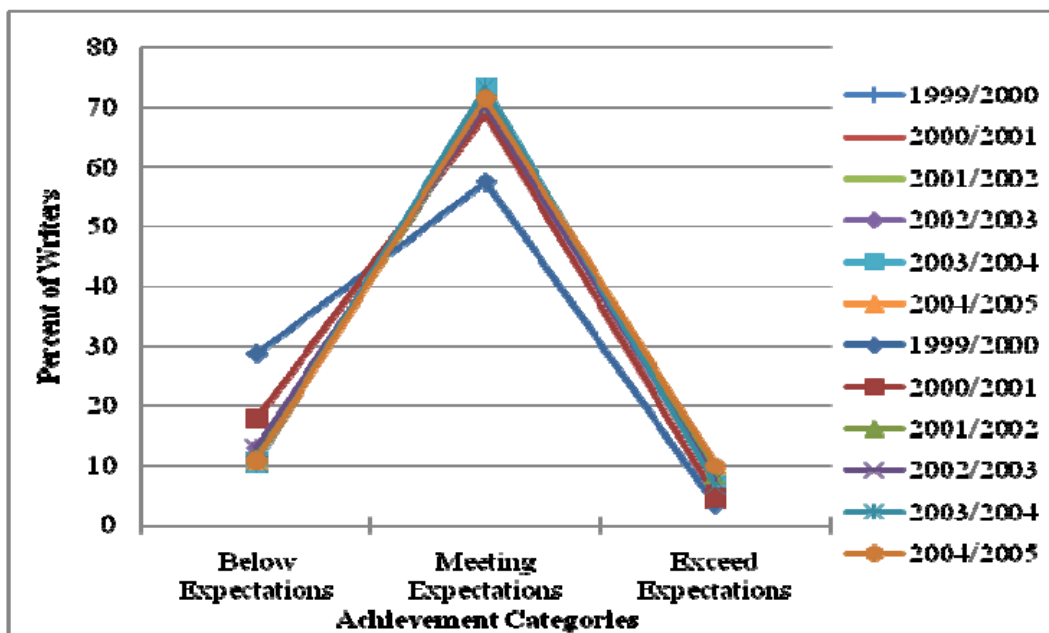
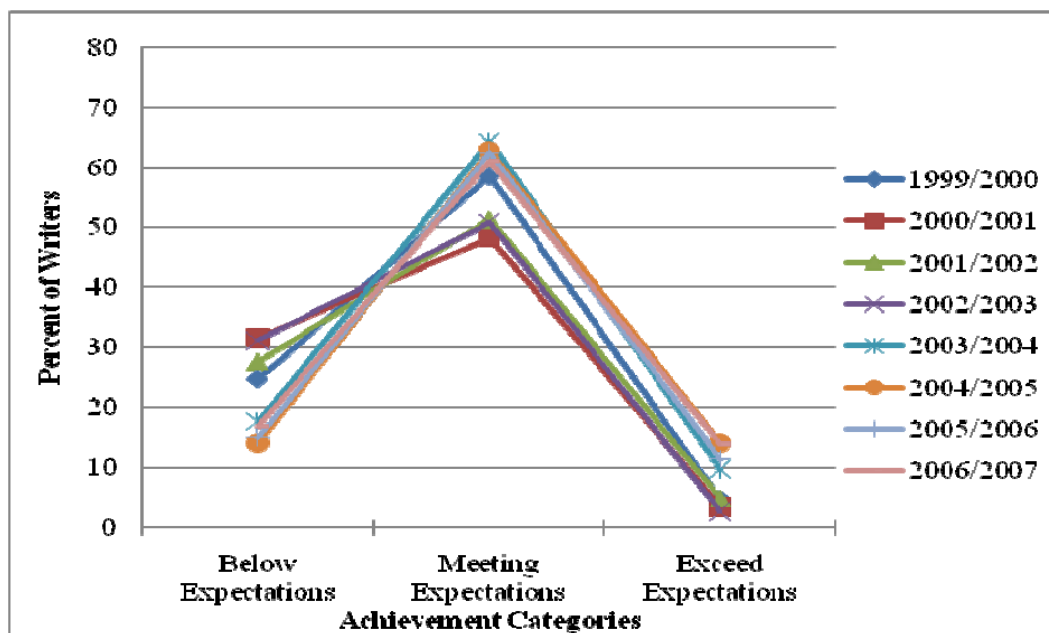


Figure 4

FSA reading achievements grade 7 1999/2000 – 2006/2007



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The results analyzed were as expected with the majority of participants falling in to the *meeting expectations* category, between 65 and 70%. The somewhat unexpected discovery was the relatively normal distribution of the achievement results. It was anticipated that the achievement results would be positively skewed which is the case but the degree to which the results were skewed was not as large as expected. Given the study population, non-graduates, it was expected that the FSA achievement results would show few if any achievement levels which were exceeding the expected grade level knowledge. However, as *Figure 3* demonstrates, this is not always the situation. There are examples in both assessments where there are proportionally fewer individuals in the exceeding category than in the below category but there are more examples where the proportions are much closer or even equal.

The K-12 courses examined as part of research question 2 included final exam participation in grade 12 English, grade 12 Communications, and grade 12 History. These three courses were selected for two reasons; based on participation levels and because there was an interest to see how much, if any, of the study population had taken a course required for graduation (i.e., a grade 12 language art course is required for graduation²²). The interest in examining participation in a language art course required for graduation was founded in the composition of study population, which is exclusively made up of non-graduates.

The three senior secondary courses for which province wide student level data were available and that had the highest participation were, as stated, grade 12 English, grade 12 Communications, and grade 12 History. As can be seen in *Table 5*, the numbers and proportions of the study population range from a low of 3.34% participation on the grade 12 history exam to a surprisingly high participation rate of 29.22% on the English exam.

²² http://www.bced.gov.bc.ca/policy/policies/graduation_req.htm

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Table 5

Non-graduate K-12 exam participation

Post-Secondary Enrolment Year	English 12	Percent of study population	Comm. 12	Percent of study population	History 12	Percent of study population
2002/2003	683	19.53	248	7.09	117	3.34
2003/2004	841	29.22	314	10.91	165	5.73
2004/2005	809	28.18	342	11.91	160	5.57
2005/2006	932	28.83	339	10.49	178	5.51
2006/2007	885	27.46	335	10.39	173	5.37
2007/2008	855	23.06	381	10.28	164	4.42
Total	5,005	25.79	1,959	10.09	957	4.93

The average participation rate for the English 12 exam is surprising in three respects. First, it should be noted that the highest levels of participation for all exams was in English 12. Please refer to *Table 6 Non-graduate K-12 exam participation other courses* in *Appendix 5 Results* for details on other courses examined. It was surprising to see such a high rate, let alone the highest rate, in English as compared to other grade 12 language arts exams such as Communications it would be considered the more difficult. Secondly it is interesting to discover that roughly one quarter of the study population participate in one of the final courses required for graduation. Finally, the relative consistency in the proportion of the study population participating in the course and exam is surprising. Some variation in participation year over year was expected and some was seen however the small degree of variation was unexpected.

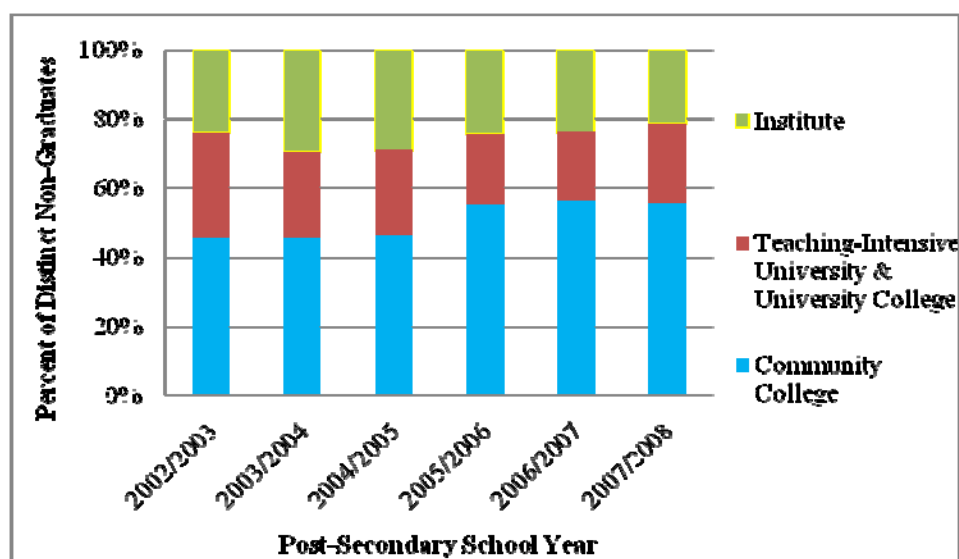
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Research findings question 3: What types of post-secondary programs that the study population registered in?

The data used for this study contained a variable, *psi_type*, which grouped the post-secondary institutions into four category types; community college, institute, teaching-intensive university (formerly known as “university-college”), and research-intensive university (formerly known as “university”). The categories originated as part of the data specifications provided to the STP participants²³. The number of possible institutions to attend in each category varies slightly across the post-secondary school years but averages 11 community colleges, 5 institutes, 5 teaching-intensive universities, and 5 research universities. *Figure 5* below displays the distribution of enrolments across the institution categories for all post-secondary school years analyzed in this study. Please refer to *Table 7 Post-secondary institution counts* in *Appendix 5 Results* for counts of the post-secondary institutions by category by post-secondary school year.

Figure 5

Post-secondary destinations



²³ http://www.aved.gov.bc.ca/student_transitions/

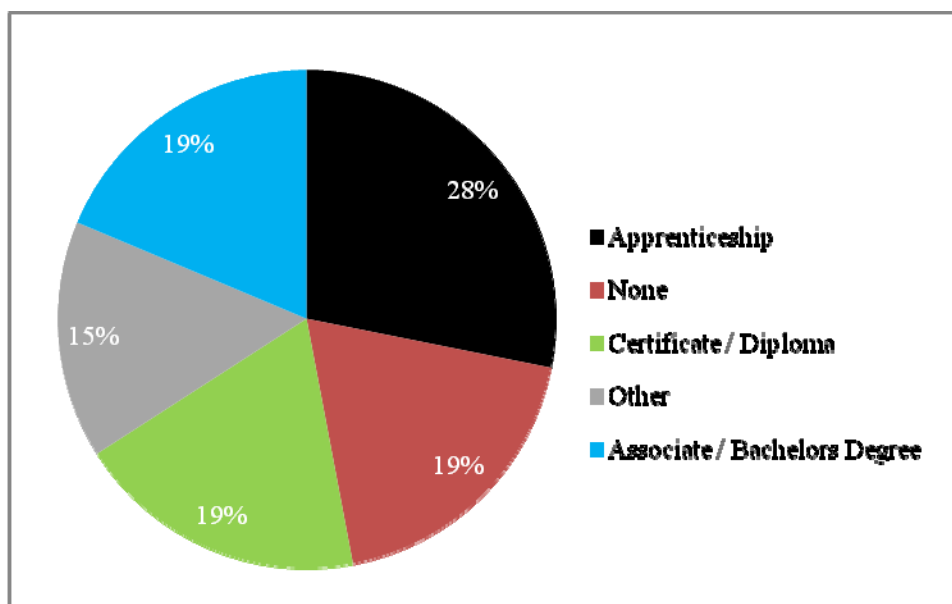
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The analysis of the destinations of the study population showed that the largest majority enrolled in community colleges, ranging from 45% of the study population to over 56%. The interesting yet somewhat expected finding was that the entire study population enrolled at non-research-intensive university institutions (note that *Figure 5* above only displays three or the four institutional destinations due to the figure displaying proportional enrolment and the lack of enrolment by the study population at research universities). This was interesting in that public research-intensive universities in BC have admission procedures specifically targeted at “mature” students and yet a segment of the “mature” student group remains excluded. This finding was however to be expected as BC post-secondary institutions participate in a college transfer program²⁴ where students complete the first portion of their studies at a community college before applying to transfer to a research-intensive university. Given this transfer program many potential non-graduate research-intensive university students are pointed towards this path so that they are able to complete any required academic upgrading prior to entering the research-intensive university sector. That said, there is a clear need as well as an opportunity for all post-secondary institutions to facilitate re-entry of the “disappeared” individual into the education system.

Further to the investigation of institutional destinations the programs in which the study population enrolled provided some interesting results. *Figure 6* shows the distribution of the major program types for the most recent (and complete) post-secondary school year contained within the dataset. Please refer to *Table 8 Post-secondary program enrolment by year* in *Appendix 5 Results* for details on the types of post-secondary programs the study population opted to enroll in.

²⁴ <http://www.bccat.bc.ca/transfer/index.cfm>

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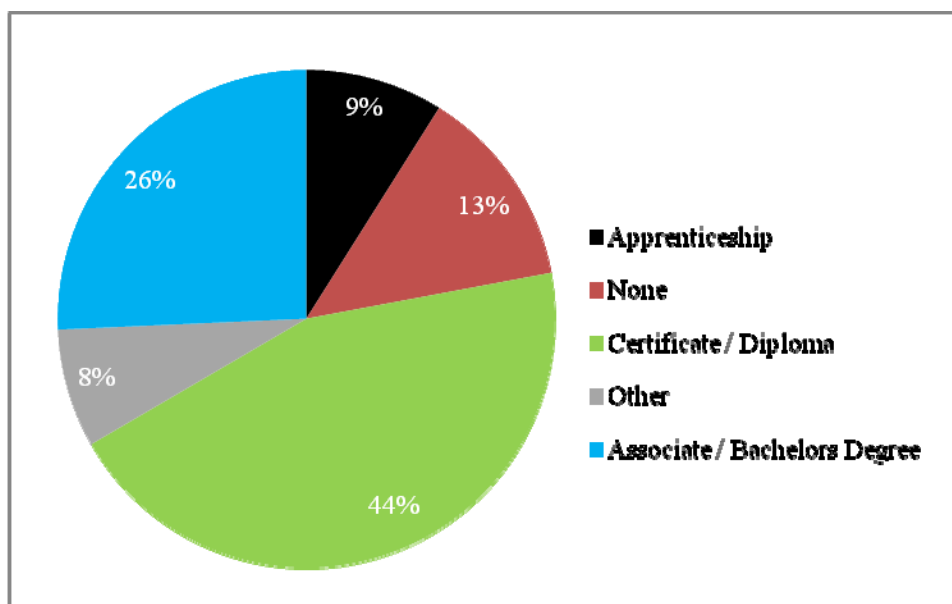
*Figure 6**Post-secondary program enrolment for non-graduates*

With the exception of apprenticeship programs, in which 28% of the study population was enrolled in, there is a surprisingly even distribution across the remaining major programs. When compared to the graduate population entering a post-secondary institution in the same year the distribution of programs changes. *Figure 7* shows the program enrolments for graduates and what is seen is a considerably different distribution. For graduates, apprenticeship programs are the second lowest grouping and comprise only 9% of the program enrolments. Moreover, the program distributions are not approximately even as they are with the non-graduate study population ranging from a low of 8% in the “Other” grouping to a high of 44% in the “Certificate / Diploma” grouping. Also of note is the difference in the “Associate / Bachelors Degree” for graduates which stands at 26% as compared to that of the non-graduate study population at 19%.

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Figure 7

Post-secondary program enrolment for graduates



Unfortunately however, the data obtained for this study did not specify which, if any, of the individuals were part of a transfer program to a research-intensive university. Consequently, it is not possible to determine which, if any, of the individuals in the “none” or “other” program category, for example, were involved in a university transfer program and which are involved in academic upgrading, to use just two possible options.

Research findings question 4: an initial investigation to determine if there were any potential predictors for individuals that do not graduate from the K-12 system but went on to post-secondary studies.

As previously stated, a regression analysis was used to examine the relationship between achievement on a standardized grade 7 reading assessment and achievement for the grade 12 English course. The analysis was conducted on the group of 401 non-graduates as a whole as

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well as on gender (male, $n = 217$ and female, $n = 184$) and those with a home language of English compared to non-English ($n = 279$ and $n = 122$ respectively). Please refer to *Table 9 Descriptive statistics for Grade 7 FSA reading and grade 12 English assessment regression*, *Table 11 Descriptive statistics for regression by gender*, and *Table 13 Descriptive statistics for regression by FSA home language* in *Appendix 5 Results* for detailed descriptive statistics on the subset of the study population included in this research question.

The investigation explored the relationship between the scale score (post IRT processing) of the grade 7 reading assessment of each individual in relation to their final course percent mark for the grade 12 English course (variables *IRT_SCALE_SCORE* and *FINAL_COURSE_PCT* respectively). The three regression analysis performed were first each examined to determine if any interpretation could be conducted. The first check was to reconfirm that this subset of the study population was of sufficient size. The sample size proved to be sufficient for testing a single predictor according to Tabachnick and Fidell (2007). The authors state that a general rule of thumb for testing a single predictor is $N \geq 104 + m$ where m is the number of independent variables (IV). For this analysis the overall subset of the study population had an $n = 401$ and the smallest group within the subset had an $n = 122$ (i.e., the non-English home language group on the FSA assessment) which was well above the suggested sample size. Further, for each of the three regressions performed there was only one IV so interpretation was able to proceed.

The second check was to ensure that the R^2 values were not equal to zero and were significant. If any of the values were equal to zero then no further interpretation was performed. To determine this, the F values in each of the regressions were examined. In all but one case the R^2 values were not equal to zero so the preliminary interpretation checks could proceed to the third and final check. The R^2 value for males in the regression using gender was equal to zero so

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no further interpretation would take place for this group. Please refer to *Table 10 Grade 7 FSA reading and grade 12 English assessment regression*, *Table 12 Grade 7 FSA reading and grade 12 English assessment regressions by gender*, and *Table 14 Grade 7 FSA reading and grade 12 English assessment regressions by FSA home language* in *Appendix 5 Results* for details on the R^2 values for each of the respective regressions performed. Additionally, for those R^2 values not equal to zero the third check was to ensure that there was a significant p-value. If the p-value was not significant, greater than 0.05, no further interpretation was conducted. Like the R^2 value check, all but one of the groups in each of the regressions were not significant, had a p-value greater than 0.05. The p-value for the subset female gender group was 0.001. Consequently, further interpretation of the respective regressions could only proceed with the female subset group. Please refer to *Table 10 Grade 7 FSA reading and grade 12 English assessment regression*, *Table 12 Grade 7 FSA reading and grade 12 English assessment regressions by gender*, and *Table 14 Grade 7 FSA reading and grade 12 English assessment regressions by FSA home language* in *Appendix 5 Results* for details on the p-values values (as indicated by the *Sig. F change* value) for each of the respective regressions performed.

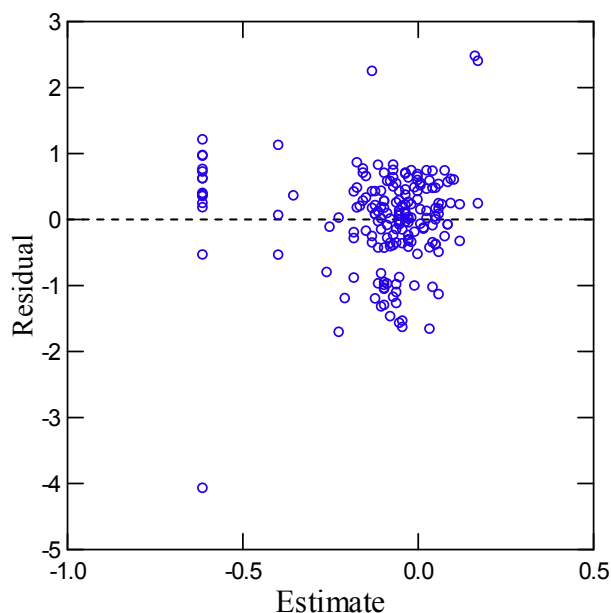
The female group was then examined in terms of the correlations between the two regression variables, the scale score (post IRT processing) of the grade 7 reading assessment and the final course percent mark for the grade 12 English course. The correlation, as detailed in *Table 15 Grade 7 FSA reading and grade 12 English assessment correlations by gender* in *Appendix 5 Results*, was relatively low at 0.235. However, despite the relatively low correlation further analysis of the regression for the female group proceeded due to there being a relationship between the two assessment variables for females and due to the relationship being positive.

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A residual plot for the female gender group, *Figure 8*, was produced and examined in order to obtain a visual representation of how far each data point is from the zero point line on the y axis. Ideally the data points would line up along the zero point line thereby indicating that there was no error. In short, the greater the distance from the zero point line the greater the error.

Figure 8

Female residual plot



It is clearly seen that some clustering does occur around the zero point line however there are numerous outliers. However, in terms of this interpretation there is a considerable amount of error. This finding is as would be expected given the relatively low yet positive correlation between the two variables for the female group. Further to this there is also some noticeable clustering around the -0.6 score on the estimate. The investigation into this grouping revealed a handful of female individuals, about 15, that had a common low score on the estimate.

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Discussion

Overall the research findings on the study population proved to be both expected and unanticipated in the proportions, composition, K-12 academic achievements, and program pursuit within the post-secondary system. It was interesting to discover that the proportions of non-graduates entering into post-secondary studies remained stable over time at approximately 1%. The composition of the study population was also expected and a bit surprising in terms of K-12 program participation and academic achievements. As stated, it was expected that there would be relatively few individuals within the study population that had participated in a K-12 French immersion program due to the nature of the program, to provide additional language training, and due to published MED documents which show a higher completion rate of French immersion students, and the study results confirmed this expectation.

In terms of K-12 academic achievement, specifically elementary level standardized assessments, the findings were as expected with the majority of participants falling in to the *meeting expectations* category however the lack of a significant skew in the distribution was somewhat surprising. A strong positive skew was anticipated but not seen. Following this, it was also surprising to see such a high rate of participation (>25% of the study group) in grade 12 language art exams required for graduation. It was somewhat perplexing to discover that approximately one quarter of the study population had participated in one of the final courses required for graduation yet did not go on to graduate. It is difficult to understand why an individual would not graduate after participating in one of the final graduation requirements. Of note was the English 12 exam which had the highest participation for the study population and is considered the more difficult of the senior language art required for graduation.

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A further interesting yet somewhat expected finding was with respect to the institutional destination and program choices of the study population. It was discovered that the entire study population enrolled at non-research-intensive university institutions. As previously stated, this finding was interesting because public research universities in BC have admission procedures specifically targeted at “mature” students and yet none of the study population appeared in one of the research universities. This finding was to be expected as BC post-secondary institutions participate in a college transfer program whereby students attend a college for the first part of their program of choice. The results from the post-secondary program exploration further support this finding. While it was not possible, due to the limitations of the dataset, to determine which individuals in the “none” or “other” program category were involved in a transfer program it is speculated that many were. However, that said, the need and opportunity for all post-secondary institutions to facilitate re-entry of the “disappeared” individual into the post-secondary education system is clear.

Finally, in terms of predictors for those that do not graduate yet go on to pursue post-secondary studies the items used in this study were limited. By themselves the assessments examined are not adequate to predict potential non-graduates or future studies. Other items are required in order to begin a meaningful investigation and analysis of potential predictors.

In terms of future steps there is still a substantial degree of exploration which could, and as stated previously, needs to occur. Given the deficits in large scale studies involving this unique group of individuals, further explorations seem crucial. With that said, future studies on the study population selected for this research study should focus on two areas, additional exploration of potential predictors and retention and completion within the post-secondary system.

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Given the limited predictors found in the dataset future studies could investigate K-12 predictors in a few different ways. A first starting point could be to expand the number and types of assessments used in a predictive exploration. Additional assessments in other grades, such as a grade 4 assessment, and additional assessments within the grades used in this study, grade 7 and 12, could be included and further explored. A second area of investigation could explore the differences between the degrees of completed K-12 graduation requirements of non-graduates who pursue post-secondary studies (i.e., how close are they to graduating prior to disappearing?). Finally, an investigation of mobility within the K-12 system could be explored as a predictor, either as mobility in isolation or in relation to the two previously mentioned areas.

The second area for future studies could investigate the retention in and completion of post-secondary studies for this study group. Post-secondary retention could be explored through a mobility analysis of the study population to examine if and how often the study population is changing institutions. Completion studies could examine completion of a credential within the institutionally expected timeframe and/or could be done in conjunction with a mobility analysis.

Regardless of the future study directions stated above the more important issue is that there is still a substantial degree of exploration which needs to occur given the deficits in the literature. Given the impact that studies on this unique group of individuals could have on the entire education system it is critical to pursue further studies in this area.

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Appendices*Appendix 1*

BC K-12 Administrative Data

- encrypted_pen – unique individual study ID
- school_year – K-12 school year
- gender – K-12 gender
- grade_ref_enrol – K-12 grade attributed to the individual
- grade_in_year – K-12 grade for school year
- top_level_organization
- district_long_name – K-12 school district name
- district_number – K-12 school district number
- school_name – K-12 school name
- mincode – K-12 unique school code
- home_lang_code_in_year – K-12 self-declared language spoken in the home
- esl_in_year_flag – K-12 ESL program participation status in the school year (ESL or non-ESL)
- special_need_code_in_year – K-12 special education program participation category in the school year
- special_need_name_in_year
- french_imm_in_year_flag – K-12 French Immersion program participation status in the school year (French Immersion or non-French Immersion)
- offshore_in_year_flag

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Appendix 2

BC K-12 Achievement Data

- encrypted_pen – unique individual study ID
- irt_scale_score – standardized scale score for the FSA post-IRT processing
- school_year – K-12 school year
- district_long_name_del – K-12 school district name where FSA was administered
- district_number_del – K-12 school district number where FSA was administered
- school_name_delivery – K-12 school name where FSA was administered
- mincode_delivery – K-12 unique school code where FSA was administered
- district_long_name_att – K-12 school district name where FSA results were attributed
- district_number_att – K-12 school district number where FSA results were attributed
- school_name_att – K-12 school name where FSA results were attributed
- mincode_att – K-12 unique school code where FSA results were attributed
- fsa_session_date – month and year of FSA administration
- fsa_3_point_scale – FSA achievement grouping for the assessment (below expectations, meets expectations, exceeds expectations)
- fsa_home_lang_group – K-12 self-declared language spoken in the home as indicated on the FSA (English, or French, or other)
- fsa_home_lang_code – K-12 self-declared language spoken in the home as indicated on the FSA (by specific language)
- fsa_esl_flag – K-12 ESL program participation status (ESL or non-ESL) as indicated on the FSA
- fsa_special_need_code – K-12 special education program participation category as indicated on the FSA
- fsa_french_imm_flag – K-12 French Immersion program participation status (French Immersion or non-French Immersion) as indicated on the FSA
- fsa_test_status – participation status on the FSA (test written or registered for test but not written)
- fsa_grade_ed_level
- fsa_grade_level – K-12 grade level of the FSA (grade 4, or 7, or 10)
- fsa_skill_code – FSA assessment type (RE, or WR, or NU)
- fsa_skill_name – FSA assessment type (reading comprehension, writing, or numeracy)
- fsa_excused_flag – FSA excusal status (excused or not excused)
- fsa_lang_of_instruction – FSA administration language (English or French)
- grade_delivery – K-12 grade that the FSA was administered to
- grade_ref_enrol – K-12 grade attributed to the individual on the FSA
- final_course_pct – K-12 final grade as a percent for the K-12 provincially examinable course
- session_date – month and year of the provincial exam
- subject_label – K-12 subject grouping for the provincially examinable courses (ex., language arts)
- course_label – K-12 subject code for the provincially examinable courses (ex., EN 12)

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- `course_description` – K-12 subject description for the provincially examinable courses (ex., English 12)
- `course_grade` – K-12 grade of the provincially examinable courses
- `student_grade` – K-12 grade of the individual that participated in the provincially examinable course
- `language_of_instruction` – administration language for the K-12 provincially examinable course (English or French)

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Appendix 3

BC Public Post-secondary Administrative Data

- encrypted_true_pen – unique individual study ID
- psi_school_year – post-secondary school year
- psi_type – post-secondary institution grouping (college, or institute, or university college & teaching-intensive university, or university)
- psi_code – short post-secondary institutional code (ex., UBC, UVIC, BCIT, etc)
- psi_full_name – full name of the post-secondary institution
- psi_credential_category – post-secondary program grouping by type of credential issued (ex., diploma, certificate, apprenticeship, degree, non, etc.)
- psi_ce_crs_only – post-secondary program status to indicate if individual is only take a continuing education course or developmental course (skills crs only or not skills crs only)
- psi_min_start_date – post-secondary start date at a institution in the specified post-secondary program (year, month, and day)
- psi_entry_status – status of the individual at time of enrolment in a post-secondary institution (ex., entry before grad)
- psi_enrolment_sequence – sequential count of each enrolment at a post-secondary institution across post-secondary school years (i.e., two enrolments at an post-secondary institution in different school years would flag the individual records with a “1” for the first enrolment and a “2” for the second enrolment)

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Appendix 4

Ethics Waiver



University
of Victoria

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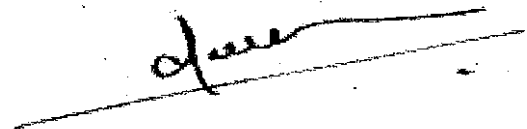
Human Research Ethics Board Certificate of Approval of Waiver

<u>Principal Investigator</u> Brent Munro Master's Student <u>Co-Investigator(s):</u>	<u>Department/School</u> EPLS	<u>Supervisor</u> Dr. John O. Anderson
<u>Project Title:</u> K-12 Non-graduate Success and Pursuing Public Post-secondary Studies		
<u>Protocol No.</u> 10-044	<u>Approval Date</u> 25-Jan-10	<u>Start Date</u>
		<u>Expiry Date</u>

Certification

This certifies that the UVic Human Research Ethics Board has examined this research protocol and concluded that, in all respects, the proposed research meets the appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Participants.

This Certificate of Approval is valid for the above term provided there is no change in the protocol. Extensions and/or amendments may be approved with the submission of a "Request for Annual Renewal or Modification" form.


Dr. Afzal Suleman
Associate Vice-President, Research

10-044 Munro, Brent

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Appendix 5

Results

*Table 3**Non-graduate enrolment (study population)*

Post-Secondary Enrolment Year	BC Non-graduate Post-Secondary Enrolment	Total Post-Secondary Enrolment	BC Non-graduate Enrolment as Percent of Total Post-Secondary Enrolment
2002/2003	3,498	339,183	1.03
2003/2004	2,878	343,373	0.84
2004/2005	2,871	355,107	0.81
2005/2006	3,233	368,005	0.88
2006/2007	3,223	379,832	0.85
2007/2008	3,707	383,983	0.97
Total	19,410	2,169,483	0.89

*Table 4**Non-graduates by K-12 program type*

Post-Secondary Enrolment Year	ESL	Percent of Distinct BC Non-Graduates	French Immersion	Percent of Distinct BC Non-Graduates	Special Education	Percent of Distinct BC Non-Graduates
2002/2003	397	11.35	9	0.26	166	4.75
2003/2004	428	14.87	21	0.73	225	7.82
2004/2005	463	16.13	23	0.80	297	10.34
2005/2006	635	19.64	52	1.61	350	10.83
2006/2007	701	21.75	47	1.46	409	12.69
2007/2008	833	22.47	60	1.62	524	14.14
Total	3,457	17.81	212	1.09	1,971	10.15

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Table 6

Non-graduate K-12 exam participation other courses

Post-Secondary Enrolment Year	Biology 12	Percent of Distinct BC Non-Graduates	Chemistry 12	Percent of Distinct BC Non-Graduates	Physics 12	Percent of Distinct BC Non-Graduates
2002/2003	186	5.32	67	1.92	30	0.86
2003/2004	229	7.96	63	2.19	46	1.60
2004/2005	204	7.11	98	3.41	59	2.06
2005/2006	285	8.82	72	2.23	41	1.27
2006/2007	260	8.07	85	2.64	40	1.24
2007/2008	233	6.29	69	1.86	39	1.05
Total	1,397	7.20	454	2.34	255	1.31

Table 7

Post-secondary institution counts

Post-Secondary School Year	Post-Secondary Institution Category		
	Community College	Institute	Teaching-Intensive University & University College
2002/2003	11	6	5
2003/2004	11	6	5
2004/2005	11	6	5
2005/2006	12	5	6
2006/2007	12	5	5
2007/2008	12	4	5

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Table 8

Post-secondary program enrolment by year

Program Type	Post-Secondary Enrolment Year (Percent of Total Year Enrolment)						Total
	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008	
Apprenticeship	9	11	12	16	19	34	100
None	11	12	14	19	21	23	100
Certificate / Diploma	13	15	16	16	17	23	100
Other	11	15	17	20	19	19	100
Associate / Bachelors Degree	12	15	16	17	16	23	100

Table 9

Descriptive statistics for Grade 7 FSA reading and grade 12 English assessment regression

Descriptive Statistics			
	Mean	Std. Deviation	N
FINAL_COURSE_PCT	56.54	20.287	401
IRT_SCALE_SCORE	-0.151	0.902	401

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Table 10

Grade 7 FSA reading and grade 12 English assessment regression

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
All individuals	.101 ^a	.010	.008	20.208	.010	4.152	1	399	.042

Table 11

Descriptive statistics for regression by gender

Descriptive Statistics				
GENDER		Mean	Std. Deviation	N
F	FINAL_COURSE_PCT	59.62	20.823	184
	IRT_SCALE_SCORE	-0.098	0.766	184
M	FINAL_COURSE_PCT	53.93	19.491	217
	IRT_SCALE_SCORE	-0.196	1.003	217

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Table 12

Grade 7 FSA reading and grade 12 English assessment regressions by gender

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
Female	.235 ^a	0.055	0.05	20.296	0.055	10.615	1	182	0.001
Male	.001 ^a	0	-0.005	19.536	0	0	1	215	0.993

Table 13

Descriptive statistics for regression by FSA home language

Descriptive Statistics					
FSA Home Language		Mean	Std. Deviation	N	
ENGLISH	FINAL_COURSE_PCT	55.86	21.866	279	
	IRT_SCALE_SCORE	-0.085	0.937	279	
NON-ENGLISH	FINAL_COURSE_PCT	58.09	16.08	122	
	IRT_SCALE_SCORE	-0.302	0.799	122	

K-12 NON-GRADUATES AND POST-SECONDARY STUDIES

Table 14

Grade 7 FSA reading and grade 12 English assessment regressions by FSA home language

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
ENGLISH	.099 ^a	0.01	0.006	21.798	0.01	2.752	1	277	0.098
NON-ENGLISH	.141 ^a	0.02	0.012	15.986	0.02	2.423	1	120	0.122

Table 15

Grade 7 FSA reading and grade 12 English assessment correlations by gender

Correlations				
GENDER			IRT_SCALE_SCORE	FINAL_COURSE_PCT
F	IRT_SCALE_SCORE	Pearson Correlation	1	.235**
		Sig. (2-tailed)		.001
		N	184	184
	FINAL_COURSE_PCT	Pearson Correlation	.235**	1
		Sig. (2-tailed)	.001	
		N	184	185
M	IRT_SCALE_SCORE	Pearson Correlation	1	.001
		Sig. (2-tailed)		.993
		N	217	217
	FINAL_COURSE_PCT	Pearson Correlation	.001	1
		Sig. (2-tailed)	.993	
		N	217	217

**. Correlation is significant at the 0.01 level (2-tailed).