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# The Impact of High School Distance e-Learning Experience on Rural Students' University Achievement and Persistence

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## Abstract

The rapid growth of information technologies has influenced the way in which education is delivered and experienced. Little is currently known about the impact of distance education experience at the secondary level of the educational system on subsequent educational pursuits in the post-secondary education system. This research utilized archival data to explore the impact of high school on-line education experience on students' performance and persistence in the first year of university. The results of this analysis suggest that first year university performance and persistence is significantly different for students who have previous experience with on-line education experiences and those who do not.

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## Introduction

The provision of education in geographically remote and dispersed rural communities has long challenged educational policymakers in Canada and around the world. Newfoundland and Labrador, the easternmost province in Canada, is home to approximately 505,000 inhabitants -- about one-half of them residing in settlements that are classified as rural. During the 2006-2007 school year, almost two-thirds of the province's 285 public schools were located in rural areas of the province (Newfoundland and Labrador, 2006; 2007). Interestingly, about one-third of the public schools in the province are designated as *necessarily existent* – they cannot be closed because the distance to travel to the nearest school by bus is too far to be feasible, especially in times of inclement weather. In the past, schools in the most remote areas of the province have experienced difficulty recruiting and retaining qualified teachers with the appropriate subject matter expertise, making it difficult for some rural schools to offer a full range of course options (Crocker & Riggs, 1979; House, 1986; Riggs, 1987; Crocker, 1989). This situation has been exacerbated in recent years. The research discussed here sought to investigate one method that has been employed to address this problem and how that solution – distance e-learning – has impacted subsequent student success and persistence in post-secondary education.

Over the past quarter century, Newfoundland and Labrador has experienced significant urbanization and outmigration as a result of dramatic shifts in the labour market conditions in the resource-based industries on which the province relies (e.g., fisheries, oil). Demographic shifts, along with the population's changing age structure, have reduced the population in many of the geographically dispersed rural communities around the province (Galway & Dibbon, 2008). As a result of the challenges in providing equitable public education opportunities to rural communities, the province has been forced to consider alternative approaches to deliver senior high school courses in small rural schools.

In 1999, the provincial government appointed a ministerial panel to address the issue of alternative educational delivery models in the public school system. The panel recommended that the existing distance education infrastructure be enhanced through the utilization of Internet-based technology to allow for a more sophisticated and advantageous mode of course delivery. In response to the recommendations of the ministerial panel, the Centre for Distance Learning and Innovation (CDLI) was created and charged with the responsibility of delivering Internet-based distance education for the K-12 public school system (Sparkes & Williams, 2000). The use of technology in this context allows rural students from across the province to overcome the educational limitations and confinements of rural living and complete courses delivered by highly qualified teachers. In CDLI's first year of operation it is estimated that approximately 703 rural students took at least one on-line course while in high school (Brown, Sheppard, & Stevens, 2000). Since then, on-line course enrolments have grown significantly. In 2008, there were approximately 1,000 students registered in one or more of the 38 Web-based high school courses offered by CDLI (Rose, Hickey, & Mercer, 2008). As a result, students who graduate from high schools in rural areas of Newfoundland and Labrador now comprise two groups: a) students who complete one or more on-line courses offered through CDLI and b) students who completed their high school education in the traditional, face-to-face classroom context entirely. Despite this growth in distance education course registrations, little is known about how the on-line course experience at the secondary level of the educational system has influenced students' subsequent educational pursuits at the post-secondary level.

A growing population of rural high school graduates in the province have completed a portion of their education in on-line learning environments that differ from the traditional classroom context. These graduates are a minority (less than 15%) of the first year student population at the main campus of the province's university, Memorial University of Newfoundland. While post-secondary student persistence theories have examined the influences of student background characteristics, none have taken into account the role of previous on-line distance course experience on subsequent student outcomes at the post-secondary level.

### *Student Persistence Models*

In post-secondary education research, student persistence commonly refers to students' continuation in a post-secondary program to completion. Researchers in the area often discuss the concept in the converse terms of student discontinuation or withdrawal from studies. Generally, two types of attrition or withdrawal may occur. Involuntary withdrawal occurs when students are compelled to discontinue studies as a result of failure to meet mandatory academic program requirements. In contrast, voluntary withdrawal refers to students' self-imposed withdrawal, which may occur for a variety of reasons that may or may not be related to academic performance. While post-secondary persistence research has been approached from a variety of perspectives, the most prominent contributions are the person-fit theories which have focused on students who drop out, in an effort to determine why they do so and how incidences of student withdrawal might be prevented. Such theories of persistence have examined individual student abilities, motivations, and preferences and the congruence of these with the environmental or institutional context. Generally, person-environment fit theories suggest that when the fit between the person and environment is

poor, performance will be impaired and withdrawal is more likely to occur. Conversely, when the fit is good, performance will be enhanced and the possibility of persistence increases (Strange & Banning, 2001). Spady's (1970; 1971) model of attrition suggested that those students who fail to fully integrate into the culture of the educational institution are more likely to withdraw before completing their studies.

One of the most prominent person-environment fit theories is Tinto's (1992) theory of student departure from higher education. In his seminal work, he proposed that students progress through three stages when they enter post-secondary education: separation, transition and incorporation. The separation stage occurs as students move away from home and their established social networks for the purposes of study. This generally involves separation from past associations and more limited interactions with familiar social networks. The second stage, transition, is a "period of passage between the old and the new, between associations of the past and hoped for associations with communities of the present" (Tinto, 1988, p. 444). Tinto suggested that the degree of difficulty experienced by students in making the transition is dependent on the degree of similarity between the old and the new. As a result of the tension between the familiar and the unfamiliar, it is during this stage that the decision to withdraw or persist is most often contemplated. The final stage, incorporation, occurs when students have adapted to the norms and patterns of behaviour characteristic to their new associations and achieve a sense of belonging as a member of a new group.

Borrowing from occupational and organizational turnover theories, Bean (1980; 1983) and Bean and Metzner's (1985) approach to modeling student attrition emphasized the role played by exogenous background factors such as such as finances and the influence of friends. These models proposed a causal relationship in the decision to withdraw or persist between organizational determinants, such as institutional quality and faculty relations, and student satisfaction and institutional commitment. They theorize that student persistence decisions are based on four primarily sets of factors, including a) background variables, including high school achievement, age, educational goals, and gender; b) academic factors, including study habits, academic advising, absenteeism, and course availability; c) environmental variables such as finances, employment, outside encouragement, and family responsibilities; and d) students' intent to leave, which is influenced by both academic and psychological variables.

Pascarella and Terenzini (2005) observed that there have been several thousand studies in the area of student retention. Over the years, a number of notable studies have sought to account for student persistence and withdrawal behaviour by combining the earlier models put forward by Tinto and Bean (Cabrera, Casteñeda, Nora, & Hengstler, 1992; Cabrera, Nora, & Castaneda, 1993). Swail's (2004) more recently proposed Geometric Model of Student Persistence, which places the primary focus on the student, suggests that student persistence is most probable when social, cognitive and institutional factors are in equilibrium. Regardless of the model, persistence studies have consistently noted that a) the first year of post-secondary studies is a potentially vulnerable time for students and b) academic background characteristics are a key predictor of persistence.

### *Rural vs. Urban Student Persistence*

In Canada and the United States, up to 25% of first year students often fail to proceed to their second year of studies (Grayson & Grayson, 2003; Lukic, Broadbent, & MacLauchlan, 2004). Research evidence suggests that rates of failure and withdrawal may be even higher for students from rural communities (Aylesworth & Bloom, 1976; Looker & Dwyer, 1998; Porter, 2005). This may be because students from rural areas may experience more upheaval and cognitive dissonance during the first year transition period due to pronounced differences between their lives in rural communities and their experiences in the new, larger urban centre. As a result of these and other factors, rural students who re-locate to an urban setting for the purposes of study are more likely

encounter difficulties during the transition period as compared to their urban counterparts.

### *Distance Education*

As Shachar and Neumann (2003) observed, while the origins of distance education can be traced back to the nineteenth century “it has yet to be universally accepted relative to current and well-practiced face-to-face (F2F) programs provided by traditional brick and mortar institutions” (p. 2). One of the most recent incarnations of distance education, on-line learning, makes use of internet-based information and communication technology tools and, to a growing extent, the emerging array of next generation on-line technologies commonly known as Web 2.0. In terms of student achievement outcomes, research on the efficacy of distance education and e-learning applications in distance education have concluded that both distance education and distance e-learning can be an equivalent, or in some instances, a superior alternative to traditional classroom-based educational delivery (Abrami et al., 2006; Bernard et al., 2004; Ryan, 1996; Seifert, Sheppard, & Vaughan, 2008; Shachar & Newman, 2003). However, an extensive meta-analysis conducted by Bernard et al. (2004) has suggested that the positive impacts of distance e-learning on achievement are most attributable to issues of pedagogical effectiveness and efficiency as opposed to the delivery mode or technology used in delivery.

According to Boyd (2004), the characteristics of students who enroll and successfully complete distance education courses may be categorized as environmental, technical, and personal or learning oriented. Environmental factors include timing and scheduling, as well as competing family or work responsibilities, while technical characteristics include computer skill and internet savvy. Some of the most common personal or psychological based characteristics associated with distance education enrolment and successful completion are motivation, attribution, self-regulation, internal locus of control, preference for autonomy and self-efficacy (Wang, Peng, Huang, Hou, & Wang, 2008). Despite recent growth in technology-based distance education research, most research in this area has focused on establishing the viability of distance education and the parameters of the technology. Much less attention has been directed toward studying the student experience and how such experience is affected by variables such as the post-secondary transition process (Bereiter, 2003; Bernard, Yiping, & Abrami, 2002; Garrison & Anderson, 2003). A number of earlier studies have examined student persistence in e-learning courses in the context of on-line courses amongst adult and/or university populations, and have sometimes compared the persistence decisions of e-learners with those of students taking courses in the traditional classroom setting (Diaz, 2002; Levy, 2007; Seifert, Sheppard, & Vaughan, 2008); however, unlike previous research, this research study was designed to explore how distance e-learning experience at the secondary level impacted student success at the post-secondary level. The authors were unable to identify a single study that examined the impact of e-learning in secondary school on achievement at the post-secondary level. If, as some have argued, distance education is equivalent to traditional, face-to-face educational contexts, then one would expect to find little difference between the post-secondary achievement and persistence of students who have taken distance education courses and those who have not. Conversely, differences between the achievement and persistence of these two groups would suggest that the students have distinct experiences or characteristics that play an influential role in their first year university outcomes.

### **Methodology**

This article addresses the following research questions:

- Do rural students who have previous on-line distance education experience differ from rural students who do not with regard to high school achievement and overall first year university achievement?
- Is there a relationship between high school achievement and on-line distance education

experience, and do these variables predict first year university achievement and subsequent withdrawal behaviour?

To assess the impact of high school distance e-learning experience on first year university achievement and persistence, this study utilized extant, archival student data. Assessment and administrative records for high school students who graduated from high school in 2003, 2004 and 2005 were provided by the provincial Department of Education. Students from rural areas of the province (i.e., settlements with a population of fewer than 5,000 residents) were identified from postal code address information. These student records also indicated if students had enrolled in distance e-learning courses in high school. The high school administration files were merged with administrative and academic files provided by the Registrar's Office at Memorial University of Newfoundland. These university files contained records for students who enrolled in their first year of university in the fall semester immediately following high school graduation in the 2003-04, 2004-05 and 2005-06 academic years. The student files for these three years were combined after a preliminary analysis confirmed that there was no significant differences between the academic performance of students in the 2003, 2004 and 2005 cohorts and, hence, the feasibility of combining the cohorts.

### *Research Sample*

The database of merged high school- and university-level student records consisted of a census sample of 2,515 first year rural university students enrolled during the 2003-04 through 2005-06 academic years.<sup>1</sup> The student information included in the records included demographic information (such as gender), address, high school cumulative average, and first year university grade point averages (GPAs) for the fall and winter semesters completed after the students' initial enrolment. For the purpose of analysis, the student files in the database were categorized into two groups: a) rural students who had completed their high school education entirely in the traditional face-to-face classroom context; and b) rural students who had completed one or more distance e-learning courses in high school. Of the total of 428 students had completed one or more high school distance e-learning courses, 321 were female and 139 were male. The remaining 2,087 students completed the entire high school program in the traditional face-to-face classroom context. A total of 1,330 of these students were female and 704 male. Upon graduation from high school, students who had completed one or more high school distance e-learning courses had an average course grade of 79.98% while those who did not have this experience had an average high school grade of 77.08%. The average GPA after two semesters of university was 2.54 for the students who completed the high school distance courses compared to an average of 2.33 for students in the comparator group.

### *Analysis*

Structural equation modeling was used to examine if enrolment in high school distance e-learning courses had any effect on students' subsequent academic performance and persistence in their first year of university. For the purposes of these analyses, student withdrawal from university studies was operationalized as one of two types: voluntary withdrawal and involuntary withdrawal.

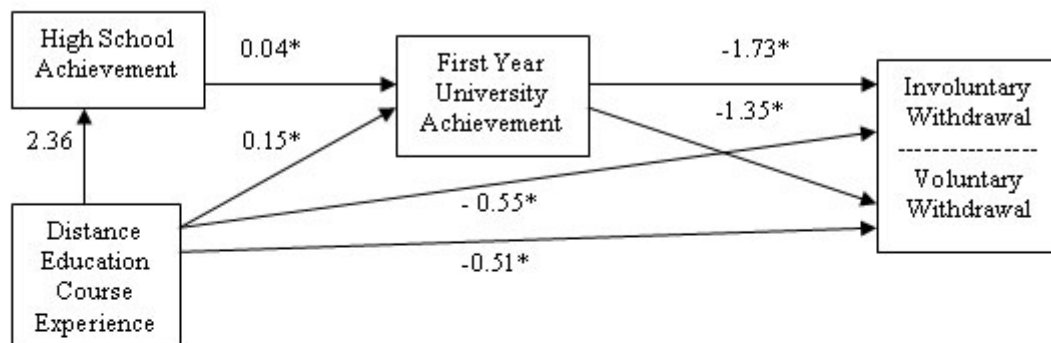
All of the statistical analyses were carried out using the SPSS and MPLUS statistical software packages.

### **Study Findings**

Two structural equation models were constructed to assess the relationship between on-line distance education experience and overall first year achievement and persistence behaviour. An unconstrained model, Model A illustrated in Figure 1, was compared to a constrained model,

Model B. The unstandardized path coefficients for each model have been included in Figure 1. In the constrained model, the paths from on-line distance education experience to high school achievement (average grade), first year university achievement (grade point average) and first year university outcome (involuntary or voluntary withdrawal) were set to be zero.

**Model A: Baseline**



**Model B: Constrained**

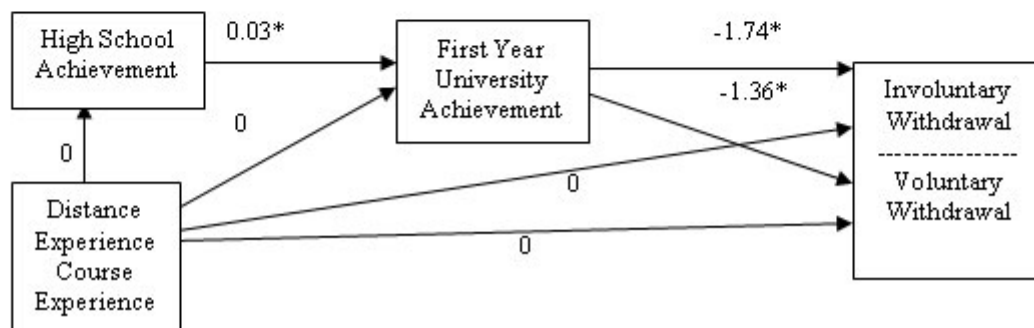


Figure 1. Baseline model (Model A) and constrained model (Model B) for the effect of on-line distance education experience on first year student achievement and withdrawal.

For the baseline model, there was no significant effect of on-line distance education experience on high school achievement, suggesting no significant difference between the two groups in this regard. However, there was a significant effect of on-line distance education experience on first year university achievement and both first year voluntary and involuntary attrition.

Comparison of the likelihood functions and fit indices of the baseline model to the constrained model also confirmed the significant effect of on-line distance education experience on academic achievement and withdrawal behaviour in the first year of university studies. More specifically, the log-likelihood was lower for the constrained model (-9020.91) than the baseline model respectively (-8892.03). Similarly, the Akaike information criteria (AIC) and Bayesian information criteria (BIC) for the baseline model (AIC = 17810.06, BIC = 17880.82) were lower than that produced for the constrained model (AIC = 18059.83, BIC = 18108.81). The chi-square test of model fit for the unconstrained and constrained models ( $\chi^2 = 257.76$ ,  $df = 4$ ) was significant at .05, indicating that the constrained model was not equivalent to the unconstrained model. Overall, when on-line distance education experience was included as a predictor of achievement and withdrawal, the model fit the data better. This suggests that on-line distance education experience had a significant effect of subsequent student achievement and persistence behaviour in university.

A comparison of the probability of voluntary or involuntary withdrawal from university for distance education and non-distance education students is presented graphically in Figure 2. As

Figure 2 illustrates, the probability of persisting in the first-year of university was greater for those students who completed on-line distance education courses in high school. Figure 2 also shows that the probability of both voluntary and involuntary withdrawal was lower for students who completed the high school distance education courses.

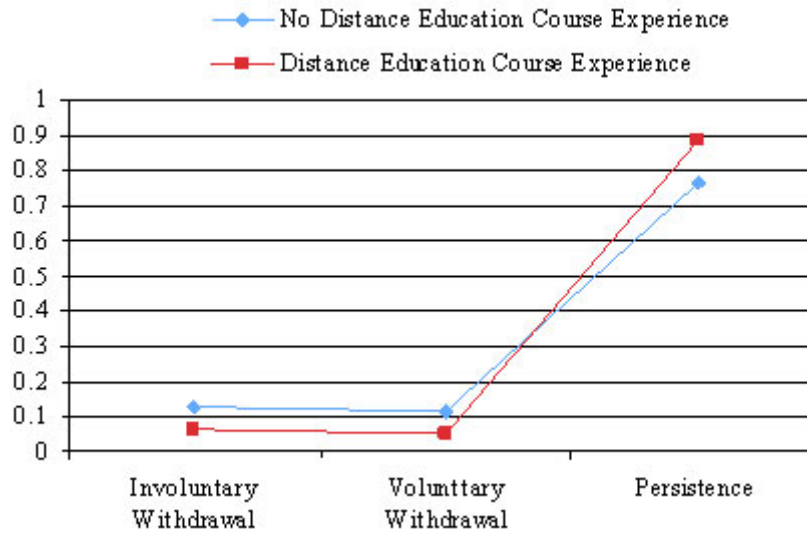


Figure 2. Probability of first year outcomes by distance education course experience

To examine the impact of academic achievement on students' enrolment status after two semesters, the probability of voluntary withdrawal and involuntary withdrawal were computed as a function of first year GPA using log-likelihood estimates. As is illustrated in Figures 3 and 4 students who performed better academically were more likely to persist in university.

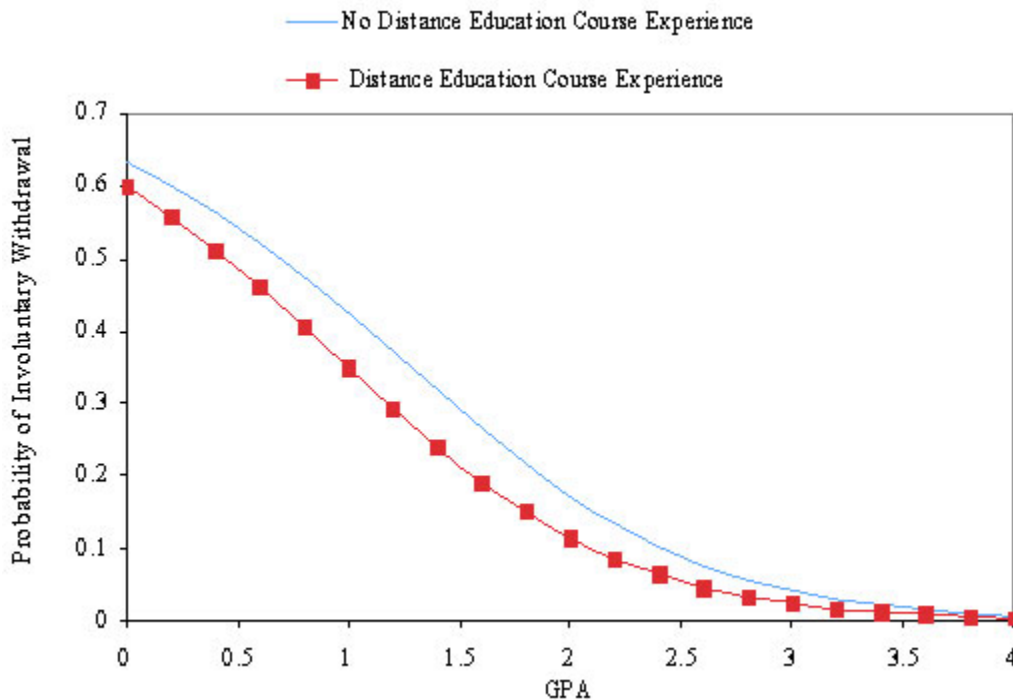
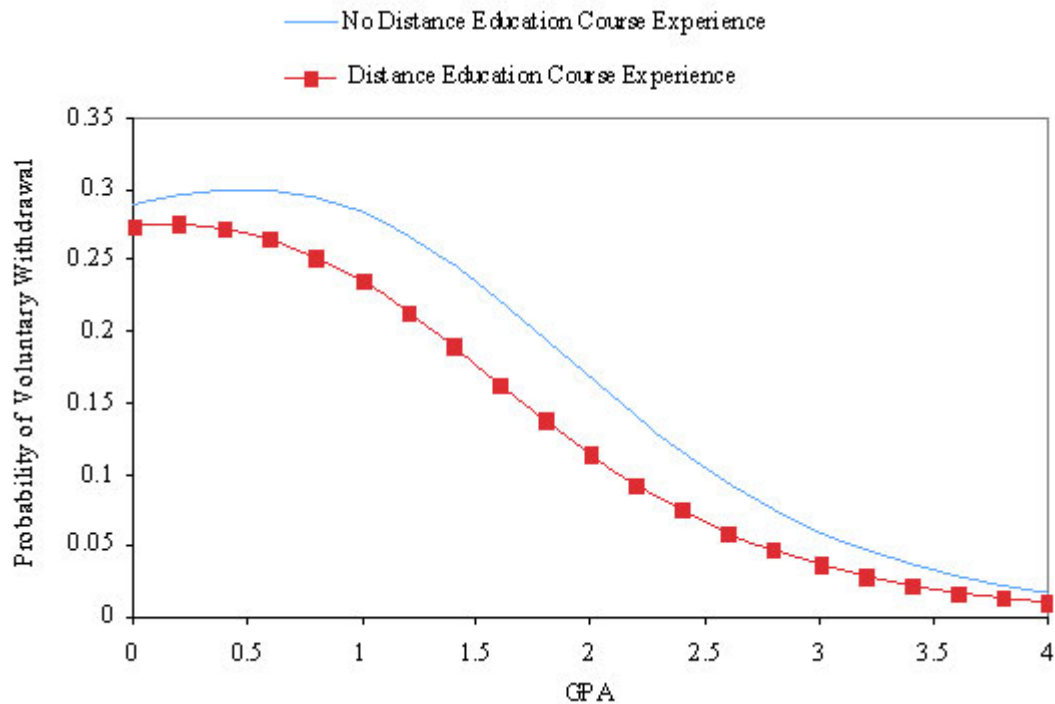


Figure 3. Probability of involuntary withdrawal as a function of grade point average by distance education course experience



*Figure 4.* Probability of voluntary withdrawal as a function of grade point average by distance education course experience

There was also a statistically detectable effect of on-line distance education experience on both involuntary and voluntary attrition respectively, as represented by the separation in lines. The students with high school distance education experience were less likely to discontinue their university studies both voluntarily ( $b = -0.550, p < .05$ ) and involuntarily ( $b = -0.513, p < .05$ ). In other words, students with high school distance education experience were more likely to persist and enrol in a second year of university studies.

## Discussion

The changing population structure and migration patterns within Newfoundland and Labrador has created unique challenges related to the issue of rural schooling generally and the delivery of the high school curriculum more particularly. In response to the declining student population and teacher supply in rural communities, since its inception in 2000-01, the Centre for Distance Learning and Innovation has sought to provide equitable access to high school courses in a manner that renders distance transparent (Rose, Hickey, & Mercer, 2008). By making on-line courses available to high school students, the Centre has been successful in providing students in rural and remote areas of in Newfoundland and Labrador with a greater diversity of course options, thus helping to level the playing field for rural students who wish to complete courses that are required for high school graduation and admission to programs at post-secondary institutions. While the provision of on-line high school courses is an innovative and viable solution to rural schooling challenges, it has also significantly transformed the school experience for many rural students. As a result, it is reasonable to question if on-line education experiences in high school have a positive or negative impact on students' subsequent educational experiences at the post-secondary level. The analysis described in this paper sought to answer this question by comparing the first year university achievement and persistence of students who completed on-line courses in high school with those who did not. As the results of our structural equation modelling shows, the effect of on-line distance education experience on student persistence and academic achievement was statistically significant in a direction favouring distance education experience. Students with distance education experience were more likely to persist in university after their initial year in



comparison to those with no on-line distance education experience, who were more likely to leave. Students with distance education experience also performed better academically.

Models of student persistence have consistently highlighted the importance of students' past academic achievements to their post-secondary persistence and success (Bean & Metzner, 1985; Cabrera, Nora, & Casteñeda, 1993; Tinto, 1987). Astin (1986) suggested that "the most 'dropout prone' freshmen are those with poor academic records in high school, low aspirations [and] poor study habits" (p. 45). Ramist (1981) argued that student motivation should be considered the *sine qua non* of persistence in post-secondary and, therefore, the most important factor in persistence research. Because the model used in the current study does not account for student motivation, it is not possible to conclude whether or not the academic achievement and persistence of the students under study was due to motivation or other related factors. However, while the current study found no significant difference between distance and non-distance students with regard to their high school achievement, it is plausible that the students who completed high school distance education courses were more motivated to achieve and persist at university. This is consistent with earlier research which suggests that high school students who participate in on-line courses are often more highly motivated, self-disciplined and independent (Barbour & Reeves, 2009). It may also be possible that the experience of completing on-line distance education courses in high school prepared students for a more independent approach to learning. This aspect of the distance education course experience – asynchronous, independently motivated study – is consistent with the study skills that many students need to succeed in the university environment. Students with distance education experience may be more self-regulated learners and able to work more independently to meet the requirements of university or to ascertain what is needed in situations where improvement is required.

Tinto (1987) noted that many students face difficulty in making the transition from high school to the post-secondary setting when they must move away from their families and established social networks to attend a post-secondary institution. This separation from communities of the past, which can be both psychological and physical, cuts students off from their established social support networks and norms, culture, practices and habits. Tinto suggested that the degree of difficulty experienced in making the transition is highly dependent on an individual's ability to adjust to a new life in a new environment, and to integrate into the culture of a new group. These observations were made well in advance of the technological advances which now permit us to surpass the traditional boundaries of time and space to connect with others in a way that was unheard of 20 years ago. While the study outlined in this paper did not examine students' use of communications technology in their first year of university, there is a possibility that student who complete on-line courses in high school experience may, as a result of the course experience or otherwise, be more familiar with the communication technologies that allow them to maintain a connection between their old and new lives. If these students are more comfortable with using computer technology and other communication tools, it is conceivable that they could more easily keep in touch with their friends and family. These sustained social and family connections could provide these students with enhanced social support, ease the difficulties of separation, and make the transition to and continuation in post-secondary studies less onerous.

With the continued growth of on-line education in high school, educators may struggle with the question of whether virtual schooling is a suitable alternative to the traditional approach to teaching and learning or whether this model of secondary education disadvantages some students by leaving them poorly prepared for further education. Overall, our findings indicate that students who completed one or more on-line distance education courses during high school were somewhat more successful in their first year of university as compared to students who completed no high school distance education courses. Perhaps more importantly, these results provide support for the provision of on-line education in high school as an alternative to the traditional face-to-face classroom format. While further studies in this area are warranted, there may be reason to believe

that on-line distance education experience in high school is beneficial to students who are making the transition to post-secondary studies.

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## Notes

1. A proportion of the student files were not included in analysis as they had incomplete information on key variables.

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