Trajectories of Educational Aspirations Through High School and Beyond: A Gendered Phenomenon?

Jennifer D. Shapka
University of British Columbia

Jose F. Domene
University of New Brunswick

Daniel P. Keating
University of Michigan

Abstract

Growth curve modeling was utilized to examine change in the educational aspirations of adolescents from early high school through to three years beyond high school, as a function of gender and other adolescent characteristics. Significant gender effects were found for level of education aspired to, rate of growth, and degree of acceleration: boys' aspirations were lower in early high school, accelerated at a faster pace to peak above girls' aspirations by the end of high school, and dropped more steeply so that, by the post-high school period, educational aspirations were equivalent across genders. Gender also interacted with Grade 9 achievement in determining educational trajectories. Finally, the perception that one faces barriers in educational attainment was found to significantly influence rate of growth and acceleration, indicating that change in aspirations over time differs between people who see barriers to their education and people who do not, independently of gender. Implications of these results for promoting students' educational aspirations are discussed.

Keywords: Gender, high school, educational aspirations

CANADIAN JOURNAL OF EDUCATION 35, 1 (2012): 239-258

Résumé

La modélisation des courbes de croissance a été utilisée pour examiner les changements dans les ambitions scolaires des adolescents à l'école secondaire et jusqu'à trois ans au-delà de l'école secondaire, en fonction du sexe et d'autres caractéristiques des adolescents. D'importantes différences selon le sexe ont été observées concernant le niveau d'éducation auquel les adolescents aspiraient, le taux de croissance, et le degré d'accélération: la courbe représentant les ambitions des garçons était plus basse au début de l'école secondaire, augmentait ensuite à un rythme plus rapide jusqu'à atteindre un pic au-dessus de la courbe des filles pour la période de la fin de l'école secondaire, et chutait enfin plus fortement de telle sorte que les deux courbes se retrouvaient au même niveau dans la période post-secondaire. Le genre a également interagi avec la réussite en neuvième année en déterminant des trajectoires éducatives. Enfin, la perception d'être confronté à des barrières entravant la réussite scolaire s'est révélée être un facteur qui influence de manière significative le taux de croissance et d'accélération, ce qui indique que le changement dans les ambitions scolaires au fil du temps diffère entre ceux qui perçoivent des obstacles au cours de leur scolarité et ceux qui n'en perçoivent pas, indépendamment de leur sexe. Les implications de ces résultats pour promouvoir les ambitions scolaires des élèves sont discutées.

Mots-clés: Genre, école secondaire, aspirations scolaires

Trajectories of Educational Aspirations Through High School and Beyond: A Gendered Phenomenon?

As one aspect of educational engagement (Suh & Suh, 2006), educational aspirations have been found to be one of the most significant predictors of actual educational and career educational attainment for young people (Garg, Melanson, & Levin, 2007; Mau & Biksos, 2000). More specifically, theory and empirical evidence converge to indicate that level of educational aspiration is predictive of persistence in schooling (e.g., Bui, 2007; Lent, Brown, & Hackett, 1994; Tinto, 1993); academic motivation (e.g., Domene, Socholotiuk, & Woitowicz, 2011); subsequent educational attainment (e.g., Anders, Adamuti-Trache, Yoon, Pidgeon, & Thomsen, 2007; Wigfield & Eccles, 2000); and eventual occupational outcomes (e.g., Eccles, 2009; Klerman & Karoly, 1995; Schoon & Parsons, 2002). Extant work has also shown that educational aspirations differ according to ethnicity (Chang, Chen, Greenberger, Dooley, & Heckhausen 2006; Strand & Winston, 2008; Uwah, McMahon, & Furlow, 2008), socio-economic status (Edgerton, Peter, & Roberts, 2008; Marjoribanks, 2003), and family composition (e.g., single-parent homes; Garg, Melanson, Levin, 2007). In attempting to identify factors that influence the development of educational aspirations, research has also explored how other aspects of educational engagement predict school outcomes. For example, in a recent longitudinal study, Wang and Eccles (2011) demonstrated that drops in school participation, sense of school belonging, and self-regulated learning were linked to drops in educational aspirations. Personality factors, such as self-esteem and self-concept (Garg, Melanson, & Levin, 2007; Uwah, McMahon, & Furlow, 2008) have also been shown to influence educational aspirations.

In addition, there is reason to believe that the developmental course of educational aspirations is a gendered phenomenon (Evans, 2009; Shapka, Domene, & Keating, 2008). Eccles has proposed that the subjective task value of a particular achievement-related choice may differ by gender (e.g., Eccles, 1994; Eccles, 2005; Eccles et al., 1983; Wigfield & Eccles, 1992, 2000); that is, evaluating the costs and benefits of pursuing a particular educational goal may involve weighing very different things for girls than for boys. Some support for this possibility is provided in Bank's (1995) study of university students' explanations for pursuing a bachelor's degree, which revealed that female students were more likely than male students to provide internal reasons (e.g. desire for self-fulfillment), and less likely to provide explanations based on luck or circumstances. Existing research on gender differences in high school students' levels of educational aspiration have provided a mixed picture, with some studies indicating that boys have higher educational aspirations (e.g., Inoue, 1999; Mendez & Crawford, 2002; Wilson & Wilson, 1992), some studies indicating that girls have higher educational aspirations (Mahaffy & Ward, 2002; Mau, 1995; Mau & Bikos, 2000), and others finding no significant gender differences (e.g., Garg, Kauppi, Lewko & Urajnik, 2002).

One potential resolution to these seemingly contradictory findings is the possibility that the aspiration levels of male and female adolescents have distinct trajectories over time, such that boys will have higher aspirations at some ages, while girls will have higher aspirations at other ages (e.g., Shapka, Domene, & Keating 2006; Shapka et al., 2008). Andres, Adamute-Trach, Yoon, and Pidgeon (2007) have shown that there are between-gender changes in the level of education that is aspired to over time. These authors, however, did not formally analyze the nature of this change, which is the purpose of the current paper. More specifically, we intend to explore educational expectations longitudinally, using growth curve modeling techniques, which will enable us to examine changes in educational aspirations as a function of gender. In order to

design strategies to promote the educational aspirations of students, it is important to understand individual differences in the trajectory of educational aspirations over time and the factors that are systematically associated with this variation.

To fully understand the influence of gender on students' educational aspirations, it is also important to examine the ways that it may interact with other factors in shaping the educational aspiration trajectories of students. For example, parents' level of education has been found to be significantly related to adolescent educational aspirations (Kirk, Lewis-Moss, Nilsen, & Colvin, 2011; Kerpelman, Eryigit, & Stephens, 2008; McWhirter, Larson, & Daniels, 1996), and appears to have differing influences depending upon the gender of the student (Andres, Adamuti-Trache, Yoon, & Pidgeon, 2007; Evans, 2009; Carpenter & Western, 1982). Therefore, it appears reasonable to explore the possibility that gender and parental education interact in influencing the trajectory of educational aspirations through adolescence. Similarly, there is empirical evidence indicating that, in terms of influencing aspirations, gender may also interact with self-concept within academic domains (Garg, Melanson, & Levin, 2007; Jacobs & Eccles, 1992; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Marsh, 1989; Marsh & Yeung, 1998), prior academic achievement (Bui, 2007; Garg et al., 2002; Marsh & Yeung, 1998; Strand & Winston, 2008), and the perception of barriers to attaining one's educational goals (Metz, Fouad, & Ihle-Helledy, 2009; Ojeda & Flores, 2008). As a result, the growth curve models generated in this study allowed for the inclusion of each of these constructs.

A majority of the previous research on the longitudinal course of educational aspirations has utilized repeated measures analysis of variance, or single-level multi-variate regression techniques. This is problematic because to do so is to assume that there are no significant differences between individuals within each gender grouping in the way that aspirations change over time (Cohen, Cohen, West, & Aiken, 2003). Experience in the classroom indicates that such an assumption is erroneous: within each gender, some students' educational aspirations change frequently in the years between entering and exiting high school, while other students' aspirations remain relatively stable. Incorporating this individual variation into models of the development of educational aspirations will yield a more accurate understanding of the phenomenon. The present study accomplishes this by employing growth curve modeling to examine the trajectories of educational aspiration from early high school through to post-secondary school years. By paying particular attention to the effects of gender and gender interactions in this process, the study will also address the issue of whether boys and girls are equivalent in the ways that their aspirations change over time, or if educators seeking to promote students' interest in obtaining further education need to tailor their plans according to gender or the combination of gender and other student characteristics.

Method

Participants and Procedures

Participants for the present study were drawn from an ongoing longitudinal study involving multiple cohorts of students from two demographically similar public high schools (Grades 9–13) located in a small city in Ontario, Canada. Data for this study were drawn from three waves of self-report data, as well as yearly data from high school student records. More specifically, this study incorporated self-report measures of attitudes that were collected when participants were at the beginning stage of their high school careers, in Grades 9, 10, or 11 (Time 1), again two years later when participants were in the latter stages of high school (Time 2), and finally, when participants were one-to-three years beyond secondary schooling (Time 3).

The first two waves of data for this study (when participants were still in high school) were collected in the spring, using a questionnaire that was group-administered to students during their first period class, separately for each school. The questionnaire included questions and measures aimed at identifying motivational and personality factors deemed to impact adolescent achievement. Prior to completing the questionnaire, students were required to fill out a consent form in which they provided their name and signature, confirming their agreement to participate. Less than 2% of the students chose not to participate in the study.

Participants for the third wave were selected from those individuals who were involved at both Time 1 and Time 2. To be selected for participation for the third wave of the project, participants need to have indicated on either their Time 1 or Time 2 consent form that they would be willing to be contacted in the future for further data collection. Data collection involved contacting these individuals via telephone, to establish their interest in continuing to participate in the study. Of the 322 participants who gave permission, 264 were successfully contacted via telephone, and all but one agreed to continue involvement with the project. A self-report questionnaire was mailed to these individuals, with a stamped and addressed envelope for participants to mail the completed questionnaire back. To increase response rates, participants were also provided with the option to complete the questionnaire on the Internet, via a password-protected web site. Participants logged onto the website using a unique username and password (access information had been provided to participants as part of the information in the package that had been mailed to them). In another initiative to increase response rates, participants were given a 1-in-20 chance of winning $200 if they completed the questionnaire by a certain date (winners were determined after the data had been collected). It should be noted that extensive analyses has been done elsewhere to identify whether any attrition biases existed with this sample. It was found that the remaining group (n=217) had higher initial levels of achievement than the initial, within high school sample (n=625), but this did not differ as a function of gender or any other demographic variable in the study (Shapka, 2009). The final longitudinal sample included 217 participants: 130 females and 87 males.

Measures

The principle outcome variable in this study was each student's level of educational aspiration, as it changed over the course of the study (*Educational Aspiration*). At each wave of data collection, students were asked identify the highest level of education that they expected to obtain. The responses were coded on a four-point scale consisting of 1 = high school diploma, 2 = community college diploma/certificate, 3 = university degree, and 4 = graduate or professional degree. Using data from all three waves of the study, a trajectory was created for each participant, tracking how his or her educational aspirations changed over the course of high school and post-secondary. Table 1 documents the average levels of educational aspiration for the entire sample, over each time period.

Table 1.
Mean Levels of Educational Aspiration for All Participants Across each Wave of the Study.

Wave	*M*	*SD*	*n*
Time 1	3.0	.53	192
Time 2	3.2	.74	212
Time 3	3.1	.78	212

To examine the interplay between gender and other variables of interest on students' educational trajectories, a number of grouping variables were created for the conditional growth models, including participants' Gender, Parental Education, Intellectual Self-concept, Early Achievement, Perception of Barriers, and Grade. *Parental Education* was used to examine the influence of parents' level of education on their child's aspirations. This variable was created from participants' reports of their parents' education levels using the same four-point scale as the outcome variable. For each participant, maternal and paternal education levels at Time 1 and Time 2 were averaged to create a single score summarizing the overall education level of both parents. Level of self-concept for academic-related tasks (*Intellectual Self-concept*) was measured using the "intellectual ability" subscale of the Harter Self-Perception Profile for College Students, and scored in accordance with the Harter's (1988) manual for scoring. The influence of early high school educational achievement on subsequent educational plans was examined via participants' grade point average for their Grade 9 school year (*Early Achievement*). These scores were created by averaging each student's marks in Grade 9, as reported in official school records. *Perception of Barriers*, a measure of whether participants believed that there were barriers to their educational aspirations, was assessed by asking them indicate (yes or no) if there was anything that might interfere with attaining the highest level of education that they hoped to achieve, at Time 1. Finally, the grade that each participant was in at Time 1 was made available for inclusion in the models, to account for potential cohort effects. Descriptive statistics for these variables can be found in Table 2.

Table 2.
Descriptive Statistics for Grouping Variables and Covariate.

Variable	*M*	*SD*	*n*
Parental Education	2.89	.89	217
Intellectual Self-Concept	3.06	.75	199
Early Achievement	77.07	8.93	217
Gender	–	–	
Female			130
Male			87
Perception of Barriers	–	–	
Yes			94
No			100
Grade	–	–	
9			93
10			80
11			44

Analytic Technique

Hierarchical linear modelling techniques were used to estimate the growth curves of the level of education that was apired to over time. All modelling was performed using HLM 5 (Raudenbush, Bryk, Cheong, & Congdon, 2001), with estimates performed using restricted maximum likelihood methods. All non-dichotomous variables were grand-centered in the models. The level 1 (within-person) factors included, Time, Time squared (to account for non-linearity in the trajectories), and the outcome variable, Educational Aspiration. The level 2 (between-person) variables included all of grouping variables (Gender, Parental Education, Intellectual Self-concept, Early Achievement, Perception of Barriers), and participants' grade levels entered as a co-variate.

Results

Educational Aspiration Trajectories

Prior to examining differences in the educational aspirations of specific groups of students, it is necessary to determine whether sufficient between- and within-person variance to warrant such analysis exists, and to identify the general shape of the educational aspiration trajectories across all participants and time points. The null model indicates the presence of significant variation in the average levels of Educational Aspiration, $t(169) = 76.85$, $p < .001$, variation which may be accounted for by differences among students. As can be seen from the variance components (Table 3), the total unexplained variance is 47%, with 18% (32% of total variance) unexplained at the between-person level, and 29% (62% of total variance) at the within-person level.

Table 3.
Variance Components Analysis for Null, Unconditional, and Conditional Growth Models.

	Between-Person Variance		Within-Person Variance	
Effect	Tau	Percent Reduction	Sigma squared	Percent Reduction
Null Model	.18	–	.29	–
Unconditional Growth Model	.14	22%	.22	28%
Gender Growth Model	.16	0%	.21	5%
Main Effects* Growth Model	.11	31%	.20	5%
Main and Early Achievement X Gender Interaction Effects Growth Model	.10	9%	.19	5%

* Gender, Parental Education, Early Achievement, Intellectual Self-concept, and Perception of Barriers

Next, the question of what shape best reflects the trajectories of students' educational aspirations was addressed by testing whether linear of curvilinear trajectories, and whether fixed or randomly varying growth over time best fitted the data. The best-fitting growth model was one that included both a linear and quadratic component, with both of these factors permitted to vary randomly. The equation expressing this particular unconditional growth model was:

$$\text{Level 1:} \quad Y_{it} = \beta_0 + \beta_1(\text{Time}) + \beta_2(\text{Time}^2) + r$$
$$\text{Level 2:} \quad \beta_0 = \gamma_0$$
$$\beta_1 = \gamma_1 + u_1$$
$$\beta_2 = \gamma_2 + u_2$$

where Y is the expected education score for each participant *i* at time *t*; *Time* is the wave of data collection, with 1 = early high school, 2 = late high school, and 3 = post high school; $Time^2$ is the quadratic form of time; β_0 is the within-person intercept; β_1 is the within-persons slope for Time; β_2 is the within-persons slope for Time squared; γ is the between-persons intercept corresponding to the matching β component; and u is represents the random variation corresponding to the matching β component.

The parameter estimates for this model are presented in Table 4, with the fact that parameter co-efficients are positive for the Time variable and negative for Time squared suggesting that the average shape of the Educational Aspiration trajectory for students in general is an inverted U-shaped curve. Furthermore, as can be seen from the "Unconditional Growth Model" section of Table 3, the growth variables explained a total of 11% of overall variance and explained 28 and 17% of within- and between-person variance, respectively. While this pattern of results holds for students in general, it is quite possible that educational aspirations grow in different ways for different kinds of people.

Table 4.
Parameter Estimates for the Unconditional Growth Curve Model.

Predictor	Coefficient	*SE*	*t*-ratio	*df*
Intercept	2.63***	.16	16.56	490
Time	.51**	.19	2.69	169
Time Squared	-.11*	.05	-2.43	169

*p<.05, ** p<.01, *** p<.001

Effects of Gender

Results to this point show that there is significant change in the level of education that students aspire to between the early high school and post-high school years, and that the rate of change decelerates as students transition out of high school. Furthermore, the presence of large amounts of unexplained variance for even the unconditional growth model suggests the existence of important individual variation in both the rates at which educational aspirations grow and the rates of deceleration in growth over time; that is, it may be sub-optimal to speak of students "in general." Instead, it may be preferable to examine educational aspiration trajectories as a

function of students' gender and other salient characteristics. Prior to testing these conditional growth models, it was necessary to control for possible cohort effects by introducing students' grade-level at Time 1 into the model. The analysis yielded no significant effects associated with this variable or alterations to the pattern of results. Therefore, to preserve power, it was excluded from the model in all subsequent analyses.

When gender was entered into the model, it was a significant factor in terms of the intercept, as well as Time and Time squared (see Table 5). This suggests that the starting point, slope, and curvature of the trajectories all differed as a function of gender. Average educational aspiration trajectories, separated by gender, are presented in Figure 1. It appears that the inverted U-shape of the initial educational aspirations curve is primarily due to the trajectories of the male participants, who, on average, have aspirations that increase sharply from Time 1 to Time 2 and decreased almost as steeply from Time 2 to Time 3. In contrast, the trajectory for the average female participant was a shallow, relatively linear, slope increasing from Time 1 to Time 3. Next, to examine the effects of the remaining variables of interest on educational trajectories, Parental Education, Intellectual Self-concept, Early Achievement, and Perception of Barriers were simultanously entered into the equation. This full "main effects" growth model yielded the results found in Table 6. Together, these variables explained 31% of between-person variance (see Table 3). Perception of Barriers was the only additional variable on which participants varied significantly, although slope term for Early Achievement approached significance ($p <$ .07). It is also interesting to note that gender remains a significant factor, even when all the other variables were introduced into the model.

Table 5.
Parameter Estimates for the Gender Growth Curve Model.

Predictor	Coefficient	*SE*	t-ratio	*df*
Intercept				
Gender	.84***	.30	2.79	487
Time				
Gender	-.84*	.36	-2.36	168
Time Squared				
Gender	.20*	.09	2.23	168

*p<.05, ** p<.01, *** p<.001

Table 6.
Parameter Estimates for the Main Effects Growth Curve Model.

	Estimation of Fixed Effects			
Predictor	Coefficient	*SE*	t-ratio	*df*
Intercept				
Gender	.79**	.30	2.68	475
Parental Education	.30	.19	1.63	475
Intellectual Self-concept	-.29	.28	-1.01	475
Early Achievement	-.02	.01	-1.22	475
Perception of Barriers	.79	.46	.31	475
Time				
Gender	-.77*	.09	-2.19	164
Parental Education	-.25	.22	-1.13	164
Intellectual Self-concept	.49	.34	1.42	164
Early Achievement	.04	.02	1.84	164
Perception of Barriers	-.71*	.37	-1.93	164
Time Squared				
Gender	.17*	.09	1.97	164
Parental Education	.07	.05	1.27	164
Intellectual Self-concept	-.12	.09	-1.43	164
Early Achievement	-.01	.01	-1.39	164
Perception of Barriers	.18*	.09	2.01	164

*p<.05, ** p<.01, *** p<.001

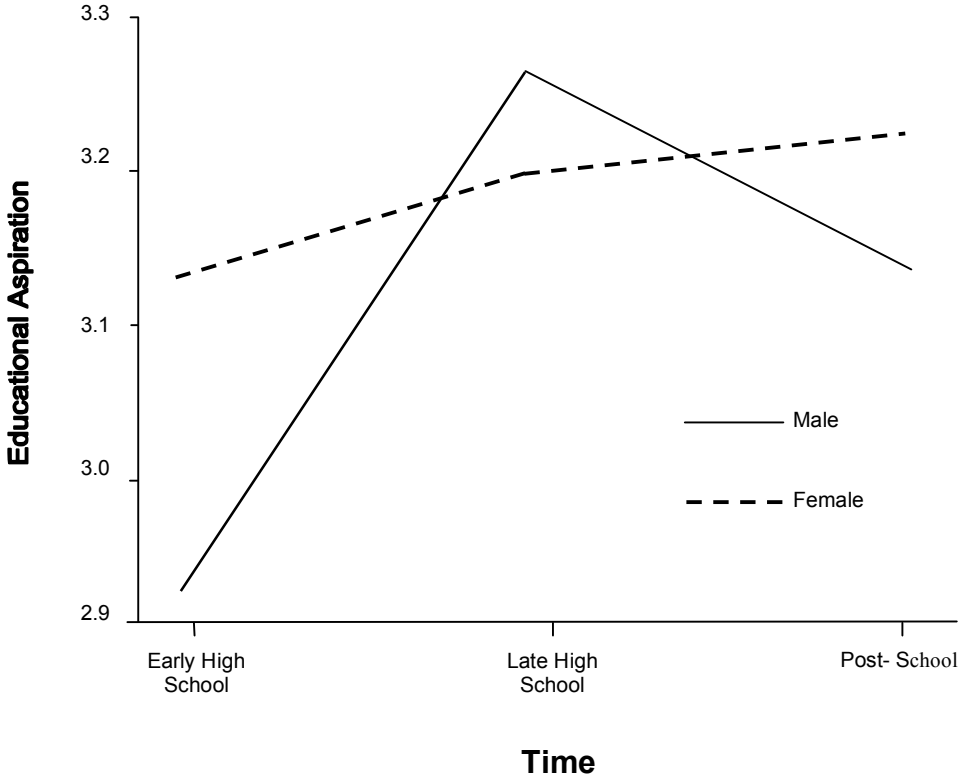

Figure 1. Level of Educational Aspiration as a function of time and gender.

Given the significance of Perceived Barriers, we decided to examine the effects of this variable in greater detail. The slope and curvature of the educational aspiration trajectories both differed significantly according to whether or not students reported perceiving any barriers to their educational goals. Graphing the educational trajectories of students who perceived barriers and students who did not perceive barriers separately (Figure 2) clearly illustrates the different patterns of growth. Specifically, students who do not perceive any barriers to their education tend to develop greater gains in educational aspirations during high school, but experience a significant drop in expectations during the transition out of high school. In contrast, the educational aspirations trajectory of the average student who perceives the presence of educational barriers has a shallower slope, but increases steadily over time, without experiencing any drop after the transition out of secondary school.

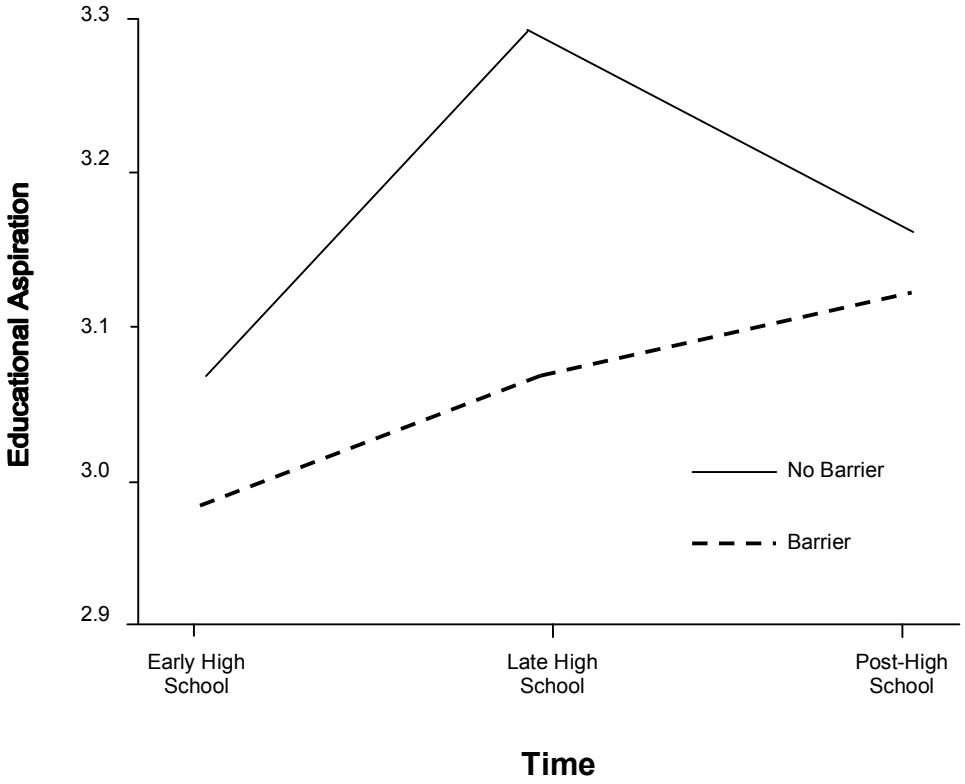

Figure 2. Level of Educational Aspiration as a function of time and perceived barriers.

Finally, to determine whether any three-way interactions between time, gender and the other variables of interest had a unique impact on the shape of participants' educational aspiration trajectories from early high school to post high school, a final series of models were fitted. Separate models containing a "Gender X [other variable]" term were generated for each of Parental Education, Intellectual Self-concept, Early Achievement, and Perception of Barriers. Only the Gender X Early Achievement model contained a significant interaction term. However, that interaction was a significant factor for the intercept ($\beta = -.07$, $t(472) = -2.02$, $p < .05$), slope ($\beta = .12$, $t(163) = 2.82$, $p < .01$), and curvature ($\beta = -.03$, $t(163) = -3.39$, $p < .001$) components of the resultant model. Inclusion of this interaction term accounted for and additional 9% of between-persons variance and 5% of the within-person variance over the main effects model (see Table 3).

To interpret the meaning of this significant three-way interaction, educational aspiration trajectories were plotted for the hypothetical high-achiever, average-achiever, and low-achiever (Time 1 GPA = 95%, 77%, and 60%, respectively), separately for each gender. It is important to note that this is "high" and "low" relative to the early high school achievement levels of the sample (*M* GPA = 77.07, *SD* = 8.93), rather than any absolute sense of the words. As can be seen in Figure 3, while there is a greater spread in educational aspiration levels from late high school to post-high school than from early high school to late high school across genders, boys' aspirations increase then decrease over the three times, regardless of their Early Achievement scores. In contrast, the trajectory of girls' aspiration levels is more closely linked to Early Achievement, with the low-achiever tending to have relatively stable aspirations over time, while

the high-achieving girl is likely to develop a marked increase in aspirations after leaving high school.

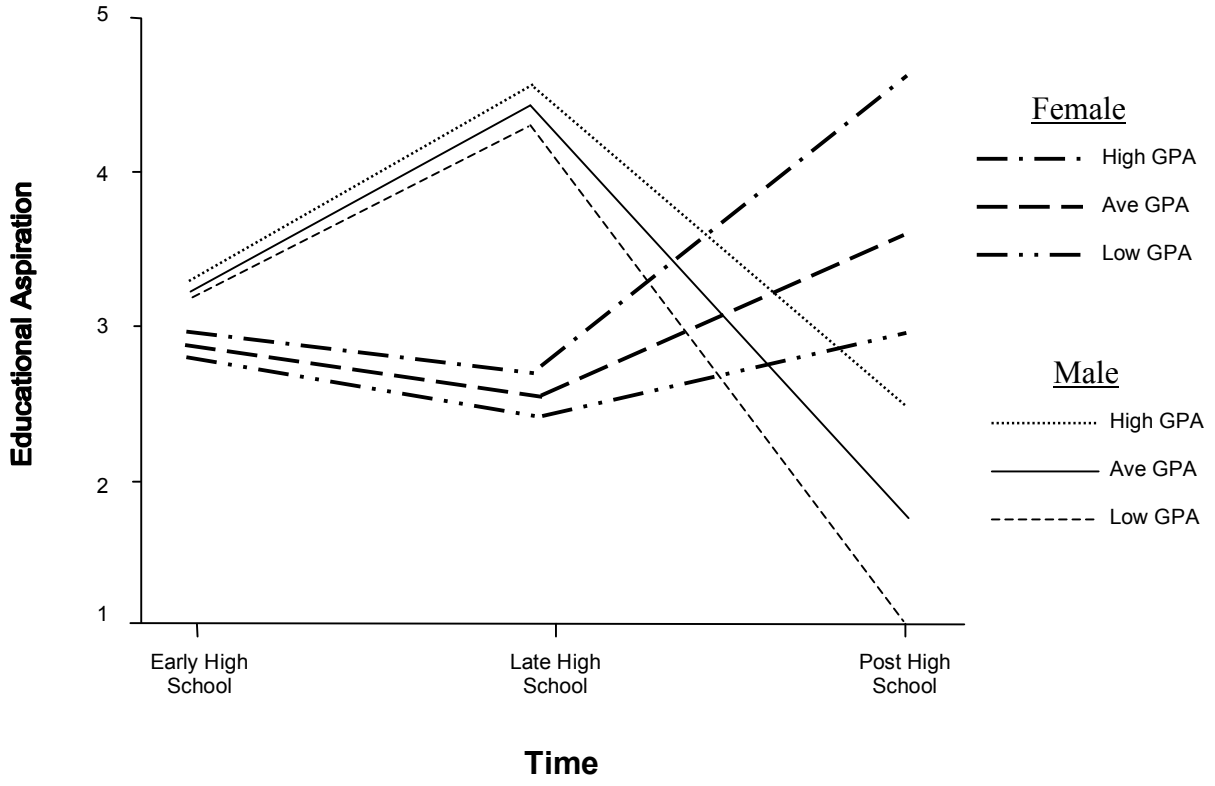

Figure 3. Level of Educational Aspiration as a function of time, Early Achievement and Gender.

Discussion

The results of this study reveal several things about the ways that educational aspirations change from early high school to the years following graduation. The overall means for the entire sample (Table 1) indicate that, at each of the three time periods, the "average" student aspires to obtaining a level of education approximately equal to an undergraduate university degree. More importantly, however, the use of growth curve modelling revealed that educational aspirations change in a quadratic rather than linear manner over this time, and that there is significant within-person variation within this phenomenon.

This study provides support for the notion that educational aspirations is a gendered phenomenon through high school and beyond. The pattern, rate, and direction of change were all found to differ significantly for male and female students. Specifically, in comparison to girls, the average boy begins with a relatively low level of educational aspiration early in high school, but these aspirations grow at a much faster rate through the high school years, only to drop back down after he has transitioned out of high school. The growth curve of the average girl's educational aspirations is shallower and more linear in shape, suggesting a less dramatic but more constant increase in aspirations throughout this period of life. In addition, the Gender by Early Achievement by Time interaction effect indicates that early high school performance

makes more of a difference to the eventual aspirations of girls than boys: girls with exceptionally high academic achievement in early high school tended to have aspirations that increased dramatically between late high school and post-high school, while the aspiration levels of girls with exceptionally low achievement tended to remain flat over time. In contrast, the inverted-U shape of boys' trajectories remained present regardless of their early academic achievement levels.

One implication of this pattern of results for educators is that a common school retention/career guidance curriculum may not be the most effective way to assist male and female students in planning for their future education, or even different types of female students. Specifically, during late high school, boys may require encouragement to engage in more realistic appraisals of their abilities and opportunities when making their future educational plans, whereas most girls may already be making realistic appraisals, given the relatively linear trajectory for this gender across time. Instead, other research indicating that girls have more difficulty connecting educational aspirations to occupational plans (e.g., Wall, Covell, & MacIntyre, 1999) suggests that they may benefit more from teaching and guidance directed at making explicit links between educational goals and vocational opportunities. In addition, early high school interventions targeted specifically at girls who achieve at a lower rate (and who don't experience a 'peak' in aspirations) need to be developed. McWhirter, Crothers, and Rasheed (2000) have found evidence that such programs can be effective for Grade 10 students. Specifically, they found increases in career decision-making self-efficacy, as well as for educational aspirations after engagement in a 9-week career education class. Interestingly, it was noted that the gains were greater for students who enrolled in class in the first term versus the second term. Earlier intervention may also reduce the likelihood that girls will opt out of math and science when they are able to do so. Unfortunately, girls are at higher risk for opting out of math (Shapka, Domene, & Keating, 2006, 2008) and subsequently narrowing their career opportunities—in the field of math and science, but also by limiting their access to post-secondary institutions where Grade 12 math is often an entry requirement (Shapka et al., 2006, 2008).

Although not linked to gender, the influence of perceived barriers on the trajectories of adolescents' educational aspirations is worthy of attention. Our results indicate that perceived barriers have an important influence on the course of adolescents' educational aspirations through high school. Specifically, for the average student who did not perceive barriers to attaining his or her eventual educational goals at Time 1, aspiration level grew rapidly from early to late high school, but dropped at nearly the same rate after graduation. In contrast, the average student who anticipated the presence of barriers had educational aspiration levels that increased steadily across the three time periods.

The inverted U-shape of the growth trajectory for students who did not anticipate barriers suggests that their initial rapid growth in aspiration level may be the result of limited awareness of real problems and barriers in their lives. If so, when they actually encounter these barriers in transitioning to post-high school life, they experience a decline in aspirations. If this is the case, these students will benefit from increased awareness of barriers to education that are commonly faced during this period of life, as well as preventative guidance on how to cope with barriers. In contrast, students who perceive that they will face barriers may benefit from support to cope with the barriers that they know they will be facing.

Regarding the implications of this finding, given the range of perceived barriers possible—from cognitive deficits to monetary constraints—it is unlikely that a 'one size fits all' intervention is going to be effective. However, the results of this study do call into the question

the commonly held assumption that it is the students who perceive barriers who are most in need of career counselling and support (McWhirter, Crothers, & Rasheed, 2000). Our results indicate that there is also a need to target individuals who do not perceive any barriers and who may hold unrealistically positive views about what is required to obtain their educational aspirations. With this in mind, future research on the interplay between barriers and change in educational aspirations over time needs to unpack these findings further, including a more nuanced exploration of the sources and kinds of perceived barriers that high school students experience. As this work unfolds, educators and school counsellors can play key roles by assisting these students to develop improved social support networks (Brown & Krane, 2000), or adapting existing strategies for assessing and planning for career-related barriers (e.g., Brown & Lent, 1996; Swanson & Woitke, 1997) for use with students who have unrealistic perceptions of what they will face in pursuing their post-secondary educational and occupational plans.

Limitations and Future Directions

This data was drawn from a high-functioning, homogenous sample (participants were predominantly suburban, European-Canadian adolescents), which imposes some limitations on our ability to generalize the findings from this research. First, given that almost all of the participants indicated that they intended to pursue a university education (and who experienced relatively high achievement early in high school), it is unclear whether the same pattern of findings (especially the absence of a significant effect for the Early Achievement variable, as well as the apparent heterogeneity of trajectories within the achievement levels revealed in Figure 3) would apply to the educational aspiration trajectories of lower achieving students, or even those at risk for non-completion of high school.

Second, the lack of participants from other cultural or racial backgrounds prevented the inclusion of ethnicity variables in the models, despite empirical evidence indicating the likelihood that ethnicity influences the developmental course of educational aspirations, and may interact with gender in doing so (e.g., Strand & Winston, 2008; Uwah, McMahon, & Furlow, 2008). Future research, using more diverse samples of participants is required to determine whether these findings can be applied to students with other achievement trajectories or from other cultural and racial groups to delineate the variance in students' educational aspiration trajectories that may be accounted for by ethnicity, and to explore the potential interaction between gender and ethnicity on students' educational trajectories.

Another problem arose from the relatively small sample size, which required that the data be grouped together into early, late, and post-high school time periods to permit robust yet meaningful conclusions. This grouping of data makes it potentially less sensitive to change than examining the development of educational aspirations across each grade of high school. In our initial analysis of the data, we attempted to divide the current data set by grade and, while the shapes of the trajectories were generally equivalent to those reported, the resultant decrease in data-points per person rendered the estimates of growth/intercept somewhat less reliable. Therefore, it is anticipated that changes in educational aspiration levels through each year of high school and beyond will generally conform to the pattern of results that was found (with peaks in the various trajectories probably occurring in the final year of high school), although future empirical examination of this topic may also reveal variation within these time periods.

The meaning of the significant results that we found in this study must be interpreted in light of the fact that the overall amount of variance explained is relatively low (although certainly acceptable for social science and educational research; see Cohen, Manion, Morrison, 2007). Regardless, the large amount of unexplained variance suggests that there are other

variables not specified in our model that would help explain changes in educational aspirations. Future work in this area is needed, with larger samples, longer periods of study, and an increased number of constructs examined.

As noted above, we measured perceived barriers in a uni-dimensional fashion. While this yielded useful information regarding the influence of barriers on educational aspirations, it precluded any examination of the kinds of barriers that were anticipated and did not allow for the relationships between perceived barriers, barriers actually encountered, and aspirations to be explored. Researchers whose primary interest is to understand the potentially different influences that different kinds of barriers may have on educational aspiration trajectories through adolescence may benefit from using the Perceptions of Barriers Scale (McWhirter, 1997) or an adaptation of the Career Barriers Inventory (Swanson, Daniels, & Tokar, 1996) to assess perceived barriers in a more thorough manner. Future research could also combine self-report information with independent assessment of the barriers that are faced by an adolescent to examine the relationships between perceived barriers, encountered barriers, and educational aspirations.

We also measured educational aspiration in a uni-dimensional fashion. This is potentially problematic because extant research suggests that educational engagement is complex and dependent on several factors (Suh & Suh, 2006). We are not alone in our treatment of this, in fact the large majority of research on this topic measures educational aspiration with a single indicator, which has been shown to be reliable and stable (Seginer & Vermults, 2002). That said, for us to learn more about trajectories of educational engagement more broadly, future work in this area needs to incorporate this complexity.

At the level of methodology, this study illustrated the advantage of using multi-level modelling to study educational aspirations over time. If some form of repeated-measures analysis of variance had been utilised to compare mean educational aspiration levels at Time 1, Time 2, or Time 3, the findings of this study may have been obscured by a failure to account for variation at the within-person level, or would simply have been unattainable (Singer & Willett, 2003). Therefore, researchers seeking to understand the development of educational aspirations through adolescence should consider the use of growth curve modelling techniques for their future studies.

Now that the importance of gender and perceived barriers on the development of educational aspirations has been established, there is sufficient justification to conduct research examining the interplay of these variables with educational attainment outcomes. Future research designs that include educational attainment information may be able to answer related questions, such as whether the steady increase in aspirations by people who perceive barriers carries over into post-secondary educational attainment; whether the decline in male educational aspirations tapers off after Time 3 or continues, eventually leading to lower educational attainment than for females; and whether the gender by barrier interaction becomes significant when educational attainments (rather than aspirations) are examined? Although the present study has successfully expanded the body of knowledge on the developmental course of educational aspirations, there ultimately remains many opportunities for further exploration of this subject area.

References

Andres, L., Adamuti-Trache, M., Yoon, E., Pidgeon, M., & Thomsen, J. P. (2007). Educational expectations, parental social class, gender and post- secondary attainment: A 10-year perspective. *Youth and Society*, *39*, 135–63.

Bank, B.J. (1995). Gendered accounts: Undergraduates explain why they seek their bachelor's degree. *Sex Roles, 32*, 527-544.

Brown, S.D., & Lent, R.W. (1996). A social cognitive framework for career choice counseling. *Career Development Quarterly, 44*, 354-366.

Brown, S.D., & Krane, N.R. (2000). Four (or five) sessions and a cloud of dust: Old assumptions and new observations about career counseling. In S.D. Brown & R.W. Lent (Eds.), *Handbook of counselling psychology* (3rd ed., pp. 740-766). New York: Wiley.

Bui, K. (2007). Educational expectations and academic achievement among middle and high school students. *Education, 127*, 328-331.

Chang, E. S., Chen, C., Greenberger, E., Dooley, D., & Heckhausen, J. (2006). What do they want in life? The life goals of a multi-ethnic, multi-generational sample of high school seniors *Journal of Youth and Adolescence*, *35*, 321-332.

Carpenter, P.G., & Western, J.S. (1982). Aspirations for higher education. *Australian Journal of Education, 26*, 266-278.

Cohen, J., Cohen, P., West, S.G., & Aiken, L.S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences,* (3rd ed). Mahwah, NJ: Erlbaum.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education*. New York, NY: Routledge.

Domene, J. F., Socholotiuk, K. D., & Woitowicz, L. A. (2011). Academic motivation in post-secondary students: Effects of career outcome expectations and type of aspiration. *Canadian Journal of Education, 34,* 99-127. Retrieved from http://ojs.vre.upei.ca/index.php/cje-rce/index

Eccles, J.S. (1994). Understanding women's educational and occupational choices: Applying the Eccles et al. model of achievement-related choices. *Psychology of Women Quarterly, 18*, 585-609.

Eccles, J.S. (2005). Studying gender and ethnic differences in participation in math, physical science, and information technology. *New Directions in Child and Adolescent Development, 110,* 7-14.

Eccles, J. S. (2009). Who am I and what am I going to do with my life? Personal and collective identities as motivators of action. *Educational Psychologist, 44*, 78–89.

Eccles (Parsons), J., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., et al. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motivation* (pp. 75-146). San Francisco, CA: W.H. Freeman.

Evans, S. (2009). In a different place: Working-class girls and higher education. *Sociology, 43*, 340-355.

Garg, R., Kauppi, C., Lewko, J., & Urajnik, D. (2002). A structural model of educational aspirations. *Journal of Career Development, 29*, 87-108.

Garg , R., Melanson, S., & Levin, E. (2007). Educational aspirations of male and female adolescents from single-parent and two biological parent families: A comparison of influential factors. *Journal of Youth and Adolescence, 36*, 1010–1023.

Harter, S. (1988). The self-perception profile for adolescents. Unpublished manuscript, University of Denver, Denver, CO.

Inoue, Y. (1999). *The educational and occupational attainment process.* New York: University Press of America.

Jacobs, J.E., & Eccles, J.S. (1992). The impact of mothers' gender-role stereotypic beliefs on mothers' and childrens' ability perceptions. *Journal of Personality and Social Psychology, 63*, 932-944.

Jacobs, J.E., Lanza, S., Osgood, D.W., Eccles, J.S., & Wigfield, A. (2002). Changes in children's self-competence and values: Gender and Domain differences across grades one through twelve. *Child Development, 73*, 509-527.

Kerpelman, J. L., Eryigit, S., & Stephens, C. J. (2008). African-American adolescents' future education orientation: Associations with self-efficacy, ethnic identity, and perceived parental support. *Journal of Youth and Adolescence, 37*, 997-1008.

Kirk, C. M., Lewis-Moss, R. K., Nilsen, C., & Colvin, D. Q. (2011). The role of parent expectations on adolescent educational aspirations, *Educational Studies, 37*, 89-99.

Klerman, J.A., & Karoly, L.A. (1995). *The transition to stable employment: The experience of U.S. youth in their early labor market career.* Berkeley, CA: National Center for Research in Vocational Education.

Lent, R.W., Brown, S.D., & Hackett, G. (1994). Towards a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior, 45*, 79-122.

Mahaffy, K.A., Ward, S.K. (2002). The gendering of adolescents' childbearing and educational plans: Reciprocal effects and the influence of social context. *Sex Roles, 46*, 403-417.

Marjoribanks, K. 2003. Family background, individual and environmental influences, aspirations and young adults. *Educational Studies*, *29*, 233–42.

Marsh, H.W. (1989). Age and sex differences in multiple dimensions of self-concept: Preadolescence to early adulthood. *Journal of Educational Psychology, 81*, 417-430.

March, H.W., & Yeung, A.S. (1998). Longitudinal structural equation models of academic self-concept and achievement: Gender differences in the development of math and English constructs. *American Educational Research Journal, 35*, 705-738.

Mau, W.C. (1995). Educational planning and academic achievement of middle school students: A racial and cultural comparison. *Journal of Counseling and Development, 73*, 518-526.

Mau, W.C., & Bikos, L.H. (2000). Educational and vocational aspirations of minority and female students: A longitudinal study. *Journal of Counseling & Development, 78*, 186-194.

McWhirter, E.H. (1997). Perceived barriers to education and career: Ethnic and gender differences. *Journal of Vocational Behavior, 50*, 124-140.

McWhirter, E.H., Crothers, M., & Rasheed, S. (2000). The effects of high school career education on social–cognitive variables. *Journal of Counseling Psychology*, *47*, 330-341.

McWhirter, E.H., Larson, L.M., & Daniels, J.A. (1996). Predictors of educational aspirations among adolescent gifted students of color. *Journal of Career Development, 23*, 97-109.

Mendez, L. M. R., & Crawford, K. M. (2002). Gender-role stereotyping and career aspirations: A comparison of gifted early adolescent boys and girls. *Journal of Secondary Gifted Education, 13*, 96-107.

Metz, A. J., Fouad, N., & Ihle-Helledy, K. (2009). Career aspirations and expectations of college students: Demographic and labor market comparisons. *Journal of Career Assessment*, *17*, 155-171.

Ojeda, L. &, Flores, L.Y. (2008). The influence of gender, generation level, parent's education level, and perceived barriers on the educational aspirations of Mexican American high school students. *Career Development Quarterly*, *57,* 84–95.

Raudenbush, S.W., Bryk, A.S., Cheong, Y.F., & Congdon, R.T. (2001). *HLM 5: Hierarchical linear and nonlinear modelling* (2nd ed). SSI Scientific Software.

Schoon, I., & Parsons, S. (2002). Teenage aspirations for future careers and occupational outcomes, *Journal of Vocational Behaviour, 60*, 262-288.

Seginer R., & Vermulst A.D. (2002). Family environment, educational aspirations, and academic achievement in two cultural settings. *Journal of Cross-Cultural Psychology, 33*, 540–558.

Shapka, J.D. (2009). Trajectories of math achievement and perceived math competence over high school and post-secondary education: Effects of an all-girl curriculum in high school. *Educational Research and Evaluation, 15,* 527-541.

Shapka, J. D., Domene, J.F., & Keating, D. P. (2006). Trajectories of career aspirations through adolescence and young adulthood: Early math achievement as a critical filter. *Educational Research and Evaluation, 12*, 347-358.

Shapka, J. D., Domene, J. F., & Keating, D. P. (2008). Gender, mathematics, and the educational and occupational aspirations of Canadian youth. In H.M.G. Watt & J.S. Eccles (Eds.), *Gender and occupational outcomes: Longitudinal assessment of individual, social, and cultural influences* (pp. 27-54). Washington, DC: American Psychological Association.

Singer, J.D., & Willett, J.B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence.* New York: Oxford University Press.

Strand, S., & Winston, J. (2008). Educational aspirations in inner city schools. *Educational Studies, 34,* 249-267.

Suh, S. & Suh, J. (2006). Educational engagement and degree attainment among high school dropouts. *Education Research Quarterly, 29*, 11-20.

Swanson J.L., Daniels, K.K., & Tokar, D.M. (1996). Assessing perceptions of career-related barriers: The career barriers inventory. *Journal of Career Assessment, 4*, 219-244.

Swanson, J.L., & Woitke, M.B. (1997). Theory into practice in career assessment for women: Assessment and interventions regarding perceived barriers. *Journal of Career Assessment, 5*, 443-462.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago: University of Chicago Press.

Uwall, C. J., McMahon, G., & Furlow, C. F. (2008). School belonging, educational aspirations, and academic self-efficacy among African American male high school students: Implications for school counselors. *Education, Counseling, and School Counseling, 11*, 296-305.

Wall, J., Covell K., & MacIntyre, P.D. (1999). Implications of social supports for adolescents' education and career aspirations. *Canadian Journal of Behavioural Science, 31*, 63-71.

Wang, M. T. & Eccles J. S. (2011). Adolescent behavioral, emotional, and cognitive engagement trajectories in school and their differential relations to educational success. *Journal of Research on Adolescence, 22*(1), 31–39.

Wigfield, A., Eccles, J. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12,* 265-310.

Wilson P.M., & Wilson, J.R. (1992). Environmental influences on adolescent educational aspirations: A logistic transform model. *Youth & Society, 24*, 52-70.