

Running head: Statistics Component

Investigating the relationship between self-concept, socioeconomic status, gender,
and high school reading achievement

Julie Coiro

University of Connecticut

Final Project, EPSY 346 – Fall, 2003

Current research points to several disturbing trends in the reading achievement of students in the United States. First, children from economically disadvantaged backgrounds achieve significantly below the achievement levels of children from families with higher income levels (Grissmer, Kirby, Berends, & Williamson, 1994). Studies indicate children from poverty are much more apt to be victims of such things as prenatal exposure to drugs and AIDS, poor nutritional practices, child abuse and neglect. Renchler (1993) argues “any one or a combination of these factors puts low-SES students at great risk for having substandard levels of academic achievement.” Furthermore, more than an estimated \$238 billion is lost each year in the United States as a result of students from low socioeconomic backgrounds who do not achieve academically and eventually drop out of school (McCormick as cited by Renchler, 1993).

Second, many struggling readers also wrestle with poor self-concepts related to their school functioning, but not necessarily to their global-self-concept (Sabornie, 1994). Phinnie (1988) reports previous experiences of failure, frustration, and humiliation often lead to beliefs of reading that outweigh any enjoyment. Third, and perhaps most troubling, is a review of research by Smith & Wilhelm (2002) about boys and reading. Their findings indicate boys have more difficulty than girls in comprehending narrative texts and that although few boys think of themselves as non-readers when they begin school, over half will call themselves non-readers by high school.

My experience as a reading teacher and literacy consultant keeps me in regular contact with students, many from economically disadvantaged backgrounds, who struggle to make sense of what they read and who, consequently, score poorly on reading achievement tests. These students lack confidence in reading and are often unwilling to invest the energy needed to become a successful member of their school literacy communities. In this study, I am interested

in more closely examining the relationship between self-concept, socioeconomic status, gender and high school reading achievement. More specifically, this study attempts to explain the role that these variables play in explaining differences in reading achievement scores for students in eighth grade, tenth grade and twelfth grade. This study focuses on two questions: (1) Does 8th grade self-concept and SES have a relationship with the set of reading achievement scores from 8th, 10th, and 12th grade? and (2) Are there group differences on the collective set of reading achievement scores across gender after adjusting for level of self-concept in 9th grade and SES? With a better understanding of whether or not differences in gender, level of self-concept and socioeconomic status can influence reading achievement of high school students over time, we can then begin to develop particular strategies for addressing those issues that most significantly relate to reading achievement in secondary school.

Literature Review

When examining the literature on self-concept and academic achievement, Marsh's (1992) study indicates a moderate relationship between self-concept, personal expectations and general academic achievement measures. Similarly, Jordan and Nettles (1999) found that 10th grade academic self-concept predicted math and science achievement in the 12th grade, after accounting for background factors. These findings are in line with Weiner's (1974) attribution theory on achievement and with James' (1890) ideas (as cited online by Huitt, 1998) of more than 100 years ago, that the intervening variable between academic achievement and self-concept is personal expectations such that "increasing self-esteem results when success is improved relative to expectations" and that "success is limited by expectations and self-esteem". More specific to reading achievement, Frederick (1984) outlined 6 basic skills that young

children need in order to become proficient readers including developing a positive self-concept. O'Sullivan's (1992) study indicated that, indeed, upper elementary aged children from low-income families who were excellent readers had extremely positive beliefs about their competence in reading. Finally in a further study, O'Sullivan & Howe (1999) found that small positive increases in perceptions of reading competency were paired with small increases in reading proficiency in children.

Longitudinal studies like the National Assessment of Educational Progress, conducted by the National Center for Education Statistics (2002), have long explored the relationship between socioeconomic status and reading achievement. In its most recent 2002 "Nation's Report Card", which can be found online at <http://nces.ed.gov/nationsreportcard/reading/results2002/lunch.asp>, findings showed significant differences in standardized reading achievement test scores from 1992 – 2002 due to socioeconomic status, which is measured by student eligibility for free/reduced school lunch. In 2002, for example, students eligible for free/reduced school lunch achieved an average scale score of 249, which is 23 points less than the average scale score of 272 received by students not eligible for free lunch. NAEP findings also suggest that the level of parent's education plays a role in reading achievement scores, such that as the level of a student's parent's education increases, on average, the level of that student's reading achievement also increases (view results at <http://nces.ed.gov/nationsreportcard/reading/results2002/parenteducation.asp>).

Similar differences in average reading scale scores by gender are reported (NCES, 2002). Data from the NAEP 2002 Reading Assessment show differences in reading achievement by gender, such that boys, on average, perform lower than girls in grades 4, 8, and 12 (see <http://nces.ed.gov/nationsreportcard/reading/results2002/scalegender-all.asp>). Although the data

suggests that the gap is slightly decreasing, female students still score an average of 10 points higher than their male peers do in the twelfth grade. The PIRLS (2001) report found that girls performed better than boys in all 35 participating countries (with over 140,000 students), yet it also reports that the differences between the scores of boys and girls for the better readers is smaller than the difference between boys and girls in the weakest group. This last statistic leads one to wonder first, whether or not differences in level of self-concept, gender and SES play a significant role in the differences of reading achievement among high-school students, and second, are these differences equally related to reading achievement across grade levels from Grade 8 - Grade 12?

Methods

The original dataset, from which a subsample of students was selected for this research, was compiled from the results of a 1988 survey conducted by the National Center of Education Statistics (NCES) of the U.S. Department of Education. “The participants consisted of a nationally representative sample of approximately 25,000 eighth graders to measure achievement outcomes in four core subject areas (English, history, mathematics and science), in addition to personal, familial, social, institutional, and cultural factors that might relate to these outcomes” (Weinberg & Abramowitz, 2002, p. 564). A follow-up study of these students was conducted during the tenth grade in the spring of 1990, a second follow-up was conducted during the twelfth grade in the spring of 1992, and a third follow-up was conducted in 1994.

For this study, a subsample of 500 students (227 males and 273 females) was selected from the larger NELS dataset. The three dependent variables of interest included 8th grade reading achievement, 10th grade reading achievement, and 12th grade reading achievement. All three scores reflected the student’s performance in the corresponding grade on a standardized test

of reading achievement. Actual values for each of these three scores ranged from 36.61 to 77.2, from low to high achievement. The three independent variables included gender, which had two categories (male and female), 8th grade self-concept and socioeconomic status. The self-concept variable was measured on a continuous scale with values ranging from 0 to 43. Higher scores were associated with higher self-concept and lower scores were associated with lower self-concept. Self-concept, in this study, was defined as “a person’s self perceptions, or how a person feels about himself or herself” (Weinberg & Abramowitz, 2002, p. 567). The variable was measured using the sum of scores on each of four items: “I feel good about myself”; “I feel I am a person of worth, the equal of other people”; “I am able to do things as well as most other people”; and, “On the whole, I am satisfied with myself”. The third independent variable, socioeconomic status (SES), was derived from a composite score of father’s education level, father’s occupation, mother’s occupation, and family income. Values of this continuous variable ranged from 0 to 35 -- from low to high SES.

To analyze the data, a multivariate analysis of covariance (MANCOVA) was conducted on three dependent variables, including reading achievement in 8th grade, 10th grade and 12th grade. Adjustment was made for two covariates: 8th grade level of self-concept, and socioeconomic status and the independent variable was gender (male and female).

Results

A preliminary analysis of descriptive information about each of the dependent variables revealed similar means for males and females with regards to reading achievement scores for grade 8, grade 10 and grade 12 (see Table 1).

An analysis of the correlation statistics suggests that eighth grade reading achievement is highly correlated with tenth grade reading achievement ($r = .754, p < .001$) and with twelfth

grade reading achievement ($r = .684, p < .001$). Similarly, tenth grade reading achievement is highly correlated with twelfth grade reading achievement ($r = .731, p < .001$). All of the dependent variables were highly correlated with each other, but not correlated enough to make multi-collinearity an issue.

Table 1. Descriptive Statistics for Dependent Variables

	Mean	SD	N
Grade 8 Reading Achievement Total	56.049	8.830	500
Males	55.545	9.116	227
Females	56.468	8.579	273
Grade 10 Reading Achievement Total	56.114	8.304	500
Males	56.257	8.609	227
Females	55.995	8.057	273
Grade 12 Reading Achievement Total	55.602	7.985	500
Males	55.310	8.560	227
Females	55.844	7.480	273

Results from several sources, however, indicate a violation of normality for the univariate distributions of each of the dependent variables. According to the histograms (see Figures 1 – 3), the reading achievement scores for all three grade levels are negatively skewed.

Figure 1. Distribution of Reading Achievement Scores for Grade 8

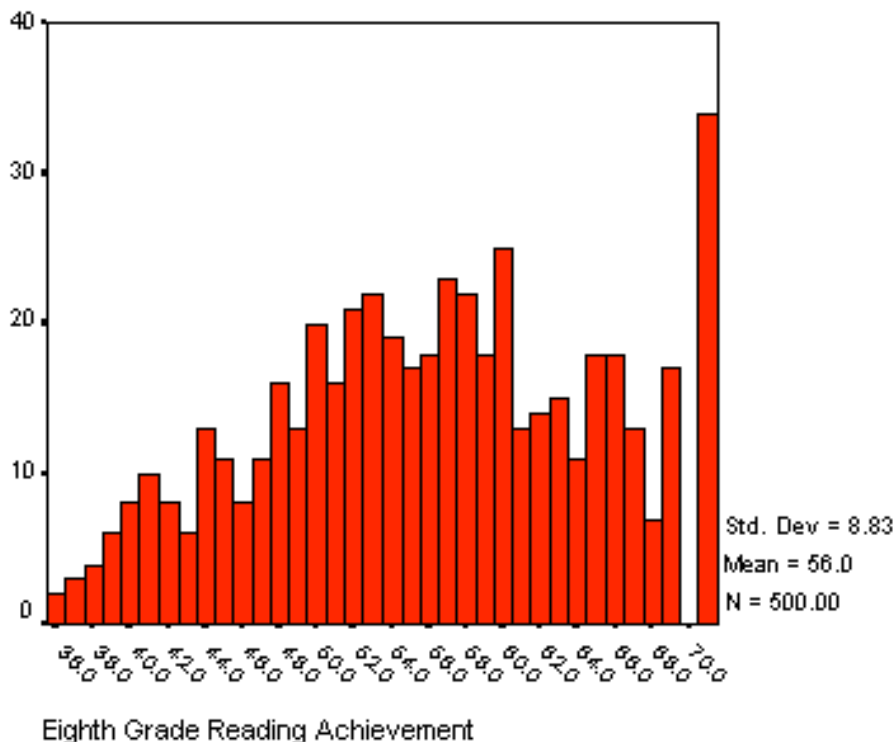
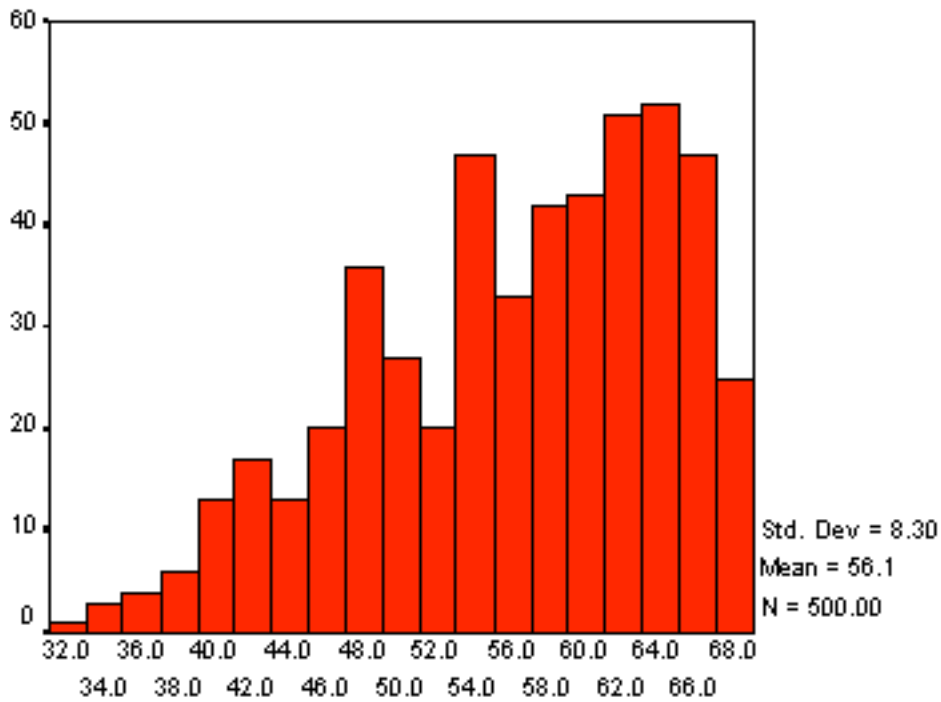


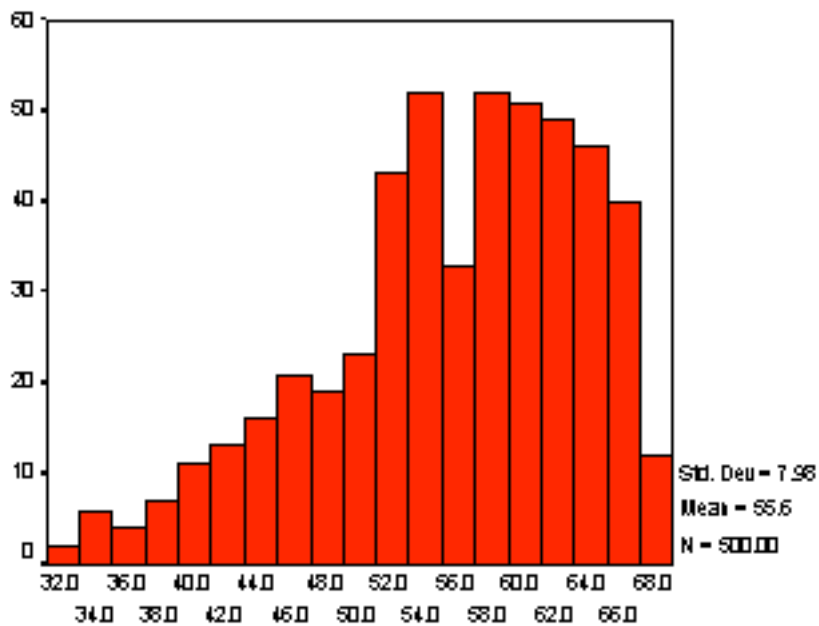
Figure 2

Distribution of Reading Achievement Scores for Grade 10



Tenth Grade Reading Achievement

Reading Achievement Scores for Grade 12



Twelfth Grade Reading Achievement

According to the skewness and kurtosis ratios (see Table 2), the distribution of 10th and 12th grade reading scores are extremely negatively skewed beyond the +2 acceptable ratio and thus, violate the assumption of normality. Similarly, 8th grade reading achievement, 10th grade reading achievement, SES and gender have ratios above the +2 range for kurtosis, again indicating non-normal distributions in this data. The extremely negatively skewed scores suggest that many participants in this subsample scored much higher than would be expected on a standardized reading achievement test, especially in Grade 8, where 2% of all students scored an almost perfect score of 70. No specific information is provided in the original study that would explain these high scores, but further multivariate analysis of the variance-covariance matrices (described in the results section below) ensure us that the data can still be interpreted with slight caution because of this non-normality. An analysis of the distribution of each independent variable indicates slightly kurtotic distributions for SES and gender and a slightly negatively skewed distribution of scores for levels of 8th grade self-concept among participants, but these do not seem to greatly influence our interpretation.

Table 2
Skewness and Kurtosis Ratios

Variable	Skewness Ratio	Kurtosis Ratio
Grade 8 Reading Achievement	-1.367	-3.693 ^a
Grade 10 Reading Achievement	-5.119 ^a	-2.478 ^a
Grade 12 Reading Achievement	-6.284 ^a	-.431
SES	-1.027	-2.904 ^a
Gender	-1.697	-2.904 ^a
Grade 8 Self Concept	-2.624 ^a	-.0321

^a = this value is outside the acceptable range of +2

Before the data was analyzed using the MANCOVA procedure, a preliminary analysis of the assumption of homogeneity of regression was conducted. The Wilks' Lambda of .993, $F_{(6, 982)} = .55221$, $p = .768$, was not significant, indicating that there is no interaction and there is homogeneity of regression overall. Thus, we can proceed with the MANCOVA analysis. The results of the Box-M test, $F_{(6, 1644339)} = 3.692$, $p = .001$, however, did not satisfy the assumption of homogeneity of variance-covariance matrices. Additional univariate tests of homogeneity of variance suggest that 12th grade reading achievement scores, $F_{(1, 727228)} = 4.50$, $p = .034$, violate this assumption, while 8th grade reading achievement scores, $F_{(1, 727228)} = .910$, $p = .340$, and 10th grade reading achievement scores, $F_{(1, 727228)} = 1.09$, $p = .297$, satisfy the assumption of equal variances. Further analysis of the generalized variance among males (Determinant = 96559.51, $n=227$) compared to females (Determinant = 40206.84, $n = 273$) suggests that the largest variance is in the smallest group, and thus, significant differences found through multivariate tests are suspect. As a result, it was decided to adjust the significance value to .01 to be more conservative when interpreting the Wilks' Lambda F-test of mean scores of reading achievement.

Question 1: Does 8th grade self-concept and SES have a relationship with the set of reading achievement scores from 8th, 10th, and 12th grade? When analyzing the data to answer the first research question, the Wilks' Lambda of .848, $F_{(2, 246)} = 14.139$ was significant, $p = .000$, (which is even more conservative than $p = .01$), suggesting that 8th grade self-concept and SES are indeed related to this set of reading achievement scores. The effect size of .079 indicates that 7.9% of achievement in reading in this set of grade levels is explained by a difference in self-concept and SES combined. Univariate tests show that self-concept and SES have a significant relationship with reading achievement in 8th grade, $F_{(2, 496)} = 31.69$, $p = .000$; in

10th grade, $F_{(2, 496)} = 22.95$, $p = .000$, and in 12th grade, $F_{(2, 496)} = 36.05$, $p = .000$. Follow-up Roy Bargman Stepdown tests also show a significant relationship between self-concept and SES with 8th grade reading achievement, $F_{(2, 496)} = 31.69$, $p = .000$. After accounting for 8th grade reading achievement scores, 10th grade reading achievement scores are not significantly related to the set of covariates, $F_{(2, 495)} = 1.94$, $p = .145$, but after accounting for both 8th and 10th grade reading achievement scores, 12th grade reading achievement is still significantly informative, $F_{(2, 494)} = 9.23$, $p = .000$.

Follow-up univariate t-tests (see Table 3) that more closely examine the influence of each individual independent variable indicated that SES is significantly related to reading achievement scores in all three grades, while self-concept in 8th grade is not significantly related to reading achievement at any of the three grade levels.

Table 3

T-tests of unadjusted univariate regressions on reading achievement at three grade levels

	DV	T-test	DF	p
SES	Gr. 8 Reading	7.947**	499	.000
	Gr. 10 Reading	6.613**	499	.001
	Gr. 12 Reading	8.083**	499	.000
Self-concept	Gr 8 Reading	-.052	499	.959
	Gr. 10 Reading	1.025	499	.306
	Gr. 12 Reading	2.052	499	.041

** $p < .001$

Question 2: Are there group differences on the collective set of reading achievement scores across gender after adjusting for level of self-concept in 8th grade and SES?

According to the Wilks' Lambda of .983, $F(3, 494) = 2.77$, $p = .041$, we can reject the null

hypothesis and conclude that there are multivariate differences across gender on the set of reading achievement scores after adjusting for 8th grade self-concept and SES. However, given our concern with not satisfying the homogeneity of variances-covariances matrixes, these findings are not particularly salient. The multivariate eta-squared = .017, indicates a small effect size, and tell us that only 1.7% of the generalized variance of the reading achievement at three grade levels can be explained by gender after controlling for 8th grade self-concept and SES. Univariate follow-up tests (see Table 4) show that gender does not explain any significant differences in reading achievement at 8th grade (p = .059), 10th grade (p = .679) or 12th grade (p = .061). Similarly, follow-up Roy-Bargman Stepdown Tests are also non-significant for any of the three reading achievement scores.

Table 4

Tests of Covariates (SES and 8th grade self-concept) and Gender on Reading Achievement at three grade levels

	DV	Univariate F	Df	Alpha	Stepdown F	Df	Alpha
Covariates	Gr. 8 Reading	31.69**	2/496	.000	31.69**	2/496	.000
	Gr. 10 Reading	22.95**	2/496	.000	1.94	2/495	.145
	Gr. 12 Reading	36.05**	2/496	.000	9.23**	2/494	.000
Gender	Gr 8 Reading	3.57	1/496	.059	3.57	1/496	.059
	Gr. 10 Reading	.172	1/496	.679	1.98	1/495	.158
	Gr. 12 Reading	3.51	1/496	.061	2.71	1/494	.100

** p<.001

Discussion

This study examined the relationship between self-concept, socioeconomic status (SES) and gender on a set of standardized reading achievement scores from students in 8th, 10th, and 12th grade. Results indicated that the two variables, 8th grade self-concept and SES, taken as a

set, are significantly related to reading achievement in these three grades. Moreover, univariate tests suggest that SES is significantly related to reading achievement while scores of general 8th grade self-concept add very little to our understanding of differences in high school reading achievement. This finding is particularly interesting given Sabornie's (1994) finding that while poor readers have low self-concepts related to academic performance, this does not necessarily carry over to their more generalized self-concept outside of school. Jordan & Nettles (1999), however, determined that a more specific measure of *academic* self-concept does significantly relate to academic achievement in high school. In this current study, the self-concept survey items did not specifically measure reading self-concept or even, academic self-concept, but rather, the items assessed an 8th grader's report of his/her more general self-concept. Thus, it is not surprising that general feelings about one's worth and value as a person does not particularly explain more of the differences in achievement specifically related to reading. In the future, we may want to more closely examine academic self-concept in the areas of reading, using for example, Henk & Melnick's (1995) Reader Self-Perception Scale to better understand any possible relationships between self-concept and scores on standardized reading achievement measures.

This study also set out to identify whether or not gender could significantly explain group differences on the collective set of reading achievement scores from 8th, 10th and 12th grade, after adjusting for self-concept and SES. This aspect of the investigation indicated that there were small significant multivariate differences across gender on reading achievement, but these differences should be interpreted with caution given the negatively skewed distributions of reading scores among this sample of students across all three grade levels. Moreover, the practical significance of gender explaining these differences is extremely small. One explanation

for the small gender differences in the results, compared to the dramatic differences illustrated in the more recent NEAP studies, may be that the NELS data was collected almost sixteen years ago and may not reflect more current gender differences found by NCES (2002) and the PIRLS (2001) report. Another possible explanation is that both of these more current reports illustrate larger differences in reading achievement by gender in 12th grade than differences among students at 4th and 8th grade. In fact, univariate tests in this study are close to being significant in 8th ($p = .059$) and 12th grade (.061). One wonders if the distribution of scores were more normal, would there then be differences in achievement at individual grade levels that could better be explained by gender?

In addition to the limitation of the NELS data being out-of-date, it is important to realize that this particular subsample was selected from another subset of approximately 5,000 students (of the original 25,000 eighth graders) who responded to all four administrations of the survey, who were always at grade level and who pursued some form of post-secondary education. Thus, we can not assume that this sample is representative of all high school students, and it would be erroneous to generalize the results to those students that do not read at grade level and who dropped out of school before college. This selective sample of students who read well and attend college may explain the negatively skewed distributions of reading achievement scores in our data. Future analyses of this data should return to the original 25,000 students and more closely examine the patterns among self-concept, gender and perhaps those students who did not read at grade level and did not pursue some form of post-secondary education. This would present a more accurate picture of those students most at-risk for not achieving in reading, and thus, may generate results more compatible with the two hypotheses in this study and with current research about low-achieving students.

References

- Fredericks, A. (1984). Ideas that stimulate reading achievement. *The Art of Parenting*, 4(2) as found in the Tips on Helping the Learning Disabled Child with Homework handout.
- Grissmer, D.W., Kirby, S. N., Berends, M., & Williamson, S. (1994). *Student achievement and the changing American family*. Santa Monica, CA: RAND: Institute on Education and Training.
- Henk, W. A., & Melnick, S. A. (1995). The reader self-perception scale (RSPS): A new tool for measuring how children feel about themselves as readers. *The Reading Teacher*, 48: 6, 470-482
- Huitt, W (1998). *Self-concept and self-esteem*. Retrieved November 10, 2003 from <http://chiron.valdosta.edu/whuitt/col/regsys/self.html>.
- James, W. (1890). *Principles of psychology*. New York: Henry Holt.
- Jordan, W. J., & Nettles, S. M. (1999). *How students invest their time out of school: Effects on school engagement, perceptions of life chances, and achievement*. Report No. 29, Washington, D.C.: Center for Research on the Education of Students Placed At Risk.
- Marsh, H. (1992). *The content specificity of relations between academic self-concept and achievement: An extension of the Marsh/Shavelson model*. ERIC NO: ED349315.
- National Center for Education Statistics. (2002). *The Nation's Report Card: Reading 2002 Major Results. National Assessment of Educational Progress*. Retrieved December 10, 2003 from <http://nces.ed.gov/nationsreportcard/reading/results2002/>.
- O'Sullivan, J., & Howe, M. (1999). *Overcoming Poverty: Promoting Literacy In Children From Low-Income Families*. Lakehead University.

- O'Sullivan, J. (1992). "Reading Beliefs and reading achievement: A developmental study of students from low income families." In S. Norris and L. Phillips (Eds.) *Pathways to literacy and illiteracy in Newfoundland*. Technical Report for the Secretary of State of Canada.
- Phinney, M. Y. (1988). *Reading with the troubled reader*. Ontario: Scholastic Canada Ltd.
- Progress in International Reading Literacy Study (2001). Retrieved October 12, 2003 from <http://timss.bc.edu/pirls2001.html>.
- Renchler, R. (1993). *Poverty and Learning: ERIC Digest, Number 83*. ERIC Clearinghouse on Educational Management Eugene OR. Retrieved December 8, 2003 from http://www.ericfacility.net/databases/ERIC_Digests/ed357433.html
- Sabornie, E. J. (1994). Social-affective characteristics in early adolescents identified as learning disabled and nondisabled. *Learning Disability Quarterly, 17*, 268-279.
- Smith, M. W., & Wilhelm, J. D. (2002). *Reading Don't Fix No Chevys: Literacy in the Lives of Young Men*. Portsmouth, NH: Heinemann.
- Weinberg, S. L., & Abramowitz, S. K. (2002). *Data analysis for the behavioral sciences using SPSS*. Cambridge, UK: Cambridge University Press.