THE POWER OF OGBU'S FOLK THEORY OF SUCCESS IN EXPLAINING PERSISTENTLY AND DISPROPORTIONATELY LOW SCIENCE ACHIEVEMENT

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by

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Abstract

Students in Country Cove have shown persistently disproportionate low levels of achievement when their results are compared with those of students from Earletown and the rest of Newfoundland. Research on the academic performance of minority groups in the United States has shown that certain groups have overcome socioeconomic barriers and discrimination to achieve educational success. Ogbu (1974, 1977, 1988) suggests that the minority groups that have performed poorly have not incorporated education into their "folk theory" of success. This research was designed to assess the students' "folk theory" of success and to determine the degree to which it could account for the Country Cove students' poor science achievement.

It was hypothesized that the factors of community, school ability, the students' "folk theory" of getting ahead, grade, and gender would have an effect on science achievement. The Otis-Lennon School Ability Test (Otis & Lennon, 1989b) was used to measure the students' school ability. A "folk theory" questionnaire was developed to assess the students' "folk theory" of getting ahead. The science test developed for the Second International Science Study was used to measure the students' science achievement. Path analysis was used to determine the effect of the factors on the students' science achievement. Quality of instruction was also investigated.

The students in each school were receiving the same quality of instruction and community, school ability, the students' "folk theory" of getting ahead, grade and gender all affected science achievement. Students who valued science perceived that they had support from their parents and teachers, had a future-orientation, and attributed their success or failure in science tc the internal causal factors of ability and effort had a "folk theory" of getting ahead that promoted science achievement. However, Ogbu's "folk theory" of success did not explain the poor performance of the Country Cove students. The negative effect of Country Cove upon science achievement did not disappear when all the variables were controlled, and, although the Country Cove students had a lower level of science achievement, their "folk theory" of getting ahead had a more positive effect on their science achievement than was found in Earletown.

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Table of Contents

List of Tables

List of Figures

CHAPTER 1: THE PROBLEM

Despite post-Confederation resettlement trends, Newfoundland still has pockets of semi-isolated rural communities. In one of these localized areas, given the fictitious name of Country Cove, students' average academic achievement is consistently below that of the province. Earletown, also a fictitious name, is another community within the same school district. However, Earletown is more urbanized, has a larger population, a higher socioeconomic base and its students consistently have performed better than the average for the province.

People familiar with the educational scene in this province will realize that this is not an atypical situation. Schools in rural communities with a low socioeconomic base have traditionally performed below the standards of Newfoundland's more urban centers (Blagdon, 1988; Crocker, 1989b). It can be argued that rural students cannot be expected to perform at the same level as urban partners, because (among other reasons) the rural students often have fewer individuals with the necessary educational background to help them with their school work at home (Statistics Canada, 1988).

However, research in the field of minority group education has shown that the existence of socioeconomic barriers and opportunity restrictions do not always lead to poor academic achievement. Certain cultural groups have

achieved high academic standards despite facing even more severe disadvantages than the Country Cove students. Therefore, the poor academic performance of the Country Cove students may not be a symptom just of low socioeconomic status.

Explanations of Science Achievement

A research project of this size does not have the resources to investigate the problem for the entire student population across all school subjects. Instead, the study will concentrate upon achievement levels of the senior high school students in science. Science instruction has received considerable public attention in Canada (Science Council of Canada [SCC], 1984) and in Newfoundland (Crocker, 1989b), and is seen as a necessary ingredient in the education of all citizens who wish to function productively in an increasingly technological society. Thus, if the Country Cove students lack a commitment to success in science, it is likely that they undervalue their education in general.

Furthermore, senior high school students probably have the most developed attitudes and perceptions towards how to get ahead in life. These students have been exposed to their culture for almost two decades and have experienced some community response to their ideas and actions. They should be more aware than the younger students of what is and what is not accepted, expected, and valued by others in their community.

This research will explore three possible explanations for the poor performance in science of the students at the senior high school level in Country Cove:

1. The Country Cove students may lack the motivation to succeed in high school science because they have accepted a local cultural "folk theory" of getting ahead that de-emphasizes the value of academic success;
2. The Country Cove students' low science achievement may be due to the students' level of school ability;
3. The high school which serves the Country Cove students may lack sufficient facilities and the qualified staff necessary to produce a higher standard of science achievement than is presently attained.

The "Folk Theory" of Getting Ahead

One possible explanation for the low achievement among the Country Cove students originates in the anthropological research of Ogbu (1977), Gibson (1987) and Suarez-Orozco (1987) in the field of minority group education. These researchers sought an explanation for the variability in school performance among minorities. Why would different minority groups, who experience similar cultural discontinuies with the predominantly Anglo-American school system, record significantly different levels of academic success? Why, for instance, would Chinese and Japanese students in Stockton, California, do considerably better in school than Black and Mexican-American students (Ogbu &

Matute-Bianchi, 1986)? All four of these groups attend schools that reflect the culture and language of the dominant Anglo-American society. All these minority students find that their language, communication patterns, learning styles, and cultural norms are different from and are in conflict with those of the schools (Ogbu & Matute-Bianchi, 1986).

Ogbu and Matute-Bianchi (1986) theorize that the phenomenon of low achievement among certain minority groups may be a reflection of chronic underachievement. They hypothesize that the groups have, when adopting a "folk theory" of getting ahead, abandoned their faith in the value of attaining an education. Education is seen as a useless commodity because it cannot serve as a vehicle for upward mobility. The groups believe that the value of attaining an education is lessened by discrimination and the existence of job ceilings for minority groups. Job ceilings result from discriminatory practices, deliberate or not, that exclude qualified individuals, usually minorities, from the more desirable jobs.

Although Country Cove students belong to no visible minority and are unlikely to suffer from job ceilings that result from discrimination, Ogbu's theory is relevant to the present situation. The semi-isolation of the Country Cove area has provided the people within the area with the opportunity to develop their own unique "folk theory" of

getting ahead that reduces the value of educational success. Newfoundlanders are proud of their ability to overcome the harsh economic conditions that have existed in this province throughout history. In Country Cove, as in many rural Newfoundland communities, the people turned to practical labour, such as fishing and logging, to attain a living. The youth of Country Cove may have attached their loyalty and pride to occupations and skills that require little formal education (Gedge, 1989; May & Hollett, 1986; Richardson, 1934). These occupations have sustained the community and provided examples of individuals who have done well and managed to get ahead without an education. Education may have been further devalued by high unemployment rates that have persisted in Newfoundland. Many students may have lost faith in the ability of a higher education to enhance their employment opportunities, that is, they may experience a job ceiling imposed by harsh economic conditions. Those Newfoundlanders who do choose occupations that require high levels of educational training are often forced to find employment in mainland Canada. Students from rural communities in this province may be unwilling to make this sacrifice because they have a strong socio-cultural attachment to their local community (May & Hollett, 1986).

Education can lead to more than physical dislocation. For those Country Cove students who wish to maintain a lifestyle based upon practical labour, schooling may be seen

as a force of cultural dislocation. "They find . . . that instead of enriching their culture and building personal confidence, schools implicitly invite them to abandon their roots, identity, and lifestyle in favour of an alternative they neither value nor desire" (Gedge, 1989, p. 4).

This research will attempt to determine whether the Country Cove students' achievement in science has been hindered by their parents', teachers', and their own perceptions of the need for science education. Student motivation, on the average, accounts for 11.4 % of the variance in achievement in science (Uguroglu & Walberg, 1979). Therefore, a local "folk theory" of getting ahead that dampens the students' motivation to succeed will influence negatively their achievement.

Low School Ability Explanation

The second explanation for the low achievement of Country Cove students is the possibility that they lack the school ability to produce high achievement in science. This study cannot ignore the research into science education that indicates that the average relationship between ability and achievement ranges between .50 and .75 (Kahn, 1969). The school ability of the students will be a factor in judging the value of recommendations to improve the situation in Country Cove.

Quality of Instruction Explanation

This research is limited to senior high school science. Each school subject brings with it particular problems. Senior high school science courses require teachers qualified in science and a certain amount of laboratory facilities. These factors will be studied to see whether the Country Cove students are being taught under the same conditions as their counterparts in Earletown.

Sample

The Country Cove and Earletown students were chosen for the sample because their achievement profiles appear to be consistent with Ogbu's "folk theory" of success. The Country Cove students have a persistently disproportionate low level of achievement when compared with Earletown students and the rest of Newfoundland. Furthermore, they live in a cultural and economic environment that would appear to be less likely to promote the value of attaining an education. There is a more detailed description of this sample in the methods chapter, which also describes the Country Cove and Earletown schools and reports the distribution of the students by school, grade, and gender.

Design

The students will be given a school ability measure and a science achievement test. The first stage of the research will attempt to determine whether the Country Cove students

are underachieving in science. In the second stage of the research the students from Country Cove and Earletown will be compared on the science achievement test with school ability controlled. If the Country Cove students have significantly lower scores on the achievement measure than their partners of equal ability from Earletown, then other factors will be sought to explain the residual discrepancy.

The third stage of the research will establish, through a questionnaire, the "folk theory" of getting ahead for the two communities. The research will investigate whether the established "folk theory" of getting ahead can account for any of the residual discrepancy in achievement levels between equal ability groups. A causal model explaining the relationship between community and science achievement via the "folk theory" of getting ahead, when the effects of school ability, grade, and gender have been controlled, will be tested. The factors of grade and gender have been added to the causal model because both factors are expected to account for part of the variance in science achievement in this sample. The instrument used to measure science achievement is designed for all senior high school students, so the higher grade level students are expected to receive higher scores on the measure because they have completed more science courses than the lower grade level students. Gender is added as a factor because the literature shows

that there is a history of sex-related differences in science achievement (Erickson & Erickson, 1984).

The final stage of the research will gather information on teacher qualifications and the amount of laboratory facilities in order to make a rough comparison between the quality of instruction received by the students in each school.

Implications

The type of action taken to improve the situation in Country Cove will depend upon the diagnosis of the cause of students' persistently, disproportionate low school achievement. If the students lack school ability, it will be necessary to employ instructional strategies that are designed to help weaker students. Perhaps the school would have to adopt a remedial reading program in its junior grades. If school facilities or teacher qualifications are inadequate, steps would have to be made to improve these conditions. If students are unmotivated to achieve because they see no value in academic success, broad-based community action will be needed. This will be especially true if it is found that the students' lack of motivation is a result of inheriting the values of their local culture. The solution is no longer contained within the educational realms of curriculum and instruction. Solutions will have to involve parents, teachers, and students, and must be implemented with some diplomacy. The residents of the area must be

confronted with the fact that they are partly responsible for the poor performance of the students and be convinced that they can control their future. There is a danger that this confrontation may further alienate the residents from the educational system. The educational system cannot simply cast blame for the low achievement onto the people it is failing to serve. It too is responsible for developing the local "folk theory" of getting ahead.

The educational system has not always capitalized as much as it could on the strengths of the Newfoundland people and encouraged them to become better at the things they are willing to do and capable of doing. Instead it has offered them alternatives that reflect the values of a different culture. The Richardson Report completed in 1934 for the newly formed Commission of Government was perhaps the first to notice the trend. The report was alarmed that the Newfoundland school system was promoting academic excellence that led to clerical occupations at a time when the majority of rural Newfoundlanders were employed in practical labour. Richardson believed the educational system could serve the province far better by giving the system an industrial bias. Education then would have more value for these people because they could apply it more directly to improving the occupations that dictated their standard of living.

The job market continues to change, and an educational system with an industrial bias may no longer be appropriate.

Nevertheless, the educational system must design a program appropriate for the times, and also do its share to convince more people that attaining an education is valuable. Convincing a group of people to strive for higher educational standards has the potential to change their course in history (Freire, 1976).

CHAPTER 2: REVIEW OF THE LITERATURE

This review will attempt to show the strength of the perceived need for Canadian citizens to achieve in science education. The literature review will then illustrate that Newfoundland students are not obtaining a satisfactory level of science education. As stated in chapter 1, this research will concentrate on three possible explanations of the low level of science achievement among the students of a particular area in the province: (a) the students may lack the motivation to succeed in school science because they have accepted a local cultural "folk theory" of getting ahead that de-emphasizes the value of academic success; (b) the students may lack the school ability to produce high achievement in science; and (c) inadequate teacher qualifications and laboratory facilities may be impeding the students' science achievement. Problems are rarely unidimensional in education and it may be some combination of these three factors that has caused the low achievement levels in science. The review will highlight how each of these three factors have been found to influence achievement. To show that any causal model designed to account for variations in science achievement should also include the effect of gender, the review contains a brief description of the relationship between gender and science achievement.

The Need for Science Achievement Among Canadian Citizens

There is an increasing need for people to be scientifically literate. During the 1990 twentieth anniversary of Earth Day, celebrities and scientists attempted to draw attention to environmental issues. The average citizen was expected to understand the significance of global warming, ozone depletion, and the destruction of the rainforests. The average person was also expected to understand how acid rain was formed and how the greenhouse effect was created. Everyone was asked to conserve and recycle. Other social issues, such as world peace, abortion, or starvation in Africa have challenged people's emotions, morality, and politics. Advocates of these causes use propaganda that appeals to people's sentiments, but also attempt to legitimize their concerns by placing scientific facts, figures, and theories upon the table. More and more, individuals are required to rely upon their scientific knowledge to judge the evidence put forth in support of a position. The Save The Planet movement is just one example that illustrates how science has pervaded our life and required Canadian citizens to use their education in science.

Besides producing informed citizens the Science Council of Canada (SCC, 1984) felt Canada needed science education that could:

- train those with a special interest in science and technology fields for further study;
- provide an appropriate preparation for the modern work world;
- stimulate intellectual and moral growth to help students develop into rational, autonomous individuals. (p. 13)

More recently the Task Force on Mathematics and Science Education (Crocker, 1989b), commissioned by the Newfoundland government to study the provincial scene, reiterated the position of the Science Council of Canada. However, the Task Force felt the Science Council's analysis neglected to consider how science education also promoted critical and analytical thinking (Crocker, 1989b):

> The essence of the argument for critical thinking is that students need to acquire the ability to go beyond specific knowledge, and learn to analyze, synthesize, assess the quality of arguments, apply the rules of logic and rational thinking, and ultimately to generate new personal knowledge. (Crocker, 1989b, p.38)

Science education does not have a monopoly upon fostering critical thinking, but it does afford unique opportunities to encourage the use of critical thinking abilities.

Striving to accomplish a higher standard of achievement in science education in this province is not merely an academic pursuit or a matter of aesthetics. The economic development of Newfoundland may depend upon the level of competence its citizens have in science and technology (Crocker, 1989b). Newfoundland has a poor record of managing its natural and human resources. Giving science a higher priority in the educational system, and then in society, may help Newfoundland realize the potential of its human resources.

Performance of Newfoundland Students in Science Education

Unfortunately, Newfoundland appears unable to capitalize fully upon the promise of science education. The Task Force on Mathematics and Science Education concluded:

> In comparison with Canadian and international standards achievement in mathematics and science in this province is consistently low. This is not an artifact of particular measures, but is a pervasive feature of the system. (Crocker, 1989b, p.88)

The Task Force studied public exam marks, post-secondary level performance, results from the Canadian Tests of Basic Skills (CTBS) and the International Science Study to deduce that the achievement level in science obtained by Newfoundland students was unsatisfactory. The public exam

results have masked the true level of science achievement in this province. The pass rates for high school biology, physics, and chemistry from 1978-1988 have hovered around 80 percent in all three subjects (Crocker, 1989b). However, Crocker believes that the stability in pass rates and public examination results occurs because the system is designed to achieve exactly that effect. The Task Force stated that "public examination results are subjected to a normative interpretation which ensures that the results in a given year are no worse than those in previous years" (Crocker, 1989b, p.88).

Further investigation illustrates that students in Newfoundland are not achieving as well in science as the public examinations would have one believe. At the post-secondary level, the problem is one of low participation rates. The Task Force discovered that "over the past several years, Memorial University has awarded an average of only 10 undergraduate degrees in chemistry and 13 in physics per year" (Crocker, 1989b, p.5). This leaves Newfoundland with few highly qualified individuals who can meet the employment requirements of scientific and technical occupations. The performance of Newfoundland students on the grade 4, grade 6, and grade 8 Canadian Tests of Basic Skills has remained stable over the 1974-1988 testing period at about the 45th percentile. The Task Force also found that "At no time, and at no grade level, has the performance of students in this

province been up to the Canadian average" (Crocker, 1989b, p.66). The Newfoundland students have improved their standards but have been unable to narrow the gap between themselves and the national standards. Other students throughout Canada have been improving their standards at an even faster rate.

The International Science Study, conducted in 1984, produced more evidence of Newfoundland's lower standard of science achievement across its entire school populace. Multiple-choice tests were administered to students in grade 5; grade 9; and in biology, chemistry, and physics courses at the grade 12 level. Interprovincial comparisons of the results showed that "Newfoundland students ranked the lowest in Canada on almost all measures" (Crocker, 1989b, p.79). To compete with their national peers on an equal plane Newfoundland students will have to improve their level of science achievement.

The overall picture of the level of science achievement of Newfoundland's students is constructed from the range of results throughout the province. There are localized groups of students whose performance sags even below the unimpressive standards of the province. Analysis of the Canadian Tests of Basic Skills results by the Newfoundland Department of Education has shown that school size and rurality have influenced the performance of the students. Students in smaller schools (Blagdon, 1986) and students

from rural communities (Blagdon, 1988) have not performed as well as their counterparts in larger schools and from the urban centers. There is some overlap here, since the smaller schools tend to be in the rural areas. The Task Force on Mathematics and Science Education also found that:

> Generally speaking, students in larger schools and in schools in urban settings . . . perform marginally better in public examinations than their counterparts in small schools and those in rural settings. Differences range from two to four percentage points, depending on the subject. (Crocker, 1989b, p.85)

This is not an alarming difference, but it does suggest certain students are placed at a disadvantage. However, the Task Force discovered more disturbing disparities between school districts. Further analysis of the public examination results revealed:

> It is not unusual to find 25 or more percentage points separating the lowest from the highest performing districts. This suggests that characteristics of a school district, beyond the rural/urban distinction, have a major influence on achievement. (Crocker, 1989b, p.85)

Students in a poorly performing district are at the bottom of the totem pole. Their performance is below the Newfoundland norms, and the provincial norms are among the

lowest in the nation. Even greater concern must be shown for a school district that consistently performs below provincial standards.

Some groups will always be below the average level by definition, unless all groups perform the same. In education one must strive to keep the gap as narrow as possible and at the same time elevate the average level. Both of these objectives can be addressed by attempting to improve the performance of the lowest achievers. The secret to finding an effective solution to the problems in this area may lie in uncovering the characteristics of poorly achieving districts, beyond the rural/urban distinction, that have a major influence on achievement. Further research could then be conducted to determine whether these characteristics are common to school districts throughout the province that suffer from lower achievement levels.

The "Folk Theory" of Getting Ahead

A Historical Development of the "Folk Theory" of Getting Ahead

Ogbu's (1974) "folk theory" of getting ahead has evolved from research into the problem of persistently disproportionate school failure among certain minority groups in the United States. Researchers originally suggested that certain minority groups were genetically deficient (Eysenck, 1971; Garrett, 1973; Jensen, 1969); the group's poor academic record was a result of their

intellectual inferiority. Eventually this explanation fell out of favour as the IQ measures received increasing criticism for being unfairly biased towards the dominant culture. It was then hypothesized that minorities were suffering from institutional discrimination (Gittell & Hollander, 1969; Smith, 1974). It was suggested that minority students were placed in second-rate school facilities, supplied with lower qualified teachers, and forced to conform to a school environment designed for the majority culture. The civil rights movement in the United States was able to win some measure of school reform through court actions for one of its largest minorities. School resources could no longer be deliberately diverted from Black schools, and minority students were bussed to schools that had been predominantly White and had better facilities. However, school resources remain unequally distributed, and, despite school desegregation, "most Black students still attend public schools that are predominantly Black" (Ogbu, 1988, p.129).

Ogbu (1988) believes that this type of school reform is too narrow and ignores two important issues. First of all, as long as there is discrimination against minorities in society at large there will be discriminatory policies and practices in the schools. The argument is that "effective minority education reform can be accomplished only when it is accompanied or preceded by reforms in the status of

minorities" (Ogbu, 1988, p.129). Secondly, people go to school to get credentials for good jobs that pay well, and, as long as minorities see little or no benefit from their education they are not likely to respond well to school reform (Ogbu, 1988).

In the 1960's, the explanation of poor minority school performance began to emphasis cultural deprivation (Bloom, Davis, & Hess, 1965; Deutsch, 1967; Hunt, 1969). The central argument of this theory is that some students come from family and community environments that fail to adequately stimulate normal development during the preschool years. Their parents may live in a poor neighbourhood, lack education, be unemployed, and not read to the child. Failure at school would be a result of the students' linguistic, cognitive, motivational, and social development being retarded. Minority and poor children were recognized as culturally deprived in this way. Ogbu noted that "about 75% of Black children were said to be culturally deprived in the mid-1960's" (1988, p.130). The cultural deprivation theory received serious consideration and led to the development of such preschool programs as Head Start in the United States. Head Start and preschool programs similar to it were designed to provide stimulus to the child and to train the parent on how to teach the child to develop appropriate skills for school learning and adjustment. It was hypothesized that culturally deprived children would succeed

academically if they developed like white, middle-class children.

The cultural deprivation theory metamorphasized into the cultural discontinuity hypothesis (Baratz, 1970; Ramirez & Castaneda, 1974), because minority groups felt it was inappropriate to refer to their children as culturally deprived. The cultural discontinuity hypothesis emphasized the role of language and cultural differences in the minority school failure. This theory concludes that a major part of the problem lies in the cultural and language conflicts between the minorities and the schools. Schools reflect the culture and language of the dominant group in society (Ogbu & Matute-Bianchi, 1986). Therefore, some groups may not do well academically because their cultures are not congruent with school culture. Graham (1988) describes the failure of aboriginal children from traditionally oriented communities in the Northern Territory of Australia to learn mathematics effectively in school as a culture-conflict educational situation. These aboriginal people traditionally make use of some number words but "place little value on precise counting and in traditional communities have little understanding of the concepts involved" (Graham, 1988, p.122). Therefore the aboriginal students are at a disadvantage in learning Western mathematics. The minority students' language is different

and does not even contain the same concepts as the dominant group's language.

The aboriginal people of Canada's Northwest Territories have also experienced cultural discontinuity with formal education (Oates, 1988). Inuit culture preaches generosity and working together for the benefit of the group (Oates, 1988). The school environment, however, encourages competitiveness and individual academic, athletic, and extra-curricular achievement. Inuit parents want their children to learn English and have better opportunities for employment, but are opposed to prolonged exposure to formal education because they feel it causes their children to become disrespectful, disobedient, lazy, and aggressive (Oates, 1988). Some students are able to cope with the discrepancies in values and goals between the Euro-Canadian school culture and the traditional Inuit culture. Others develop behavioral conflicts, low self esteem, and low confidence levels (Oates, 1988).

The cultural discontinuity approach has also led to the design of educational programs. These programs were devised to produce school success in place of school failure by making the classroom more compatible with the culture of the underachieving minority group. The Kamehameha Elementary Education Program (**KEEP**) was developed to remedy Native Hawaiian academic underachievement by changing educational practices (Vogt, Jordan, & Tharp, 1987). The Hawaiian

educational system serves Japanese, Chinese, Filipino, Samoan, Native Hawaiian, and Haole (Northern European ancestry) children. The Japanese, Chinese, and Haole children have generally good school records, while the Filipinos, Native Hawaiians, and Samcans have relatively poor ones (Vogt et al., 1987). KEEP included a K-3 language arts program that was culturally compatible for Hawaiian children and produced significant gains in reading achievement levels for educationally at-risk Hawaiian children. KEEP involved making changes in instructional practice, classroom organization, and motivation management. The classroom, for example, was no longer organized for independent study at individual desks. Hawaiian children are accustomed to helping one another, and being helped more often by peers and siblings, because of the pattern of multiple caretakers and companion groups in the home culture. Therefore, to increase the amount of peer interaction, the teacher met with small homogeneous reading groups while the rest of the class worked in small groups at "learning centers" located throughout the classroom.

Some felt that KEEP simply used solid educational practices that would work equally well with any other population. However, the educational practices generated by KEEP did not meet with success when implemented in the Rough Rock Demonstration School on the Navajo Reservation there (Vogt et al., 1987). Organizing the classroom into groups

did not work with the Navajo students. Navajo culture had many instances of sibling caretaking and mutual helping in the community but also adhered to strict separation of the sexes. The Navajo students would help and interact if the groups were divided into students of the same sex. The classroom was then culturally compatible for the Navajo children. Vogt et al. (1987) felt the Hawaiian and Navajo experiences confirmed that cultural discontinuity was one credible explanation for school failure.

Overall, however, the policies and intervention strategies generated by past and present explanations of the lower academic performance of minority students have been less effective than desired (Ogbu, 1988). Ogbu feels that the explanations have had certain weaknesses in common. One weakness is that the explanations are ahistorical. Minorities' perceptions of and responses to schooling might have been shaped by their collective historical experience in school and society. Second, the explanations tend to view education in the abstract. The explanations have not paid enough attention to the role of schooling as a cultural formula for preparing young people to participate in the job market, and to how the job market opportunities have affected the minorities' perceptions of and responses to education. Third, the explanations tend to focus only on those minorities that are not successful in school. The explanations do not address the issue of variability in

minority school performance. Some minorities succeed in school even though they possess cultural and other characteristics that researchers tend to associate with school failure (Ogbu, 1988). Ogbu and Matute-Bianchi (1986) suggest there is a need for a conceptual framework that will enable researchers to account for the school success of some and the school failure of others.

Describing the "Folk Theory" of Getting Ahead

The "folk theory" of getting ahead explains low school achievement of certain groups by hypothesizing that they do not put a concentrated effort into achieving academic success because they perceive there to be little chance of a reward for their labour. This theory is based on the belief that education is more of an utilitarian than intellectual pursuit:

> Although education is influenced by political and ideological needs and issues (Cohen, 1975) and by religious beliefs and tradition, the most important source of influence shaping formal education today appears to be the industrial economy and its perceived needs. As for clients of education, i.e., parents and students, we suggest that their perceptions and responses are also highly influenced by economic considerations. (Ogbu & Matute-Bianchi, 1986, p.80)

Therefore the reward for achieving academic success is the enhancement of a person's opportunity to achieve economic success in adult life.

The connection between academic success and economic success has had a high profile. The Science Council of Canada (1984) stated that "education for the world of work is important to society and to individuals: our economy needs appropriately trained human resources and individuals need employment that is financially and personally rewarding" (p. 15). The Task Force on Mathematics and Science Education (Crocker, 1989b) also publicized the same view by claiming that improved levels of science achievement will foster economic growth. Hanrahan and Montgomery (1986) suggested, in a background report for the Royal Commission on Employment and Unemployment in Newfoundland and Labrador, that neither the educational system nor the agencies responsible for economic development have sufficiently emphasized the positive relationship between education and economic development. Hanrahan and Montgomery (1986) felt that both institutions should place more effort on promoting the value of education for economic prosperity.

The same trend appears to be prevalent in American society. Giroux (1984) believes the national debate centered upon the relationship between public education and the wider society concentrates on the economic connection:

> What is most striking in the current debate is the relationship that is being drawn between the state of the U.S. economy, with its lagging domestic performance and its shrinking preeminence in the international marketplace, and the failure of the schools to educate students to meet the economic needs of the dominant society. (Giroux, 1984, p.187)

A review of American national policy papers, such as the National Commission on Excellence and the National Task Force on Education for Economic Growth, reveal a "new" public philosophy (Giroux, 1984). This "new" public philosophy defines public education "primarily through a struggle for economic success and individual mobility" (Giroux, 1984, p.191).

Although these are not entirely negative goals, Giroux (1984) feels they do not lead public education in the appropriate direction. Public education should have a stronger commitment to democratic principles and promote an ethic of civic responsibility and enhance critical thinking abilities so that citizens will make informed judgements about the political, social, and cultural issues that structure society. One danger of the "new" public philosophy is that some students may find education is a deceiving promise. If schooling fails to offer opportunities for self- and social-empowerment, the student may become alienated

from the educational system. Giroux (1984) believes "in part, this alienation is expressed in the high rate of student absenteeism and school violence, and in the refusal of many students to take seriously the academic demands and social practices of schools" (p. 189). Ogbu and Matute-Bianchi (1986) likewise contend that the academic performance of the different cultural groups will be significantly influenced by the degree of faith each group has in the ability of education to produce economic benefits and respectable status for its members.

Every society or population has its own "status mobility system" or "folk theory" of getting ahead (Ogbu & Matute-Bianchi, 1986). Each "folk theory" will tend to generate its own role models or ideal successful persons. The people who become role models are widely perceived by members of the population as people who are successful because of their personal attributes and behaviours (Ogbu & Matute-Bianchi, 1986). Parents usually try to raise their children to emulate the behaviour of these role models, and, as children grow older, they too strive to be like the successful members of the population. If school success is perceived by members of the population to make people successful, individuals will tend to incorporate the pursuit of education into their "folk theory" of getting ahead. Where there is a strong connection between school success and later economic and societal success in adult life, the

population will institutionalize the beliefs, values, and practices that enhance academic success into their culture (Ogbu & Matute-Bianchi, 1986). The beliefs, values, attitudes, and behaviours that promote striving for academic success are taught to the children consciously and unconsciously by parents and other childrearing agents. The direct and indirect cues from the community will eventually lead the children to develop a cultural conception of how to get ahead and of what role schooling plays in getting ahead.

Certain cultures produce "folk theories" that may not support striving for academic success, because adult opportunity structures are not perceived to be enhanced by schooling. Some groups voluntarily engage in a way of life that does not require schooling. The Amish in the United States, for example, do not need white middle-class school credentials to succeed in the Amish economy and status system. Other groups are relegated involuntarily to menial occupations or ways of life that do not require and do not reward school success.

However, the priority placed upon schooling in the group's "folk theory" of getting ahead will not be determined solely by the lack of need and lack of reward for success in education. The Chinese and Japanese, who immigrated to the United States in the 19th and early 20th centuries, were not adequately rewarded for their school success, but they still maintained "folk theories" that

supported conventional school success (Ogbu & Matute-Bianchi, 1986). The first Japanese and Chinese immigrants expected a level of intolerance from the dominant host culture and did not seek equal status with the Anglo-Americans. Instead, an American education had a value for these groups because the immigrants found they had made progress beyond their peers back home.

The historical life experience and coping behaviours condoned by the group will influence the role schooling plays in the group's "folk theory" of getting ahead. The conditions that shape the "folk theory" of getting ahead may vary from one cultural group to the next. The groups that incorporate schooling into their "folk theories" tend to achieve academic success. The groups that do not incorporate schooling into their "folk theories" tend to experience persistent, disproportionate school failure.

The "Folk Theory" of Getting Ahead and Academic Achievement

Ogbu (1974) felt the poor school performance of the blacks in Stockton, California, was due to the group's "folk theory" of getting ahead. His original ethnographic research began in 1968 and lasted for 21 months. During that time, Ogbu attended community meetings, made classroom observations, and interviewed parents, teachers, students and community leaders. A questionnaire was also administered to 225 students in the fifth through twelfth grades and dealt with:

(a) family background;

(b) educational and occupational goals;

(c) influence of parents, teachers, and peer groups as perceived by the children;

(d) the extent to which the children saw themselves or others responsible for the type of work they did in school. (Ogbu, 1974, p.18)

Relevant school records of students were examined to study discipline problems and school progress as indicated by letter grades given to students in various classes. Although school letter grades are not a very reliable indicator of school achievement, because the marking is open to the subjective grading practices of the teachers, more quantative data from standardized test performances and school drop out rates did reveal that blacks were not achieving the same level of academic success as whites and other minorities in the Stockton area (Ogbu, 1977).

Ogbu concluded that the life experiences of the black community in the Stockton area demonstrated that academic success had not produced social or economic rewards for blacks. Stockton had never offered blacks equitable rewards for their educational efforts in terms of jobs, income, housing, or social position. Therefore academic success was not incorporated into the black "folk theory" of getting ahead. Black parents may have verbally encouraged their

children to get a good education, but communicated more powerful and more subtle messages that contradicted what they had said. The parents often worked in low level, low paying jobs, or were unemployed. The adults openly discussed their experiences and frustrations of dealing with a system controlled by the dominant white culture. As a result, black youths did not persevere in their academic pursuits because they perceived there to be no reward for their efforts. The black students did not think they were less able than their more academically successful peers from the white community. However, attempting to achieve educational success was associated with being white; those black students who did put effort into their schooling were ostracized by their black peers.

Low socioeconomic status and racial discrimination did not prevent Punjabi sikhs, who had immigrated to Valleyside, California, from achieving academic success (Gibson, 1987). Researchers analyzed school performance data, used participant observation techniques, and conducted formal and informal interviews with high school seniors, their parents, and their teachers. The Punjabi parents had immigrated from small rural Indian communities, were illiterate or semi-illiterate, and spoke very little English. Most of the families were supported by fathers who worked for minimum wage in the surrounding fruit orchards. Most Punjabi students could not speak English when they began

kindergarten. Despite these severe handicaps, the Punjabi students were able to achieve the same level of academic success as their white classmates. The Punjabi community also had a higher rate of high school graduates and had more of its male students enroled in upper level college preparatory maths and science classes. However, the female Punjabi students typically had lower achievement than the Punjabi males and were less likely to enroll in upper level college preparatory maths and science classes.

> The gender difference related directly to parents' assumptions about the necessity and desirability of higher education for their daughters. Although most Valleyside Punjabis said their daughters were free to go as far with their education as they wished, they said too that the girls should marry first, and that decisions about higher education and careers should be made in concert with their husbands and their in-laws. Parents worried that too much education before marriage would make a girl too independent in her views and behavior, thus tarnishing her reputation and quite possibly jeopardizing arrangements for her marriage. (Gibson, 1987, p. 265)

The Punjabi sikhs of Valleyside had incorporated achieving educational success into their "folk theory" of getting ahead (Gibson, 1987). However, the Punjabi parents

expected a certain amount of discrimination from their new hosts and vigorously protected their children from becoming Americanized. Nevertheless, they saw attaining an education as an honourable pursuit and not a part of cultural assimilation. Punjabi children were expected to learn how to speak English and do whatever was required to attain a good education, providing they also maintained strong roots within the Indian community. This meant the Punjabi students usually conformed to school rules and devoted themselves to their studies. Effort was seen as the key to academic success. The Punjabi parents and their children believed that the barriers of discrimination or lack of intelligence could be overcome by applying greater effort.

Hispanics, who recently arrived in the United States from Central America, have also challenged the odds and remained in school (Suarez-Orozco, 1987). Many of the Hispanic students came from war-torn countries and were unable to speak English. They were placed in large inner-city schools where they were confronted by an atmosphere of drugs, violence, low expectations, and the calculated tracking of minority students into nonacademic subjects (Suarez-Orozco, 1987). The Hispanic students often found they also had to work to help support their family. The Hispanics were not ideal students, but they did stay in school and attempted to learn English and obtain an education.

Suarez-Orozco (1987) used participant observations, ethnographic interviews, and the Thematic Apperception Test (TAT) to gather data on the Central American students. The TAT consists of a series of vague drawings that are presented sequentially to students. Students are asked to make up a story based on the drawing. The narrative should have a past, present, and a future. It became clear from the TAT results that many of the Hispanic students were aware of the sacrifices that had been made to give them an opportunity to have a better life. The students felt it was their responsibility to become successful in the United States so that they could repay their families for the sacrifices that had been made. Suarez-Orozco (1987) discovered that "universally, informants reported that schooling was the single most significant avenue for status mobility" (p.291). The Hispanic community had incorporated schooling into their "folk theory" of getting ahead. This was part of the reason why their children were able to persevere in school under adverse conditions.

The "Folk Theory" of Getting Ahead in a Newfoundland Setting

The "folk theory" of getting ahead attempts to explain the different achievement levels among cultural groups by focusing on the life experiences and goals of each particular group. The factors that shape the "folk theory" of getting ahead may vary from each cultural or social group. Ogbu (1988) has argued that a low job ceiling and

discrimination in hiring have deflated the value of education for certain minority groups. Women, as a group, historically have faced low job ceilings but, nevertheless, have maintained a respectable level of achievement in most academic subjects (Mickelson, 1989). Mickelson believes that women may not view economic benefits as the primary reward of educational success. Women also place a high priority on establishing healthy relationships with family and friends. The reward of education may be measured in its ability to enhance these relationships. Mickelson's arguments illustrate how every group must be studied from its own perspective. This section will set the "folk theory" of getting ahead into a Newfoundland context by looking at the life experiences of Newfoundland youth.

Many Newfoundlanders have what May and Hollett (1986) call a socio-cultural attachment to their local community. These people wish to live within the community in which they were raised. Economically this makes sense because the standard of living in rural areas is not necessarily lower because of lower incomes and higher unemployment (May & Hollett, 1986). The present unemployment insurance system allows Newfoundlanders to stay in rural areas and draws more people into seasonal occupations (May & Hollett, 1986). The Royal Commission on Employment and Unemployment in Newfoundland and Labrador concluded that the present system has not produced major changes for rural areas:

> After all, people in rural areas have lived with seasonal work for over 200 years and accept it as part of the Newfoundland lifestyle. (May & Hollett, 1986, p. 185)

Seasonal employment in Newfoundland usually implies the use of physical skills in the manual labour markets of fisheries and lumber. Newfoundlanders have attached a considerable amount of pride to their ability to work successfully in physically demanding occupations.

In certain areas of the province, unemployment and seasonal occupations may have created a "folk theory" of getting ahead that lowers the value of the promise of education. Campbell, Fowler, Noel, Senior, and Snelgrove (1975) discovered that Newfoundland students from homes where unemployment occurs generally have lower occupational expectations than students from homes where there has been continuous employment. Many youths live in communities that have numerous examples of people who, in the youths' eyes, have succeeded or done well without an education. The economic reality in rural areas allows some seasonally employed people to own their homes, vehicles and other amenities, and still have plenty of time for recreational pursuits. Subtle messages from their peers and parents suggest that education does not offer anything they need and perhaps offers them a life they do not even want. Campbell et al. (1975) found that "non-urban students aspire to and

expect lower middle class occupations to a greater extent than do urban students" (p. 68). Careers that require a high level of educational training are usually available only in urban centers or outside the province. Education is also seen as somewhat of a gamble. As the level of education increases the person begins to specialize. That person may be highly qualified but unable to substitute that training into a wide range of occupations (May & Hollett, 1986). There is a fear that the chosen profession may no longer be in demand or simply not be as rewarding as originally expected. Years of hard work will have been in vain.

Thus, semi-skilled or unskilled occupations are the mainstay of the rural Newfoundland economy. Youth realize that manual jobs are possible and no formal training is needed. Many Newfoundland youths do not depend on education and believe their lives will not be enhanced by what it offers so they reject its labour (Gedge, 1989).

Value orientations. A group's "folk theory" of getting ahead can be shaped by the group's time orientation and the degree of influence from the group's significant others. The "folk theory" of getting ahead hypothesizes that it is the influence of significant others that defines how life is to be lived. A Newfoundland youth may choose to reject the promise of future employment through education for the immediate gratification of an unskilled occupation with an income, because of the cultural orientations of the

community. Kluckhohn (1961) suggested that life goals are a critical feature of any culture and that life style is significantly determined by the culture's orientation in certain areas. One of these areas is time-orientation. Kitchen (1966) states that groups can be differentiated by the emphasis they place on the present, past and future:

> Past. Where the Past orientation is dominant, there is generally high regard for tradition. Ancestors tend to be revered. The old ways are regarded as best. Change away from tradition is deplored, toward the ways of the past encouraged. Activities should be performed as they used to be.
>
> Present. Where the Present dominates, little attention is generally given to what happened, while the future may be regarded as vague and unpredictable. There is no point in worrying about the future or trying to bring back the past. One should live each day as it comes along, do the best one can in a kind of continuous present. Things go up and down, some get better, some worsen, but generally life is about the same.
>
> Future. Those oriented toward the future are generally somewhat discontented with the present, see little or no virtue in tradition for the sake of tradition, desire not to be known as old-

> fashioned. They plan for the future, often think highly of change, believe that the future will be better for themselves and still better for their children, better than the present, better than the past. (Kitchen, 1966, p. 10)

In any Newfoundland community that is present-oriented, choosing to search for employment in the more quickly accessible skilled or semi-skilled occupations would be acceptable and perhaps even preferable. A present orientation would be consistent with a "folk theory" of getting ahead that does not value education. Present-oriented youths may choose to concentrate on achieving success in the present because they believe life will not improve in the future by achieving educational success.

Kluckhohn (1961) verified her value orientation theory by studying five communities in the American Southwest. Although the five communities were in the United States, there were marked cultural distinctions between the populations. One group was an off-reservation settlement of Navaho Indians. The next group was a Pueblo Indian community. The third was a Spanish-American village. A Mormon village and a recently established farming village of Texan and Oklahoman homesteaders made up the other two communities. The study attempted to determine which value orientations in each community were most dominant. The following is a description of what Kluckhohn believed to be

the possible value orientations in each category of basic human problems.

The relationship between Human Beings and Nature:

a) Humans are Subject to Nature and defenceless against its forces;

b) Humans have Mastery over Nature and natural forces can be overcome and put to use for human beings;

c) Humans live in Harmony with Nature.

Activity or Valued Personality Type:

a) The Being orientation stresses development and emphasizes the release and indulgence of existing desires;

b) The Being-in-Becoming orientation accepts contemplation and meditation to improve oneself and develop as an individual;

c) The Doing orientation stresses working hard and achieving results rather than enjoying life or developing the self.

Time Orientation:

a) The Past orientation stresses traditional ways as most acceptable;

b) The Present orientation emphasizes living for today and not worrying about the past or what will happen in the future;

c) The Future orientation places importance on preparing for a better life in the future.

Human Beings' relationships with each other:

a) The Individualistic orientation stresses responsibility for oneself and individual goals are more important than those of the group;

b) The Lineal orientation stresses more group goals but has a hierarchical structure where older members usually make the decisions for the group;

c) The Collateral orientation has a cooperative structure where each member in the group has equal status and all work for the benefit of the group.

People participating in the study answered a questionnaire that was administered orally. Each item told a story with three people in it or described a situation with three alternatives. Participants were asked to rank each alternative in the item according to which they thought was the best. Rankings were requested because a particular orientation may be dominant in a society, but the other orientations may sometimes be used in certain situations or by certain groups (Kluckhohn, 1961).

Kluckhohn (1961) concluded that the pattern of variation discovered in value-orientations illustrated that cultural variations existed between the different populations. The dominant value orientation of the culture will have an influence on the individual:

> Value-orientation preferences which the child, in being socialized in one cultural tradition as

> opposed to another, has subtly built into his total apperceptive mass through the role expectations imposed upon him are an extremely important aspect of his total personality. (Kluckhohn, 1961, p. 365)

Therefore it is possible that a dominant cultural time-orientation may affect personal career decisions.

Kitchen (1966) adapted Kluckhohn's instrument to study the value-orientations of grade nine students in Newfoundland. Subjects were given a written form of the original questionnaire. The wording was simplified and shortened. The wording was also modified to reflect a fishing rather than an agricultural society. The questionnaire also required pupils to indicate family characteristics and their own involvement with mass media, church activities, and peer groups. Information for community variables was provided by school principals and government officials. The research received responses from 2151 pupils from some 250 communities who were attending 168 of the 175 Anglican schools offering grade nine.

Kitchen's hypotheses were based on the research of American society which illustrated that variations in value orientations existed along a peasant-urban continuum:

> The general hypothesis of this study is that the value-orientations of Newfoundland high school pupils will vary between those typical of peasant

> society and those typical of urban society according to the pupils' involvement and that of their communities, families, and friends with the traditional fishing village and modern American urban society. (Kitchen, 1966, p. 155)

The position of each community along the peasant-urban continuum was determined by the proportion of the inhabitants in the settlement engaged in the traditional fishery, the degree of industrialization, the strength of the transportation links with the outside, the population, the degree of influence from the religious denomination, the strength of the television coverage, and the form of municipal government. The amount of involvement each family has in the traditional fishing village or modern American urban society was measured by parental occupation, education, and vertical mobility. Vertical mobility refers to the extent to which fathers' occupations are more or less urban than their grandfathers'.

Kitchen found variation in value orientation between the peasant and urban communities but the pattern did not always follow the American model. Pupils more involved in urban society had, as predicted, a greater preference for the Mastery-over-Nature orientation than those less involved. Pupils more involved in urban society also behaved as predicted by choosing more strongly the Individualistic orientation than those less involved. It was predicted that

the pupils more involved in urban society would choose the Doing orientation and be less inclined to choose the Being. However, in the Newfoundland study the pupils at the extreme ends of the peasant-urban continuum more often chose the Being orientation while the pupils in the emerging or intermediate communities more often chose the Doing orientation. Although the Future-orientation is the most dominant time orientation in modern American urban society, it was discovered that the pupils more involved in urban society in Newfoundland were less future oriented than pupils less involved. The more involved students tended to be more present oriented than the pupils from the traditional or peasant societies.

Kitchen's (1966) finding on the Time-orientation of pupils from Newfoundland fishing villages appears to be inconsistent with the behaviour of these rural students. Choosing employment in seasonal occupations over educational training for future employment appears to be a present-orientation. This may be an example of what was earlier described by Kluckhohn (1961) as a situation in which a particular value orientation is dominant but another orientation is used for certain decisions.

The "folk theory" of getting ahead suggests that the influence of significant others shapes the attitudes of the youth. Dominant value orientations within a culture are also impressed upon the youth by significant others (Kluckhohn,

1961). One influential group named by both Ogbu and Kluckhohn was the parents. A second group of significant others in the school setting is the teachers. Crocker (1989b) charges that, in Newfoundland, there is a crisis of low expectations among the teaching profession:

> One of the most striking aspects of the discussions with teachers and school district officials was the pervasive assumption that large numbers of students are simply incapable of coping with academic work at the high school level. Many, in fact, went as far as to argue that too many students are finding their way into post-secondary institutions - students who are fundamentally incapable of meeting the demands of programs at that level. Within the high schools themselves, a prevalent view seems to be that unless certain students are allowed to opt for non-academic courses, many will simply become frustrated, fail, and drop out. (Crocker, 1989b, p.45)

To further assess the students' "folk theory" of getting ahead this research will also investigate the time orientation of the students and the level of support the students perceive they are receiving from both their parents and teachers in their educational endeavours.

Attribution theory. In this section, Attribution Theory will be briefly explained and it will be shown how it can be

used to assess certain aspects of the students' "folk theory" of getting ahead.

Attribution Theory described by Weiner (1974) states that individuals attribute achievement outcomes predominantly to the four causal factors of luck, task difficulty, effort, and ability. Weiner (1974) proposed that these causal factors be along two dimensions: a locus-of-causality dimension and a stability dimension.

> The locus of causality dimension is seen as one in which, at one end, actions are seen as having personal, or internal causes (such as effort or ability); and at the other end, as having environmental, or external causes (such as luck or task difficulty). The stability dimension is seen as one in which, at one end (the "stable" end), causal factors have somewhat enduring characteristics, and will remain relatively invariant over time (task difficulty and ability are considered stable causes); and at the other end (the "unstable" end), causal factors will vary over time, and may change from one moment to the next (luck and effort are considered unstable causes). (Pancer & Eiser, 1977, p. 253)

Ability will influence an individual's locus of causality. High ability students tend to attribute their achievement outcomes to internal causal factors (Weiner, 1974).

Therefore, high ability students believe they have a greater measure of control over their future than do low ability students.

Students who attribute their success and failure to external and stable causal factors are more likely to be unmotivated when presented with new achievement-oriented situations, if they have experienced failure at similar tasks in the past. These students see little chance of achieving success in the newly presented task. The stability of the attribution is the more important factor in determining one's future expectations of success or failure (Weiner, Heckhausen, Meyer, & Cook, 1972; Valle & Frieze, 1976; Weiner, 1974). If one attributes past performance to stable causes, which are expected to remain invariant over time, one will expect future performances to be similar.

Attributing outcomes to the unstable causal factor of effort appears to have a more positive impact on achievement motivation. Students will show greater persistence at achievement-oriented activities where failure can be attributed to effort (Andrews & Debus, 1978; Weiner et al., 1972). Research by Andrews and Debus (1978) illustrated that students trained to attribute failure to lack of effort became more persistent at completing future tasks. Because effort is an unstable causal factor it is worthwhile, in certain situations, to persist at an achievement-oriented task because, although failure may have been experienced in

the past, there is the likelihood that the outcome may change.

Although effort is also an internal causal factor it allows students the opportunity to protect their egos. Some students will minimize study on a task that has been described as difficult and as needing a high ability to succeed. They feel it is better to receive charges of laziness than to risk failing at the task and demonstrating low ability (Covington, Spratt, & Omelich, 1980; Nicholls, 1984).

The "folk theory" of getting ahead proposes that youths from certain minority groups are unmotivated to achieve academically because they perceive the circumstances which make an education useful to be beyond their control (Ogbu, 1988). The youth believe that low job ceilings and discrimination limit education's potential for upward social mobility (Ogbu, 1988). The members of the underachieving minorities did not attribute their failure to lack of ability (Ogbu, 1988). They were further frustrated by the belief that the factors or circumstances are stable and not able to be altered. Research by Raviv, Bar-Tal, and Bar-Tal (1980) supports the conjecture that disadvantaged children, defined on the basis of their socioeconomic status, tend to attribute their failure more to stable than unstable causes.

Newfoundlanders do not appear to suffer from discrimination. However, many of Newfoundland's rural

communities may have simulated the effect of a low job ceiling because there is little room for upward mobility in an economy that is almost exclusively based on semi-skilled occupations. Therefore, some Newfoundlanders may have the same attributional pattern as the more academically unsuccessful minorities. The persistently poor economic climate in Newfoundland may have produced the same pessimistic attitude that things will not change and are out of any individual's control.

This research will investigate the causes to which the Newfoundland students attribute their success or failure in academic tasks in science in order to help assess the students' "folk theory" of getting ahead.

The Relationship between Ability and Science Achievement

Studies using the "folk theory" of getting ahead assume no disparities exist between the general abilities of any particular minority group and the dominant cultural group. This may be a plausible assumption for very large groups. Therefore, most studies in this area neglect to ascertain ability levels of each group before comparing achievement levels. This section of the literature review will show that the general ability of smaller groups of students cannot be ignored when comparing their achievement levels, because a strong relationship exists between ability and science achievement.

Measures of ability show consistent and positive relationships with achievement (Fraser, Walberg, Welch, & Hattie, 1987). Fleming and Malone (1983) confirmed these results in a meta-analysis for studies conducted in kindergarten through twelfth grade since 1960. In this meta-analysis, science achievement was defined as "outcome on any instrument that measures science achievement in content areas taught in kindergarten through twelfth grade" (Fleming & Malone, 1983, p. 483). General ability consisted of a number of measures of general, verbal, or mathematical intelligence; verbal and mathematical science aptitude tests; and language ability. The relationship between the selected ability measures and students' science achievement had mean correlations ranging from 0.41 to 0.43. It is interesting to note that the meta-analysis found considerable variability in the relationship across grade levels:

> The relationship between general ability and science achievement is lowest at the elementary school level ($r = 0.25$). This correlation coefficient more than doubles at the middle school level ($r = 0.59$) and decreases again by about 20% during the high school years ($r = 0.47$). (Fleming & Malone, 1983, p. 484)

A quantitative synthesis approach to the review of the relevant research verified the strong positive relationship

between ability and science achievement. Steinkamp and Maehr (1983) synthesized findings from 66 articles and reports since 1965 and found the mean correlations between achievement and cognitive ability to be significantly positive for boys ($r = 0.36$) and for girls ($r = 0.32$).

Harty, Beall, and Scharmann (1985) investigated the relationship between fifth grade students' science achievement and their attitudes towards science, interest in science, reactive curiosity, and scholastic aptitude. Scholastic aptitude was measured by the "Cognitive Abilities Test: Multi-Level Form 3" which had a verbal, quantitative, and nonverbal component. A multiple regression of the six predictor variables accounted for 47% of the variance in science achievement (Harty et al., 1985). However, most of the variance (44%) was attributed to the verbal, quantitative, and nonverbal variables that made up the scholastic aptitude measure. This is consistent with the findings of the meta-analysis completed by Steinkamp and Maehr (1983).

Affect, as defined by instruments purporting to measure emotions, values, and feelings related to science, had a positive but significantly lower relationship with achievement than did ability. The mean correlations between achievement and affect were small for boys ($r = 0.19$) and for girls ($r = 0.18$) (Steinkamp & Maehr, 1983).

Burkman, Tate, Snyder, and Beditz (1981) investigated the simultaneous effects of two teaching methods, time allowed for study, and academic ability on achievement in a high school science course. One teaching method was teacher directed and the other was more student directed. With the teacher-directed method the teacher set specific daily work schedules and held full class lectures and discussion sessions. With the student-directed method the teacher presented the order and time limit for the content but gave the students responsibility and independence to pace their studies. The teacher provided individual help when needed. Students were taught three specific sections of a life science course. The combination of two instructional methods and three allowed times resulted in six treatment groups. The main effect of ability on achievement was strong but there was an ability-treatment interaction. Burkman, Brezin, and Griffin (1982) later conducted a similar study but added another teaching method and a second student variable. The additional instructional method allowed groups of two to five students to work collectively to complete exercises, and to determine the pace of progress. Any member who failed to achieve the preset mastery level on a test was required to do review and could rejoin the original group only after passing the test. The second student variable measured the students' assessment of the degree to which their teacher implemented the assigned instructional method. The

interaction among the three variables formed a complex pattern of results and sometimes contradicted results from the original study. However, one clear conclusion was made:

> Student ability interacted with SAI (student assessment of treatment implementation) and assigned treatment, but had an independent effect on achievement distinct from all of the other variables. For all assigned treatments and levels of SAI, achievement increased with ability. (Burkman et al., 1982, p. 783)

Two other studies showed that the relationship between ability and achievement may be weakened by employing non-conventional instructional methods. Burrows and Okey (1979) hypothesized that the use of the Mastery Learning Strategy would improve achievement and negate the relationship between ability and achievement. A group of fourth and fifth graders were taught a topic in mathematics using the mastery learning approach and their achievement results were compared to three other groups that were subjected to more conventional teaching methods. The students in the mastery learning program were given the same instruction as the other groups but in addition were given diagnostic tests for each skill. The tests were corrected and the students were directed to additional instruction until they demonstrated mastery of the skill. No new content was covered by the student until he or she achieved mastery of each skill.

Burrows and Okey (1979) found that the students in the mastery learning program did achieve better results on their posttest but the relationship between ability and achievement was reduced from a correlation coefficient of .84 only to .51, and was therefore far from negated.

Research by Anania (1983) confirmed that different instructional methods may only weaken the relationship between ability and achievement. In the study, three forms of instruction were used to teach probability to fourth and fifth graders and to teach cartography to eighth graders. Conventional instruction was group based and the class was paced by the teacher. Students were allowed to proceed to new learning regardless of their test performances. The second instructional approach used mastery learning. Students who did not initially meet an 80% criterion set for mastery were given additional opportunities to participate in learning, and were not introduced to new topics until they acquired the entry behaviours needed to succeed at the next level. The third instructional approach used tutoring. Undergraduate education majors enroled in a private college were used as tutors. In the fourth and fifth grades, each tutor was responsible for three students, while in grade eight one-on-one tutoring was provided. Students in the tutorial program were held to a criterion of 90% accuracy on formative tests. Anania discovered ability accounted for 38% of the variance in achievement in the conventional group,

15% of the variance in achievement in the mastery group, and only 10% of the variance in achievement in the tutorial group.

Ability cannot be ignored when attempting to understand achievement levels in science:

> To extrapolate, to achieve in science requires more than good intentions (cf. Maehr, in press). It requires ability. This may be similarly true for all school subjects, but it does appear to be especially true for school science. (Steinkamp & Maehr, 1983, p. 388)

This research will attempt to determine the direct relationship between ability and science achievement with this sample of students. The research will then attempt to determine the influence of the "folk theory" of getting ahead on science achievement with ability controlled.

The Relationship Between Quality of Instruction and Student Outcomes

The Science Council of Canada (1984) proposed that quality science education, especially at the secondary school level, requires specialist teachers and adequate laboratory facilities. Fortunately, most secondary schools in Canada do have adequate laboratory facilities and highly trained science teachers teaching in their areas of speciality (SCC, 1984). The present research expects to find that the two communities under study are receiving the same

quality of instruction. Although quality of instruction can be inferred in different ways, this study will depend upon teacher characteristics (training and experience) and school facilities. Both schools are under the authority of the same school board, so each should receive the same expenditure per student and the same standard of qualified teachers. However, the more urban community may attract more experienced teachers and have a greater financial ability to assist the school obtain facilities. Therefore, this section of the review will investigate the relationship between quality of instruction and student achievement so that the present research can assess the impact of some instructional discrepancies that may exist.

The value of determining whether the quality of instruction is able to explain some amount of the variance in academic achievement is that presumably the school has greater control over this variable than other factors that may influence achievement. Unfortunately, researchers have found it difficult to separate the effects of the quality of instruction and student characteristics such as socioeconomic status, family background, and ability on student outcomes (Heyneman & Loxley, 1983). In 1966, the Coleman Report released its findings on an extensive survey of American schools that included its assessment of the impact of quality of instruction on achievement:

> The components of school expenditure have little, if any, impact on student performance. Consequently, investments in reduced class size, improved teacher quality, or improved school facilities are likely to have little effect on educational output. (Perl, 1973, p. 157).

However, the validity of the conclusions in the Coleman Report were criticized because of the statistical techniques used to analyze the data (Murnane, 1975).

A second American study attempted to determine if, after controlling for students' family backgrounds and that of their classmates, increases in educational expenditures at the secondary school level would increase the scores of students on tests of academic ability (Perl, 1973). The study was based on data from a large sample of students who graduated from high school in 1960. It was discovered that in schools with a higher percentage of teachers with M.A. degrees, and Ph.D's, and with more of the teacher's time spent in his or her area of specialization, student performance on ability tests was greater (Perl, 1973). There was a qualification noted for teacher training:

> The impact of having teachers with M.A. degrees may reflect the special qualities of teachers who go on to receive M.A.'s and not the usefulness of advanced training per se. If this is the case, while it would be useful for individual schools to

> pay a premium to attract teachers with advanced training, there might be no particular gain associated with encouraging the existing staff to acquire M.A. degrees. (Perl, 1973, p. 169)

Perl (1973) also concluded that teacher experience had no significant effect on student performance on academic ability tests.

Heyneman and Loxley (1983) suggested that instead of making generalizations based on a few of the world's school systems (mostly in Europe, North American, and Japan) a fairer assessment of the impact of the quality of instruction could be obtained by studying a wider range of countries. Therefore, they investigated the effect of primary school quality on pupil academic achievement across twenty-nine countries from Africa, Asia, Latin America, and the Middle East. Survey information was gathered from six major sources. The largest of those sources was an 18-country science survey completed by the International Association for the Evaluation of Educational Achievement (IEA). School and teacher quality appeared to influence student learning around the world, but, the poorer the country, the greater the impact of school and teacher quality on science achievement.

Perl's (1973) conclusion on the effect of teacher experience on student achievement has been contradicted by other studies. Biniaminov and Glassman (1983) found that, in

Israel, teachers who had more years of teaching within the same school produced the highest rates of school-certified graduates. Student achievement was measured by the rate of certificates because, in Israel, the certificates were given only to high school graduates who successfully passed governmentally prepared and administered examinations. Teachers with long teaching experience in the same secondary school may have had a positive influence on student achievement because the teachers were familiar with the abilities of the school's student population and knew the academic requirements for passing various government exams (Biniaminov & Glassman, 1983). Biniaminov and Glassman predicted "an increase of 8 years of teaching experience in the same school would raise the percent of government certificated graduates by 35.53 percent" (1983, p. 264).

Murnane (1975) measured the effect of teaching experience by studying the performance of 1000 second and third grade Black students in maths and reading. The results of student performance suggest teachers improve with experience for the first three years of teaching, but teachers with five years of experience are equally as effective as those with ten years of experience (Murnane, 1975).

A meta-analysis by Druva and Anderson (1983), conducted to look at the relationships between teacher characteristics and student outcomes, found that teacher

experience accounted for only 1% of the variation in student achievement. The meta-analysis studies done by Sweitzer and Anderson (1983) and Druva and Anderson (1983), which looked at research on science teacher education practices, suggest that science teacher training influences teacher performance but does not translate into a strong influence on student achievement. Sweitzer and Anderson found a mean effect size of 0.77, from 68 different studies, when various teacher outcome criteria were used as dependent measures. Teachers who received inservice or preservice science teacher educational training tended to outperform the comparison groups on measures of science content, process, attitude toward science, and desired teaching behaviours. Desired teaching behaviours included behaviours such as questioning techniques and use of the inquiry strategy. However, teacher training accounted only for four percent of the variation in student achievement (Druva & Anderson, 1983).

Specialized science teacher training may have an even less significant influence on student achievement in science at the elementary school level. Research by Zuzovsky, Tamir, and Chen (1989) judged specialized science teachers in their sample to be better prepared and to exhibit more adequate modes of science instruction than the general teachers. The specialized teachers had done more post-secondary science studies, had received more preparation for science teaching and inservice training, and had more science teaching

experience. However, no significant differences were found in science achievement between the students (grade 5) of the two teacher groups. It seems a mediating effect of attitudes acted differently on the two teacher groups. The overall effect of students' attitudes towards school and science was negligible for the general teacher group. There was an overall negative influence of students' attitudes on achievement in the specialized teacher group. As a result, similar achievement was made by the two student populations.

Although the Science Council of Canada (1984) calls for improved laboratory facilities, the review of the literature suggests that laboratory instruction does not significantly affect science achievement. Bates (1978) review of the literature uncovered that "lecture, demonstration, and laboratory teaching methods appear equally effective in transmitting science content" (p. 74). However, laboratory experiences do appear to promote students' skills in working with equipment and may nurture positive attitudes towards science (Bates, 1978). Yager, Eigen, and Snider (1969) investigated the effects of laboratory and demonstration methods upon outcomes of instruction in a grade eight biology course. There were three treatment groups. In the laboratory group students performed individually and completed 50 of 57 laboratories designed for the course. The demonstration group completed each of the laboratories as a class demonstration done by the teacher or a student. The

discussion group did neither the laboratories nor demonstrations, but were given results for the laboratories for discussion and interpretation. There were no significant differences among the three treatment groups in terms of achievement in biology. There was also no significant differences among the three groups in terms of critical thinking, understanding of science and scientists, and attitudes towards biology. The students in the laboratory group did demonstrate more laboratory skills than the students in the other two treatment groups. Skills were determined by a practical examination which included focusing a microscope, and constructing and working a manometer. Yager et al. (1969) made the following conclusion:

> Using the lack of an adequate laboratory (materials, space, or time) as a means of explaining the lack of desired outcomes or failure to provide a modern course may not be appropriate in view of this study. (p. 84)

Babikian (1971) discovered similar results regarding laboratory instruction and achievement. Babikian used three slightly different treatments with nine classes of eighth grade students to teach six concepts of buoyancy in liquids. An expository group had the teacher present the concept verbally and give examples. A class discussion could follow but no audiovisual materials other than a chalk board were

used. In the laboratory group the concept was stated by the teacher and then the procedure was described for the verification of the concept in the laboratory. Students in the discovery group were asked to discover an unstated concept individually, after receiving instructions on the use of laboratory equipment. There were no significant differences in overall achievement observed between the expository and laboratory methods. Both methods were superior to the discovery method in terms of achievement.

The Relationship between Gender and Science Achievement

Research shows consistently that there are sex-related differences in science achievement, and usually boys outperform girls (Erickson & Erickson, 1984). The Second International Science Study (SISS) conducted in Canada for the IEA revealed that boys outperformed girls in grade 5, grade 9, and in the students' final year of schooling (Connelly, 1989). For students in their final year of high school, the boys outperformed the girls in biology, physics, and particularly in chemistry (Connelly, 1989). In the United States the National Assessment of Educational Progress (NAEP) conducted large scale surveys of science achievement in 1969-70, 1972-73, and 1976-77 and found similar results (NAEP, 1978). In each survey the NAEP assessed science at three age levels (9, 13, and 17 years of age). The achievement level of males at each age was higher

than that of the females in all three assessments of science achievement (NAEP, 1978).

However, in Newfoundland, the relationship between gender and science achievement appears to be different than that found in larger target populations. The effect of gender on science achievement in Newfoundland is not significant though the overall picture of performance in science tends to favour the girls (Crocker, 1989b).

Although gender has had a small effect on science achievement in Newfoundland, the literature suggests that sex-related differences in science achievement do exist. Therefore, this research will attempt to determine the influence of the "folk theory" of getting ahead on science achievement with the effect of gender controlled.

Summary and Conclusions

The research shows that certain minority groups have achieved success in education despite discrimination, the existence of job ceilings, and having cultural discontinuities with the dominant society. It appears that the minority groups that do succeed are the ones that have a "folk theory" of getting ahead which stresses that, despite the obstacles, education will produce economic rewards and upward status mobility. Each groups' "folk theory" of getting ahead is shaped by their present experiences and their history. The review shows there is reason to believe that the cultural and economic influences in certain areas

of Newfoundland may have caused some communities to have developed "folk theories" of getting ahead that cast doubt upon the usefulness of achieving an education in science.

Most researchers have taken an ethnographical approach to assessing a groups' "folk theory" of getting ahead. This study will take a psychometric and correlational-causal approach to assessing students' "folk theory" of getting ahead. The review of the literature has attempted to establish that the students' "folk theory" of getting ahead can be assessed by measuring the value they place on obtaining a science education, the amount of support they perceive they are receiving from their parents and teachers, and by determining their time-orientation and their attributional patterns used to explain the causes of their success or failure in science.

The school ability of students cannot be ignored when comparing achievement levels, because a strong relationship does exist between school ability and science achievement. School ability may also affect an individual's "folk theory" of getting ahead, because higher ability students tend to have a different attributional pattern than lower ability students for explaining their success or failure.

The review of the literature suggests that the amount of facilities, and level of teacher experience and training are likely to affect science achievement only if there is a

wide variation in these variables within the sample populations being studied.

Although there appears to be no significant sex-related differences in science achievement in Newfoundland, the effect of gender upon science achievement will be investigated in this sample because female students typically do not do as well in science as male students. The literature also suggests that gender will influence an individual's "folk theory" of getting ahead. In some cultures, females do not receive the same support from home as the males, and females may even have their own definition of success. In Newfoundland, female students aspire more to upper and middle class occupations than do male students (Campbell et al., 1975). It has also been found that, in Newfoundland, level of educational attainment has a greater impact on the labour force activity of women than that of men (Anger, McGrath, & Pottle, 1986). When compared to women with less formal education, female university or college graduates are more likely to be employed, to remain in the labour force for longer periods of time, and to have employment with career interest and opportunity for advancement (Anger et al., 1986). Also, although female high school graduates in Newfoundland have not enroled heavily in all the different science courses offered at the post-secondary level, they have enroled heavily in the life sciences and in nursing (Crocker, 1989b). Therefore, the

female students may see science education as a valuable commodity for future success.

CHAPTER 3: METHOD

This research takes a psychometric, correlational-causal approach to assess the power of Ogbu's "folk theory" of success in explaining persistent, disproportionate low science achievement. The present chapter states the hypotheses of the study and describes the methods used to test them. There is a description of the sample, and of the instrumentation, including a description of the OLSAT school ability measure, the IEA science achievement test, and a detailed description of how a questionnaire was designed to determine certain aspects of the students' "folk theory" of getting ahead. The chapter concludes with a description of the collection and analysis of the data.

Hypotheses

The first stage of this research attempts to establish that the Country Cove students are underachieving, by comparing their performance on a science achievement measure with that of the Earletown students. It is hypothesized that the Country Cove students will have lower scores on the science achievement measure than the Earletown students.

The review of the literature suggests that there is a strong positive relationship between school ability and science achievement. The second stage of this research attempts to establish that the community will affect science achievement even when ability is controlled. It is hypothesized that the Country Cove students will have lower

scores on the science achievement measure than students of equal school ability from Earletown.

In the next stage of this research a causal model (shown in Figure 3.1) is tested in an attempt to establish that the "folk theories" of getting ahead for the two communities will account for part of the discrepancy in science achievement levels between equal ability groups. To the degree that students value science education, perceive they have support from their parents and teachers, have a

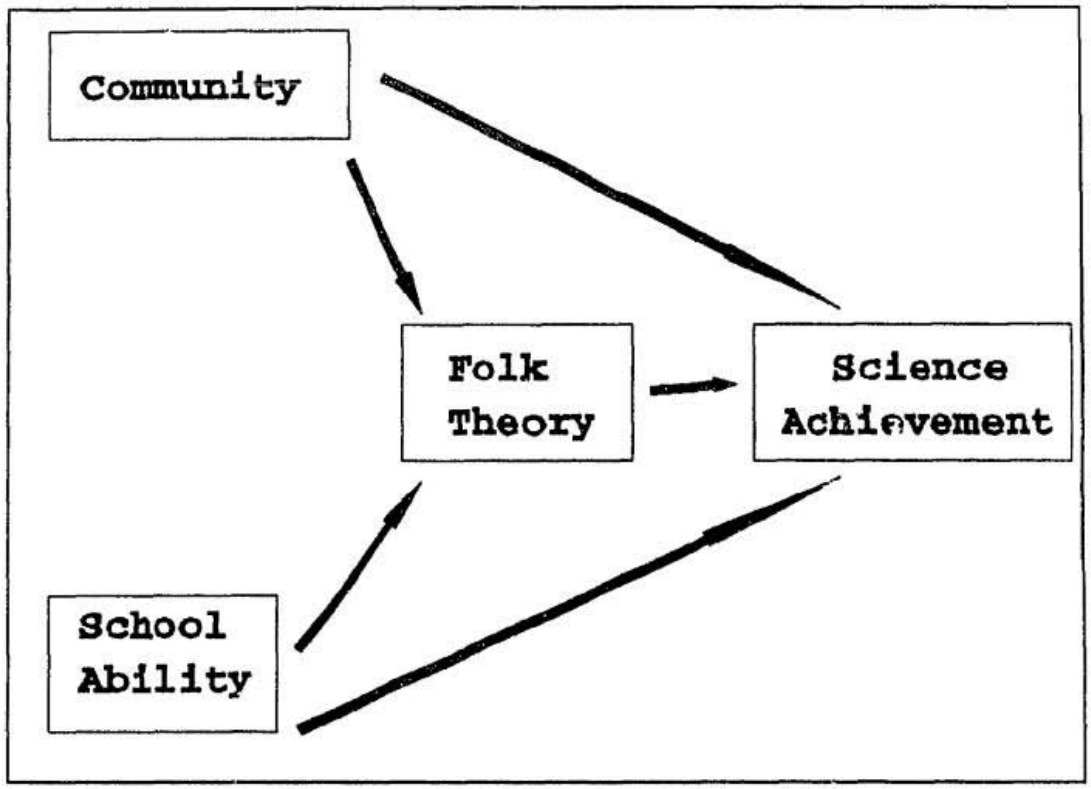

Figure 3.1. The Hypothetical Causal Model Used to Explain the Causal Relationships among Community, School Ability, the "Folk Theory" of Getting Ahead and Science Achievement.

future-orientation, and attribute their success or failure in science to internal causal factors they are hypothesized to have a "folk theory" of getting ahead that will promote science achievement. It is hypothesized that the economic and cultural environment in the Country Cove area has created a local "folk theory" of getting ahead that is less likely to promote science achievement than the local "folk theory" of getting ahead for Earletown. The review of the literature shows that high ability students have a more internalized locus-of-control. Therefore, it is also hypothesized that the high ability students' "folk theory" of getting ahead is more likely to promote science achievement than the low ability students' "folk theory" of getting ahead.

In this stage of the research another causal model (shown in Figure 3.2) was used to study the relationship between the community, the students' "folk theory" of getting ahead, and achievement in science when the effects of school ability, grade, and gender have been controlled. This model is hypothesized to account for more variance in science achievement in this sample. This model is also expected to give a more accurate measure of the mediating effect of the "folk theory" of getting ahead on the relationship between the community and science achievement.

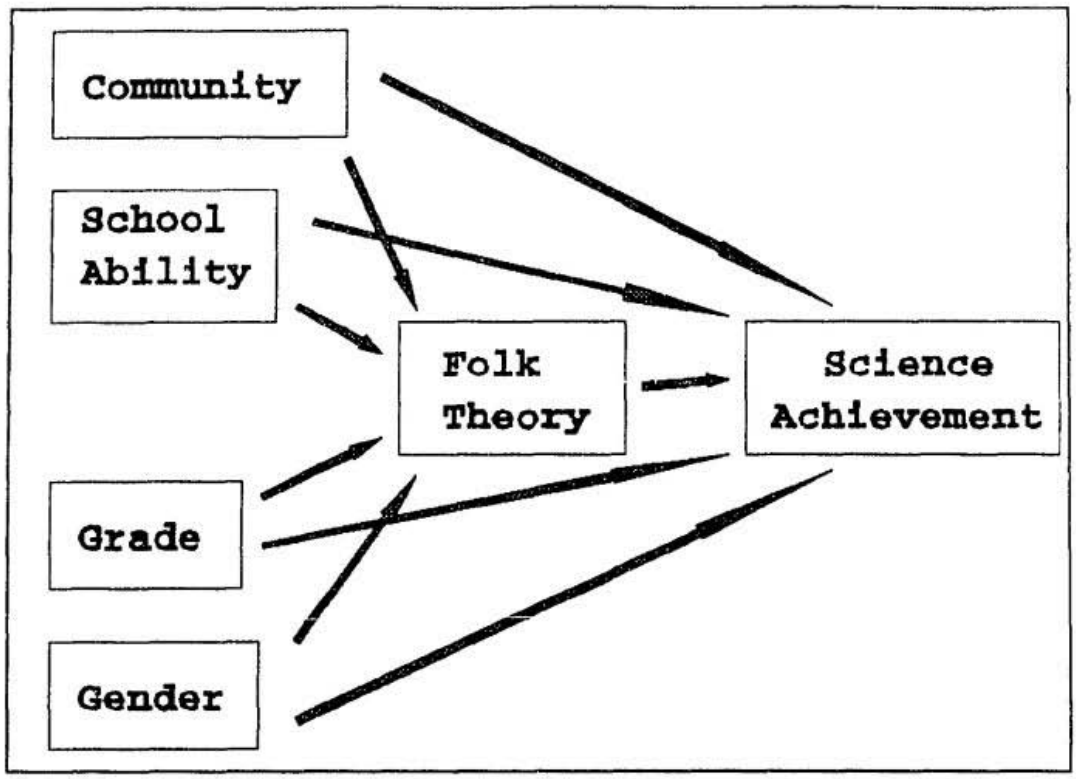

Figure 3.2. The Hypothetical Causal Model Used to Explain the Causal Relationships among Community, School Ability, Grade, Gender, the "Folk Theory" of Getting Ahead and Science Achievement.

Female high school students in this province have slightly outperformed the male students. Therefore, it is hypothesized that in this causal model the female students will score higher on the science achievement measure than the male students. The research literature also suggests that females may have a different "folk theory" of getting ahead than males. In Newfoundland, the level of educational attainment has had a greater economic impact on females than on males. It is hypothesized that the female students' "folk theory" of getting ahead will be more likely to promote

achievement in science than the male students' "folk theory" of getting ahead. Thus, gender may act as a suppressor variable, suppressing the relationship between the students' "folk theory" of getting ahead and science achievement, unless it is controlled.

The higher grade level students have completed more science courses than the lower grade level students. This should give the higher grade level students an advantage on a science achievement measure. Therefore, it is hypothesized that the scores on the science achievement measure will increase with the students' grade level. Spain and Sharpe (1990) found in a survey of early school leavers in Newfoundland that the percentage of early school leavers increased from grade 10 to grade 12. The largest percentage of early school leavers were in grade 12 at the time of school leaving.

> The most salient group of early school leavers were those who had reached Level III before withdrawing from school. The size of the group was not the only factor of interest. This group had also enjoyed the most success of all the leavers surveyed. They had persisted in school the longest. They were the oldest of the early school leavers, well beyond school leaving age. (Spain & Sharpe, 1990, p. 168)

It appears that higher grade level students may abandon their faith in education despite their history of past success and persistence. Therefore, it is hypothesized that, as the grade level increases, the students' "folk theory" of getting ahead will be less likely to promote achievement in science. Thus, grade also may act as a suppressor variable, suppressing the relationship between the students' "folk theory" of getting ahead and science achievement, unless it is controlled.

Quality of instruction could also act as an intervening factor in the relationship between the school and achievement in science. However, it was omitted from the causal models because it was beyond the scope of this thesis to develop a quantitative measure of it. It was hypothesized, however, that there are no significant differences in the quality of instruction between Country Cove and Earletown. The quality of instruction in both schools was investigated qualitatively in order to determine whether this was a valid assumption.

Sample

To assess the impact of the "folk theory" of getting ahead on science achievement it was necessary to identify two communities that should have a different "folk theory" of getting ahead. Country Cove was chosen because it appears the social and economic influences in this region could shape a "folk theory" of getting ahead that does not

incorporate the need for academic success. Earletown was chosen because the social and economic environment in that area should have promoted a "folk theory" of getting ahead that values attaining an education. Information from the 1986 Canadian Census (Statistics Canada, 1988), shown in Tables 3.1 and 3.2, illustrates the difference between the two communities in the study and shows how each community

Table 3.1

Percentage of the Population 15 years of Age and Older by Highest Level of Schooling

	Canada	NFLD	Earletown	Country Cove
1. Less than Grade 9	17.3	26.6	13.2	43.3
2. Grade 9-13				
-Without Certificate	27.1	31.3	33.6	36.5
-With Certificate	12.7	8.6	9.6	6.9
3. Trades Certificate	3.1	1.7	2.7	0.9
4. Other Non-university Education				
-Without Certificate	6.8	3.5	4.7	2.6
-With Certificate	14.5	14.4	21.5	5.6
5. University No Degree	8.9	8.3	8.3	1.7
6. University With Degree	9.6	5.6	7.2	1.7

Table 3.2

Percentage of the Population that Is Unemployed

	Canada	NFLD	Earletown	Country Cove
1. Between the age of 15-24	17.0	38.9	36.4	55.0
2. Over the age of 25	8.5	21.6	19.6	60.7

compares with the Canadian and Provincial education and economic conditions. The Country Cove youth have few citizens with a high level of education or training to act as role models. Table 3.1 shows that the majority of the population 15 years of age and older in the Country Cove area has not achieved a high school graduation certificate. As a result most of the residents in Country Cove do not depend upon a high level of education or training in their daily lives. Table 3.2 shows that there is a higher level of unemployment in the Country Cove area. The majority of the families make their living from seasonal employment in the fishery or logging (Statistics Canada, 1988).

The Earletown community has a greater number of citizens with higher educational credentials to act as role models for their youth. Table 3.1 shows that a larger percentage of Earletown's population, who are 15 years of age and older, have received some amount of post-secondary

educational training. Table 3.2 shows that unemployment is lower in Earletown. There is more permanent employment in Earletown than in Country Cove (Statistics Canada, 1988).

The two schools used in this study are the only senior high schools in each community. The achievement profiles of both schools also are consistent with different "folk theories" of getting ahead. The Earletown and Country Cove schools have in the past offered the same senior high school science courses in the same year. From 1983 to 1989 Earletown students have averaged 9 marks better than the Country Cove students on the unadjusted public examination results in these science courses. The results from the 1983 and 1986 Canadian Tests of Basic Skills (CTBS) for grade 8 students, shown in Figure 3.3 and Figure 3.4, further highlights the difference in performance between Country Cove and Earletown students. The Country Cove students have performed consistently below the standards set by students in Earletown, Newfoundland, and the rest of Canada.

The Country Cove school has approximately 230 students from grade 7 to 12. The Earletown school has approximately 460 students from grade 4 to 12. Both schools are under the authority of the same school board. A total of 242 senior high school students from the two schools participated in the study. There was a total of 87 grade 10 students, 88 grade 11 students and 67 grade 12 students. There were 94 students from Country Cove and 148 students from Earletown.

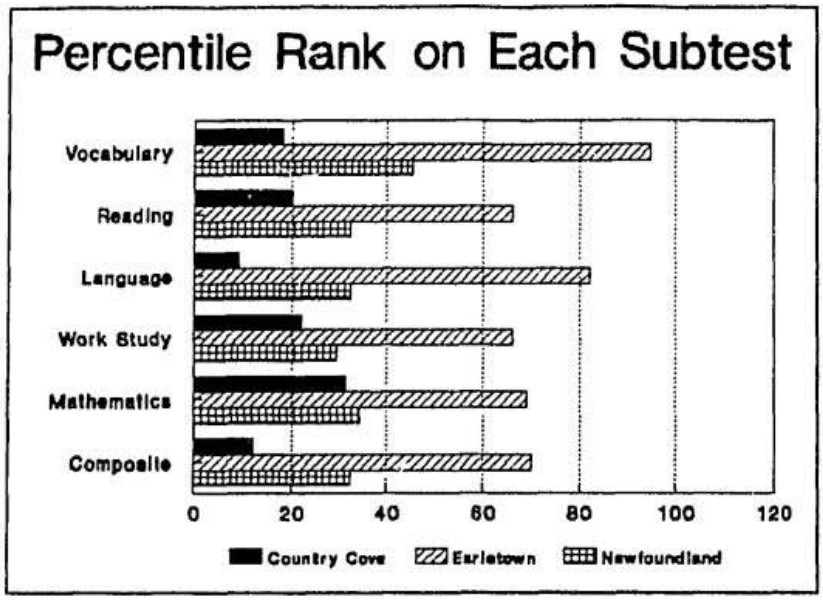

Figure 3.3. Percentile Ranks on each Subtest of the 1983 Grade 8 Canadian Tests of Basic Skills for Country Cove, Earletown, and Newfoundland.

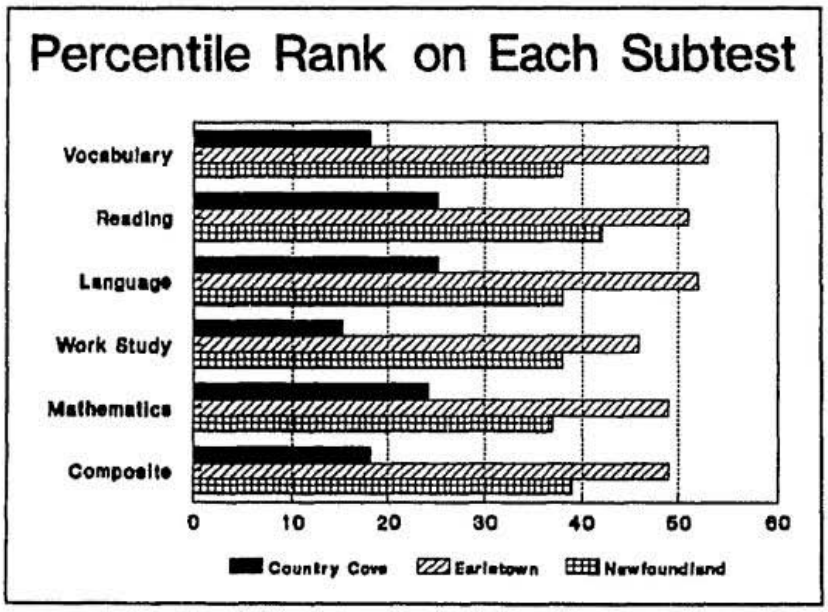

Figure 3.4. Percentile Ranks on each Subtest of the 1986 Grade 8 Canadian Tests of Basic Skills for Country Cove, Earletown, and Newfoundland.

Table 3.3 gives the number of males and females in each grade for each school. Six students chose not to participate and 17 were absent from school on the day the research was being conducted. However, the 242 students studied comprise an extremely representative sample of each school because only a small number of students in either school did not participate in the study.

Table 3.3

The Number of Males and Females in Each Grade by School

	Grade		
Gender	10	11	12
Country Cove			
Males	20	15	15
Females	12	22	10
Earletown			
Males	32	19	17
Females	23	32	25

Procedure

Instruments

The Otis-Lennon School Ability Test

The Sixth Edition of the Otis-Lennon School Ability Test (OLSAT) Level G (Otis & Lennon, 1989b), designed for students in grades 9 through 12, was the instrument used to measure

students' school ability. The OLSAT is designed to assess students' ability to cope with school learning tasks. The instrument measures verbal, quantitative, and figural reasoning skills. The students' performance on such tasks as detecting similarities and differences, solving analogies and matrixes, classifying, and determining sequence is evaluated. The OLSAT can be utilized to identify students who appear to be achieving below their academic potential.

The OLSAT is a pen and pencil multiple-choice test which is group-administered and objectively scored. Students are presented with 72 items and given a 40 minute time limit (Otis & Lennon, 1988). For the purposes of interpretation, raw scores are converted to scaled scores. Norms for grade and age are provided to complete the conversion. The scaled score, or School Ability Index (SAI), is a normalized standard score with a mean of 100 and a standard deviation of 16 (Otis & Lennon, 1989a). The SAI scores for age are provided in three-month intervals and were used in this study because they give a finer measure of an individual's school ability. The same data is also used to derive a Verbal and Nonverbal SAI.

Kuder-Richardson-20 reliability coefficients, reported for grade and age, range from .80 to .93 (Otis & Lennon, 1989a). The standard errors of measurement for 14-, 15-, 16-, 17-, and 18-year olds range from 4.2 to 5.3 SAI points. These high internal consistency reliability coefficients suggest that the OLSAT is measuring a single school ability dimension.

A measure of validity was computed by correlating scores from the OLSAT Level G with scores from the Stanford Test of Academic Skills, Third Edition. Correlations between the two instruments range from .57 to .82 (Otis & Lennon, 1989a), suggesting that the OLSAT is a valid measure of school ability.

"Folk Theory" Questionnaire

A questionnaire was designed to investigate certain aspects of the students' "folk theory" of getting ahead. Students were given 30 minutes to complete the questionnaire. The questionnaire has 85 five-point Likert items (see Appendix A) and consists of the following five subscales:

a) The Value of Science Education (Values)
b) The Perceived Support of Teachers (Teacher)
c) The Perceived Support of Parents (Parent)
d) The Time-Orientation of the Student (Time)
e) Attribution
    i) Locus of Control (Control)
    ii) Stability (Stability)

Values subscale. The Value of Science Education subscale was designed to measure the value students place on having an education in science. This subscale attempted to determine whether the students believe that a science education can in some degree improve their chances of getting ahead in life by increasing career and employment

opportunities, helping to enhance family life, promoting a healthy lifestyle, helping to clarify religious beliefs, or by providing an amount of intrinsic satisfaction.

Teacher subscale. The Perceived Support of Teachers subscale was designed to measure the support students perceive they are receiving from their teachers to achieve in science.

Parent subscale. The Perceived Support of Parents subscale was designed to measure the support students perceive they are receiving from their parents to achieve in science.

Time subscale. The Time-Orientation subscale was based on Kitchen's (1966) Value-Orientations Questionnaire and adapted to the Likert scale format. The Value-Orientations Questionnaire presented students with a problematic situation and three alternatives which the students had to rank according to their preference. The following is an example of a time-orientation item.

Three parents were talking about what they thought their children would have when they were grown.

A One said: "I really expect my children to have more than I have had, if they work hard and plan right. There are always good chances for people who try."

B One said: "I don't know whether my children will be better off, worse off, or just the

same. Things always go up and down, even if you work hard, so you can't really tell."

C One said: "I expect my children to have about the same as I had, or to bring things as they once were. It is their job to work hard and find ways to keep things going as they have been in the past." (Kitchen, 1966, p.355)

Alternative A is a future orientation; alternative B is a present orientation; and alternative C is a past orientation. The Time-Orientation subscale did not use past, present, and future items. Rather, the subscale was designed to get a measure of the degree to which students subscribe to a future-orientation as opposed to a non-future- (either a past or present) orientation. Students with past or present orientations would tend to agree more with the non-future statements. The non-future statements are reverse coded, so that a high score on the Time-Orientation subscale indicates a student is inclined to be future-oriented.

Control and stability subscales. The Attribution (Locus of Causality and Stability) subscales are closely modelled after the Multidimensional-Multiattributional Causality Scale (MMCS) (Lefcourt, Von Baeyer, Ware, & Cox, 1979) designed for university undergraduate students. The MMCS has two 24-item Likert scales. One scale concerns achievement and the other affiliation. Only the achievement portion was

altered and used for the present research questionnaire. The wording used in the MMCS items was changed to simplify the statements for high school students and to relate each item more specifically to achievement in science. The MMCS used only a four-point Likert scale but the Attribution subscales were scored on a five-point continuum. This was done to keep the scoring on the Attribution subscales consistent with the scoring of the other subscales in the questionnaire.

The Attribution subscale has 24 items spread equally across four attributions: six items focusing on abilities, six items involving effort, six items focusing on task difficulty or context, and six items that focus on luck. Both the Locus of Control and Stability subscales are comprised of 12 items that concern success and 12 items that concern failure experiences. Table A.1 shows which items belong to each attribution and indicates whether the item is worded as a success or failure experience.

For the Locus of Causality subscale, responses are scored high when they attribute success in science to ability and effort; responses are scored low when they attribute success to context and luck. Thus, a high score on the Locus of Causality Attribution subscale indicates the student attributes success or failure in science more to internal than external factors.

For the Stability Attribution subscale, responses are scored high when they attribute success in science to effort

and luck; responses are scored low when they attribute success to ability and context. Thus, a high score on the Stability Attribution subscale indicates the student attributes success or failure in science more to unstable than stable factors.

A balanced number of positively and negatively worded items for each subscale are mixed throughout the questionnaire. Table A.2 shows which items belong to each subscale and indicates whether the item was worded in a positive or negative fashion.

Each item was scored on a five-point continuum where "strongly agree" receives five points for positively worded items, "agree" four points, and so forth. For the negatively worded items, the scoring procedure is reversed.

A high total score on the questionnaire indicates the students value science education, perceive they have support from their parents and teachers, have a future-orientation, and attribute their success or failure in science to internal factors. These are characteristics of a "folk theory" of getting ahead that should promote science achievement.

Pilot study. A school board in eastern Newfoundland was contacted and asked whether the questionnaire could be piloted in a rural high school that had approximately 200 to 300 students from grade 7 to 12. It was felt that results from a school meeting these specifications would be more

applicable than an urban sample to the schools investigated in the research study. Once the school board had chosen a suitable school, the principal was consulted and a date for testing was set. The parents were then notified by letter (see Appendix B) for permission to administer the questionnaire to their children.

A sample of 24 senior high school students who were enroled in a science course participated in the pilot study. An informal discussion was held with the students immediately following the administration of the questionnaire to seek their views on its clarity.

Measurement of Science Achievement

The IEA science achievement test is a 35-item multiple-choice test of general science knowledge used by the Second International Science Study to access achievement levels of senior high school students. The time limit established for the test was 50 minutes. As described by one of the coordinators of the Canadian portion of the study:

> Most of the test items were developed by the IEA/SISS international coordinating centre for administration in all participating countries. The Canadian research team modified some items to conform with metric notation and Canadian language usage. In addition, the team decided to exercise the option of including "national" items. A large selection of potential national items was

> distributed to science educators across Canada for evaluation of their appropriateness for science curriculum in their jurisdictions. The SISS team selected the national items from those on which there was the most agreement that they were testing material taught in the schools. (Connelly, 1989, p. 25)

Only five of the items on this test were selected from Canadian sources. The remaining 30 items were selected from international sources.

The alpha reliability for this specific test was not recorded, but the reliabilities for other IEA tests used by the SISS were generally in the .75 range (Crocker, 1990). I assumed at the outset that reliability for the IEA test used in this study is within the same range.

The Canadian research team of science educators considered the IEA tests used by the SISS to have substantial face validity in representing the core of scientific knowledge (Crocker, 1990). However, the Canadian research team felt the tests did have a weakness:

> The most serious weakness of the tests, from the perspective of the objectives of science teaching as generally understood in Canada, was the omission of items on such areas as scientific processes, science and society, and technological applications. (Crocker, 1990, p. 12)

Measuring Quality of Instruction

Two teacher characteristics were investigated. The science teachers on both staffs were asked, in separate informal interviews, to report their years of teaching experience and degree of teacher training. During the same informal discussions the science teachers reported the amount of senior high school laboratory facilities available in their school and the level to which these facilities were utilized. School records were reviewed to see which senior high school science courses had been offered in each school over the last 5 years.

Data Collection

In the Fall of 1989 the school board responsible for the Earletown and Country Cove schools was contacted. Interviews were held with the principals of each school. The school board and principals were informed of the type of data to be collected and the conditions under which the data was to be reported. Later that fall, the school board and each principal received a package describing the instruments to be used to collect the data. The package contained a description of the OLSAT and copies of the questionnaire and IEA science achievement test. Permission to conduct the research was granted on the condition that the names of the students and the schools remain anonymous.

Both principals were contacted again in April of 1990 and arrangements were made to conduct the study. In the

first week of May, 1990, letters of permission were sent to the parents via the students (see Appendix C). The testing period started two weeks later. By this time the majority of the letters had been returned with the parents' responses.

Data collection was conducted in the middle of May. By this time the students almost had completed their science courses for the year. The research could not be conducted any later because it would interfere with final examinations. Data was first collected in the Country Cove school and then the same procedures were used to collect the data in the Earletown school.

On the morning that the data was collected, teachers were shown how the students were to prepare and record their responses on the separate machine-scorable answer sheets used for the OLSAT and IEA test. Teachers were also given strict instructions on the time limits for each instrument. Both answer sheets recorded the student's name, age by number of years and months, gender, grade, and item responses. All the students remained in their homerooms and were assigned teacher supervisors for the testing period. The OLSAT was administered first. Students were told how to use the machine-scorable answer sheets and then given 40 minutes to complete the OLSAT. Immediately after all OLSAT answer sheets had been returned, the students had to prepare a second answer sheet for the IEA science achievement test. The IEA test was then administered and the students were

given 50 minutes to complete the test. Once all the students had completed the IEA test, the questionnaire was handed out. The students had a maximum of 30 minutes to complete the questionnaire. After school, there was an informal discussion with the science teachers to gather information on school facilities, and their teaching experience and training.

Data Analysis

Once the data was collected, the OLSAT and IEA tests were machine-scored. The OLSAT scores were then converted to SAI scores using the norms booklet provided with the OLSAT instrument (Otis & Lennon, 1989a). The IEA scores were left as raw scores that indicated the number of correct responses.

A data file was prepared that contained values for the following variables: student identification number, school attended, grade level, gender, age in number of years and months, item responses to each of the 85 items on the questionnaire, the SAI score on OLSAT, and the total raw score on the IEA test. The Earletown school was coded as 0 and the Country Cove school was coded as 1; grade level was given as 10, 11, or 12; males were coded as 0 and females were coded as 1. The SAI scores on OLSAT were used as the measure of the students' school ability. The total score on the questionnaire, when using the Locus of Causality Attribution subscale, was used to determine the students'

"folk theory" of getting ahead. The number of correct items on the IEA test was used as the measure of the students' science achievement.

The alpha reliability coefficients were then found for the IEA science achievement measure, the total questionnaire, and for each subscale in the questionnaire.

A principal components analysis followed by a Varimax rotation was performed on the questionnaire to determine the justification of combining the subscales to obtain a total score.

Descriptive statistics were computed for the scores from the OLSAT ability measure, the "folk theory" of getting ahead questionnaire, and the IEA science achievement test. The means and standard deviations of the scores from each instrument were analyzed for both schools together, and for each school. The means and standard deviations for all three instruments were also analyzed, in both the schools together and in each school, for each grade and for each gender.

For the first stage of the analysis, the effect of community on science achievement was computed. For the second stage of the analysis, the effect of community on science achievement was computed when the effect of school ability was controlled. For the third stage of the analysis, a Pearson correlation matrix was computed for the variables community, school ability, the "folk theory" of getting ahead, grade, gender, and science achievement. The

correlation matrix was used in a number of analyses: (1) the path analysis for the next two causal models; and (2) to assess whether or not gender and grade were masking the true relationships that exist between community, school ability, the "folk theory" of getting ahead, and science achievement.

In the fourth stage of the analysis, a path analysis was used to investigate the hypothesized causal relationships between the variables of community (X_1), school ability (X_2), the "folk theory" of getting ahead (X_3) and achievement in science (X_4). In this hypothetical causal model (shown in Figure 3.1) the variables of community, school ability, and the "folk theory" of getting ahead were hypothesized to have a direct effect on the dependent variable science achievement. The "folk theory" of getting ahead was also hypothesized to have a mediating effect on the relationship between community and science achievement, and on the relationship between school ability and science achievement. The equations to determine X_3 and X_4 are

$$X_3 = a_1X_1 + a_2X_2 + \text{Constant}_1$$

$$X_4 = a_3X_1 + a_4X_2 + a_5X_3 + \text{Constant}_2$$

where the a_i represent standardized path coefficients relating the independent and dependent variables.

In the final hypothetical causal model (shown in Figure 3.4) the variables of community (X_1), school ability (X_2), grade (X_3), gender (X_4), and the "folk theory" of getting ahead (X_5) were hypothesized to have a direct effect on the dependent variable achievement in science (X_6). However, the variables community, school ability, grade, and gender were also expected to have an indirect effect on achievement in science because these variables were hypothesized to have a direct effect on the students' "folk theory" of getting ahead. The equations to determine X_5 and X_6 are

$$X_5 = b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + \text{Constant}_3$$

$$X_6 = b_6X_1 + b_7X_2 + b_8X_3 + b_9X_4 + b_{10}X_5 + \text{Constant}_4$$

where the b_i represents standardized path coefficients relating the independent and dependent variables.

For the final stage of the analysis, the data collected on the quality of instruction in each school was organized but no statistical analysis was performed.

CHAPTER 4: RESULTS

Questionnaire Characteristics

Reliability

The students who participated in the pilot study reported that the item statements were not misleading and that the questionnaire instructions were clear and easy to follow.

The alpha coefficient of reliability of the pilot questionnaire was 0.83. Fourteen of the items correlated negatively with the total questionnaire. The correlations were small and more than half of these items were from the Attribution subscale. In the pilot questionnaire, none of the Attribution subscale items had been reverse coded. It was decided that no items needed to be altered, but that items in the Attribution would have to be recoded.

The alpha coefficient of reliability of the final "folk theory" questionnaire was 0.87.

Combining the Subscale Scores

The alpha reliability coefficients are shown in Table 4.1. The Stability Attribution subscale is so unreliable it will not be used in the determination of the total score on the questionnaire or considered in further relation to the other subscales.

Table 4.1

Alpha Reliability Coefficients of Each Subscale of the "Folk Theory" Questionnaire

Subscale	Alpha Coefficient
1. Values	0.76
2. Teacher	0.60
3. Parent	0.71
4. Time	0.64
5. Attribution	
i) Locus of Control	0.51
ii) Stability	0.26

The intercorrelation matrix of the remaining subscales, shown in Table 4.2, illustrates that each subscale is fairly highly correlated with each of the other subscales that make up the questionnaire.

Table 4.2

Intercorrelations among Subscales on the "Folk Theory" Questionnaire

Subscale	2	3	4	5
Students (n = 242)				
1. Values	.45	.47	.52	.29
2. Teacher	---	.47	.39	.39
3. Parent		---	.45	.31
4. Time			----	.27
5. Attribution (Locus of Control)				---

A principal components analysis was completed on the five subscales. The size of the eigenvalues stabilized after the second. The Varimax Rotation on the first two principal components produced the loadings shown in Table 4.3. The Values, Parent, and Time subscales load heaviest on Factor 1. The Teacher and Attribution (Locus of Control) subscales load heaviest on the second factor.

Table 4.3

Factor Loadings of the Subscales of the "Folk Theory" Questionnaire on First Two Factors (Varimax Rotation)

Subscale	Factor 1	Factor 2
1. Values	.81	.17
2. Teacher	.53	.57
3. Parent	.71	.30
4. Time	.82	.09
5. Attribution (Locus of Control)	.10	.94

However, the Teacher subscale is a strong component of both factors and there is a high correlation of 0.55 between the two factors. This, and the alpha reliability coefficient of 0.87 suggests that all five subscales have an overriding unity. I believe that this is a picture of the "folk theory" of getting ahead. This claim of validity for the questionnaire is based on this face validity judgement supported by the arguments made in chapter 2 about the elements that comprise a "folk theory" of success.

Descriptive Statistics for OLSAT

Table 4.4 contains the means and standard deviations of the SAI scores on the OLSAT for the total sample and for each school. The OLSAT provides, in a National Norms Booklet, age-based norms to indicate students' level of ability compared with other students of the same chronological age (Otis & Lennon, 1989b, p. 21). The total sample of students, with a mean SAI score on the OLSAT of 91.0, are an average ability group. The Earletown students have higher ability scores than the Country Cove students. The Earletown students are a slightly above average ability group; the Country Cove students are a slightly below average ability group.

Table 4.4

Means, Standard Deviations, and Sample Sizes for SAI Scores on OLSAT by School and Total Sample

Group	$\bar{X}$	SD	N
Total Sample	91.0	13.3	242
Earletown	94.6	11.8	148
Country Cove	85.4	13.5	94

Table 4.5 contains the means and standard deviations for the SAI scores on the OLSAT by grade for the total sample and for each school. The school ability of the total sample of students tends to increase as the grade level increases. This is particularly true for the Country Cove

students. Both the grade 10 and 11 Country Cove students are below-average ability groups. The grade 12 students in the Country Cove school are, however, an average ability group. The Earletown students are a more homogeneous group in terms of ability. Each grade in the Earletown school is an average ability group. Also, for each grade the Earletown students have more ability than the Country Cove students.

Table 4.6 contains the means and standard deviations for the SAI scores on the OLSAT by gender for the total sample and for each school. In the total sample and in each school the male students have higher ability scores than the female students; however, the difference is small in some cases.

Table 4.5

Means, Standard Deviations, and Sample Sizes by Grade for SAI Scores on OLSAT in Both Schools Together and in Each School

	Grade								
	10			11			12		
Group	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N
Total Sample	89.1	14.1	87	90.6	11.4	88	93.9	14.1	67
Earletown	94.7	12.1	55	94.2	10.5	51	94.9	13.2	42
Country Cove	79.8	12.3	32	85.7	10.9	37	92.3	15.6	25

Table 4.6

Means, Standard Deviations, and Sample Sizes by Gender for SAI Scores on OLSAT in Both Schools Together and in Each School

	Gender					
	Males			Females		
Group	$\bar{X}$	SD	N	$\bar{X}$	SD	N
Total Sample	92.1	14.7	118	90.0	11.7	124
Earletown	96.8	12.1	68	92.7	11.3	80
Country Cove	85.7	15.6	50	85.1	10.8	44

Descriptive Statistics on the "Folk Theory" Questionnaire

Table 4.7 contains the per-item means and standard deviations of the scores on the "folk theory" questionnaire for each school. The Country Cove students scored slightly higher on the questionnaire than the Earletown students. Therefore, by hypothesis, the Country Cove students' "folk theory" of getting ahead is more likely to promote academic success in science than the Earletown students' "folk theory" of getting ahead.

Table 4.8 contains the per item means and standard deviations of the scores on the "folk theory" questionnaire by grade in the total sample and in each school. Table 4.8

Table 4.7

Per-item Means, Standard Deviations, and Sample Sizes for Scores on the "Folk Theory" Questionnaire by School

Group	$\bar{X}$	SD	N
Earletown	3.3	0.30	148
Country Cove	3.4	0.27	94

Table 4.8

Per-item Means, Standard Deviations, and Sample Sizes for Scores on the "Folk Theory" Questionnaire by Grade in Both Schools Together and in Each School

	Grade								
	10			11			12		
Group	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N
Total Sample	3.4	0.27	87	3.3	0.31	88	3.3	0.29	67
Earletown	3.4	0.28	55	3.3	0.32	51	3.4	0.30	42
Country Cove	3.4	0.25	32	3.4	0.29	37	3.4	0.27	25

shows that for each grade the Country Cove students' "folk theory" of getting ahead is as likely to promote academic

success in science as the Earletown students' "folk theory" of getting ahead.

Table 4.9 contains the per-item means and standard deviations of the scores on the "folk theory" questionnaire by gender in the total sample and in each school. Table 4.9 shows that in the total sample and in the Country Cove

Table 4.9

Per-item Means, Standard Deviations, and Sample Sizes for Scores on the "Folk Theory" Questionnaire by Gender in Both Schools Together and in Each School

	Gender					
	Males			Females		
Group	$\bar{X}$	SD	N	$\bar{X}$	SD	N
Total Sample	3.3	0.28	118	3.4	0.30	124
Earletown	3.3	0.28	68	3.3	0.32	80
Country Cove	3.4	0.28	50	3.5	0.25	44

school the female students' "folk theory" of getting ahead is more likely to promote academic success in science than the male students' "folk theory" of getting ahead.

Descriptive Statistics for IEA

The IEA science achievement test had an alpha reliability of 0.81. This means that the IEA test is a reliable measure of science achievement for senior high school students.

Table 4.10 contains the means and standard deviations of the IEA scores for the total sample and for each school. Table 4.10 shows that the Earletown students had a better

Table 4.10

Means, Standard Deviations, and Sample Sizes for IEA Scores in Both Schools Together and in Each School

Group	$\bar{X}$	SD	N
Total	14.6	5.8	242
Earletown	15.5	5.7	148
Country Cove	12.3	5.4	94

performance on the IEA science achievement measure than the Country Cove students.

Table 4.11 contains the means and standard deviations of the IEA scores for each grade in the total sample and in each school. Performance on the IEA science achievement measure tended to improve with grade level. The grade 10 Earletown students outperformed the grade 10 Country Cove students on the IEA science achievement measure. The grade 11 Earletown students outperformed the grade 11 Country Cove students and had the best performance of any grade group on

the IEA science achievement measure. In grade 12, however, the Country Cove students slightly outperformed the grade 12 Earletown students on the IEA science achievement measure.

The IEA test was one of the measures used in the Second International Science Study (SISS) to determine the level of science achievement of secondary school students in their last year of school. Newfoundland students had a mean score of 18.6, and in Canada students had a mean score of 21.7 (Crocker, 1989a, p.61). Table 4.11 reveals that neither of

Table 4.11

Means, Standard Deviations, and Sample Sizes for IEA Scores by Grade in Both Schools Together and in Each School

	Grade								
	10			11			12		
Group	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N
Total Sample	12.7	5.0	87	14.8	6.1	88	15.6	5.9	67
Earletown	14.3	5.0	55	16.8	6.3	51	15.4	5.4	42
Country Cove	9.9	3.8	32	11.9	4.4	37	15.9	6.8	25

the grade 12 groups in this study performed up to the provincial or national standards on the same IEA science achievement measure.

Table 4.12 contains the means and standard deviations of the IEA scores for each gender in the total sample and in

each school. Table 4.12 shows that in the total sample and in each school the male students outperformed the female students on the IEA science achievement measure.

Table 4.12

Means, Standard Deviations, and Sample Sizes for IEA Scores by Gender in Both Schools Together and in Each School

	Gender					
	Males			Females		
Group	$\bar{X}$	SD	N	$\bar{X}$	SD	N
Total Sample	15.8	6.2	118	12.8	4.9	124
Earletown	17.2	6.2	68	14.7	4.7	80
Country Cove	13.9	5.8	50	10.5	4.4	44

Relation between Community and Science Achievement

There is a significant ($p < .001$) negative correlation of -0.27 between community and science achievement. This means that, as hypothesized, the Country Cove students scored significantly lower on the science achievement measure than the Earletown students.

Relation between Community and Science Achievement when School Ability is Controlled

School ability has a strong significant correlation of 0.574 ($p < .001$) with science achievement. However, the

hypothesis for this stage of the research is incorrect. The significant relation between community and science achievement disappears when school ability is controlled.

Effect of Community, School Ability, and the "Folk Theory" of Getting Ahead upon Science Achievement

The next stage of the research tested a hypothetical causal model used to explain the effects of community, school ability, and the "folk theory" of getting ahead upon science achievement. The "folk theory" of getting ahead was an intervening variable in the causal model. A path analysis was used to identify the direct and indirect effects of the variables upon achievement in science. The Pearson correlation matrix for all the variables used in this test are shown in Table 4.13.

The path coefficients for the causal model used in this stage of the study are reported in Table 4.14 and a path diagram of the model is illustrated in Figure 4.1. This causal model accounted for 36.8 % of the variance in achievement in science in this sample. However, many of the relationships between the variables did not turn out as hypothesized.

Table 4.13

Pearson Correlation Coefficients among the Variables Community, School Ability, the Students' "Folk Theory" of Getting Ahead, Grade, Gender, and Achievement in Science

	Independent Variable					
Dependent Variables	Community	Grade	Gender	School Ability	Achievement in Science	Folk Theory
Community	1.00					
Grade	.01	1.00				
Gender	-.07	.11	1.00			
School Ability	-.34	.14	-.08	1.00		
Achievement in Science	-.27	.20	-.26	.60	1.00	
Folk Theory	.14	-.09	.09	.16	.14	1.00

Table 4.14

The Path Coefficients of the Causal Model used to Investigate the Effect of Community, School Ability, and the "Folk Theory" of Getting Ahead upon Science Achievement

	Independent Variables		
Dependent Variables	Community	School Ability	Folk Theory
Folk Theory	.221*	.235*	----
Achievement in Science	-.088	.560*	.061

(*p < .001)

The Direct Effects upon Science Achievement

As predicted, school ability had a significant positive effect upon achievement in science. It was hypothesized that when the effect of school ability upon science achievement was controlled there would be a residual discrepancy in achievement between the two communities that could be partly explained by their "folk theories" of getting ahead. However, in this model neither community nor the students' "folk theory" of getting ahead had a significant effect upon science achievement when the effect of ability was controlled.

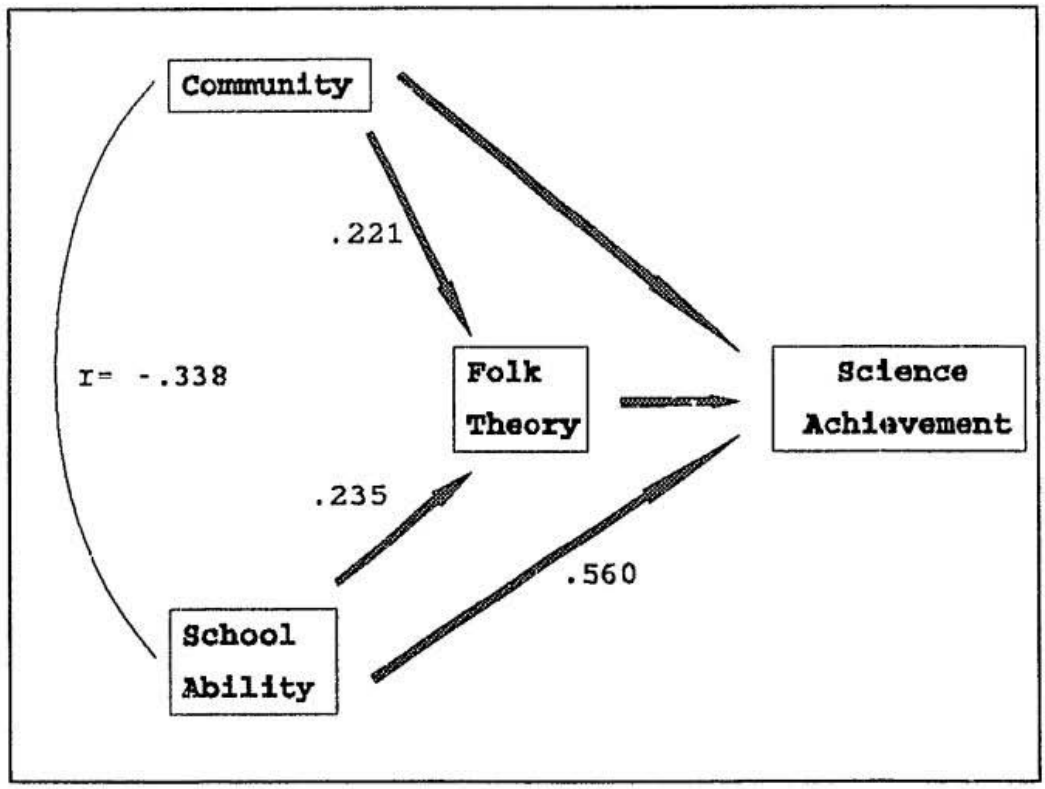

Figure 4.1. The Path Diagram of the Causal Model used to Investigate the Effects of Community, School Ability, and the"Folk Theory" of Getting Ahead upon Science Achievement

The Direct Effects upon the Students' "Folk Theory" of Getting Ahead

Table 4.14 shows that both community and school ability had a significant effect on the students' "folk theory" of getting ahead. The high ability students had, as hypothesized, a higher score on the "folk theory" of getting ahead questionnaire. The Country Cove students, however, did not score as hypothesized. They had higher scores on the "folk theory" of getting ahead questionnaire than the Earletown students.

Effect of Community, School Ability, the "Folk Theory" of Getting Ahead, Grade, and Gender upon Science Achievement

The correlational matrix in Table 4.13 suggests that grade and gender are variables that should be included in the hypothetical causal model designed to investigate the relationship between community, school ability, the "folk theory" of getting ahead and science achievement.

Community and science achievement are negatively correlated. Any variables that have same-sign zero-order correlations with community and science achievement may suppress the relationship between community and science achievement. Grade may be suppressing the relationship between community and science achievement because grade is positively correlated to both of these variables. Gender may also be suppressing the relationship between community and

science achievement because it is negatively correlated with both of these variables.

The "folk theory" of getting ahead and science achievement are positively correlated. Any variables that have opposite-sign zero-order correlations with the "folk theory" of getting ahead and science achievement may suppress the relationship between the "folk theory" of getting ahead and science achievement. Grade may be suppressing the relationship between the "folk theory" of getting ahead and science achievement because it is negatively correlated with the "folk theory" of getting ahead and positively correlated with science achievement. Gender may be suppressing the relationship between the "folk theory" of getting ahead and science achievement because it is positively correlated with the "folk theory" of getting ahead and negatively correlated with science achievement.

Since grade and gender may be acting as suppressor variables, the final hypothetical causal model tested in this stage of the research included the effects of community, school ability, the "folk theory" of getting ahead, grade, and gender upon science achievement. Again the "folk theory" of getting ahead was an intervening variable in the causal model. A path analysis was also used to identify the direct and indirect effects of the variables upon science achievement. The path coefficients for this causal model are reported in Table 4.15 and a path diagram

of this model is illustrated in Figure 4.2. This causal model, as hypothesized, accounted for more of the variance in achievement in science than the previous causal model. This causal model accounted for 45% of the variance in science achievement in this sample.

The Direct Effects upon Science Achievement

Table 4.15 shows that in the final model community has a significant effect upon science achievement. The effect of community upon science achievement turned out as hypothesized. The Country Cove students' scores on the

Table 4.15

Path Coefficients of the Causal Model used to Investigate the Effect of Community, School Ability, the "Folk Theory" of Getting Ahead, Grade, and Gender upon Science Achievement

	Independent Variable				
Dependent Variable	Community	School Ability	Grade	Gender	Folk Theory
Folk Theory	.245*	.275*	-.146***	.140***	
Achievement in Science	-.141**	.488*	.176*	-.260*	.118***

(*p < .001) (**p < .01) (***p < .05)

science achievement measure were significantly lower than the scores of the Earletown students. The relationship between community and science achievement was not significant in the two previous causal models because the

effects of grade and gender were not controlled. Grade and gender are suppressor variables that mask the true relationship between community and science achievement.

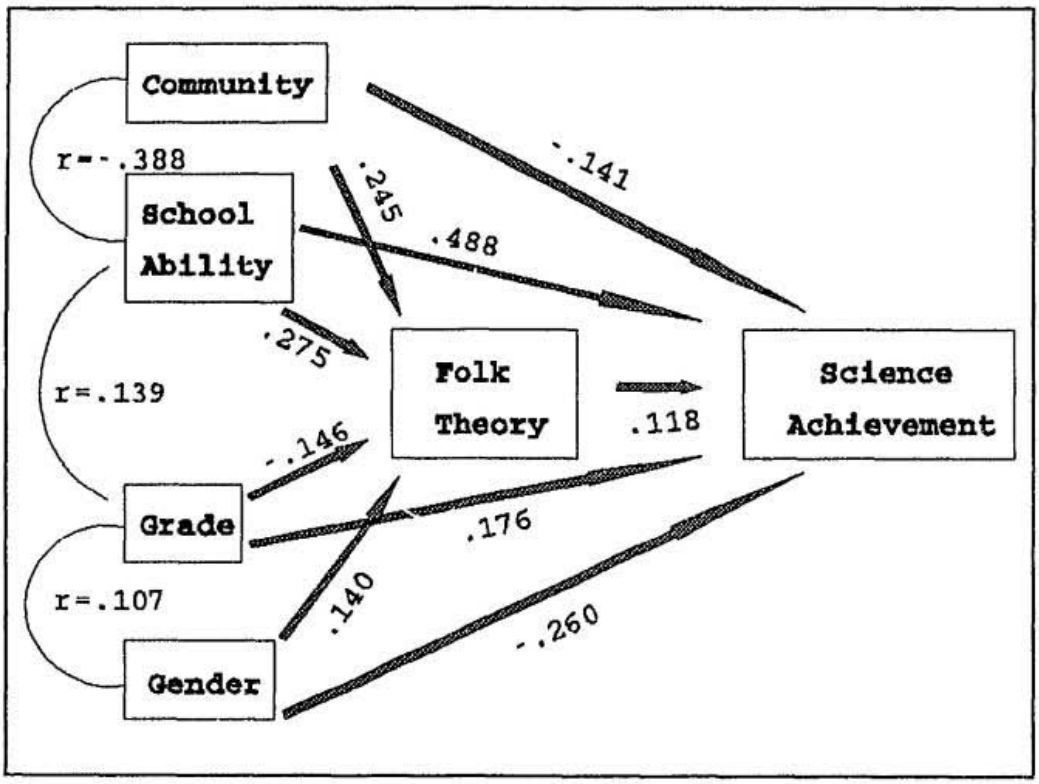

Figure 4.2. The Path Diagram of the Causal Model used to Investigate the Effect of Community, School Ability, the "Folk Theory" of Getting Ahead, Grade, and Gender upon Science Achievement

Grade and gender are also suppressor variables that mask the true relationship between the students' "folk theory" of getting ahead and science achievement. When the effects of grade and gender were controlled, the effect of the students' "folk theory" of getting ahead upon science achievement turned out as hypothesized. Students who value science, perceive they have support from their parents and

teachers, have a future-orientation, and attribute their success or failure in science to internal causal factors have a "folk theory" of getting ahead that promotes science achievement.

The effects of school ability and grade also turned out as hypothesized. The level of achievement in science increased as student school ability and grade level increased.

However, the effect of gender upon science achievement did not turn out as hypothesized. The female students in this sample have a lower level of achievement than the male students.

The Direct Effects upon the Students' "Folk Theory" of Getting Ahead

Table 4.15 shows that community, school ability, grade, and gender all have a significant effect on the students' "folk theory" of getting ahead. The effects of school ability, grade, and gender upon the "folk theory" of getting ahead turned out as hypothesized for this causal model. The high ability students' "folk theory" of getting ahead is more likely to promote academic success in science than the low ability students' "folk theory" of getting ahead. As the grade level increased the students' "folk theory" of getting ahead is less likely to promote academic success in science. The female students' "folk theory" of getting ahead is more likely to promote academic success in

science than the male students' "folk theory" of getting ahead.

The effect of community upon the students' "folk theory" of getting ahead did not turn out as hypothesized for this causal model. The Country Cove students' "folk theory" of getting ahead is more likely to promote academic success in science than the Earletown students' "folk theory" of getting ahead.

The Total Effect of Community, School Ability, Grade, and Gender upon Science Achievement with the Students' "Folk Theory" of Getting Ahead as the Intervening Variable

Table 4.16 contains the direct, indirect, and total effects of community, school ability, grade, gender, and the students' "folk theory" of getting ahead upon science achievement.

Table 4.16

The Direct, Indirect, and Total Effects of Community, School Ability, Grade, Gender, and the Students' "Folk Theory" of Getting Ahead upon Achievement in Science

Independent Variables	Direct Effects	Indirect Effect Via Folk Theory	Total Effects
Community	-.141	.029	-.112
School Ability	.488	.032	.520
Grade	.176	-.017	.159
Gender	-.260	.017	-.243
Folk Theory	.118		.118

The total effect of community upon science achievement. There is a strong total effect of community upon science achievement. The Country Cove students have a lower level of achievement in science than the Earletown students. Table 4.16 shows that the students' "folk theory" of getting ahead has a positive mediating effect on the Country Cove students' level of science achievement. This is an unexpected result. The students' "folk theory" of getting ahead was hypothesized to have a negative mediating effect on the Country Cove students' level of achievement.

The total effect of school ability upon achievement. School ability has the strongest total effect upon science achievement. The total effect of school ability upon science achievement turned out as hypothesized. High ability students have a higher level of achievement in science than the low ability students. The indirect effect of school ability upon science achievement via the students' "folk theory" of getting ahead also turned out as hypothesized. Table 4.16 shows that the students' "folk theory" of getting ahead has a positive mediating effect on the high ability students' level of achievement.

The total effect of grade upon science achievement. There is a strong total effect of grade upon science achievement. As hypothesized, the students in the higher grade levels had a higher level of achievement than the lower grade level students. This suggests the IEA test is a

valid measure of science achievement. The higher grade level students have completed more science courses and therefore should outperform lower grade level students. The indirect effect of grade upon science achievement via the students' "folk theory" of getting ahead also turned out as hypothesized. Table 4.16 shows that as grade level increases the students' "folk theory" of getting ahead has a negative mediating effect upon the students' science achievement.

The total effect of gender upon science achievement. There is a strong total effect of gender upon science achievement. In Newfoundland, female students have slightly outperformed male students in science so it was hypothesized that gender would have the same effect on science achievement in this study. However, the female students in this study had a lower level of achievement in science than the male students. Table 4.16 shows that the students' "folk theory" of getting ahead had, as hypothesized, a positive mediating effect on the female students' level of achievement.

Quality of Instruction

Table 4.17 contains the number of years of teaching experience and level of teaching certification of the science teachers in the two schools. The table shows there is little difference in the level of teaching certification between the teachers in the two schools. The teachers in Earletown clearly have more teaching experience. However,

the Country Cove teachers have been teaching long enough not to be considered beginning teachers. As reported in chapter 2, the research literature suggests that teachers with more than three years of teaching are equally as effective as teachers who have far more teaching experience (Murnane, 1975).

Table 4.17

The Number of Years Teaching Experience, and Level of Teaching Certification of the Science Teachers in the Two Schools

School	Teaching Experience	Certification Level
Earletown	18	6
	11	5
	17	6
	13	7
Country Cove	5	6
	5	7

Informal interviews with the teachers in both schools revealed that the laboratories in the two schools have the equipment necessary to perform all the core laboratory activities in the senior high school courses being offered. Both schools have only one laboratory which must be time shared with junior high school students. Despite the scheduling problems the teachers in both schools reported

that senior high school core laboratory activities were completed.

Over the last five years the two schools have offered the same science courses but not always simultaneously. The two schools have offered environmental science, physical science, and two levels of physics and biology courses. Earletown has offered two levels of chemistry courses but Country Cove has only offered the first year course. Neither school offers all these courses every year. The third year science courses are rotated into the curriculum. A student may complete the level one biology course in grade 10 and then have to wait until reaching grade 12 to complete the second biology course. The science courses are also timetabled back to back so that each year a student must choose, for example, between biology and physics. Academic students from these two schools typically graduate from grade 12 with four science courses and usually have at least one course in each of biology, physics, and chemistry.

Summary and Conclusions

There is no strong evidence to show that the Earletown students are receiving a higher quality of instruction than the Country Cove students. The Earletown science teachers have more years of teaching experience than the Country Cove science teachers but have the same level of teacher certification. The two schools offer the same number of

science courses, have similar laboratory facilities, and utilize their labcratories to the same degree.

The Country Cove students did score significantly lower on the science achievement test than the Earletown students. The Country Cove students have a lower level of school ability than the Earletown students and are a below-average school ability group. High ability students have a higher level of achievement in science than low ability students. In the simplest analysis performed in this study, when the effect of school ability upon science achievement is controlled there is no significant discrepancy in levels of achievement between the Country Cove and Earletown students.

In the next causal model the students' "folk theory" of getting ahead had no significant intervening effect between community and science achievement when only the effect of school ability was controlled.

However, grade and gender suppressed the effects of community and the students' "folk theory" of getting ahead upon science achievement. In the final causal model the students' "folk theory" of getting ahead has a significant intervening effect between community and science achievement when the effects of school ability, grade, and gender are controlled. Students who value science education, perceive they have support from their parents and teachers, have a future-orientation, and attribute their success or failure in science to internal causal factors have a "folk theory"

of getting ahead that promotes achievement in science. The Country Cove students' "folk theory" of getting ahead has a positive mediating effect on their level of science achievement but the Country Cove students still have a lower level of achievement than the Earletown students.

The female students, low ability students, and the lower grade level students also had a lower level of achievement in science than their comparison groups. The students' "folk theory" of getting ahead has a positive mediating effect upon achievement for the high ability students and the female students. However, as grade level increases the students' "folk theory" of getting ahead has a negative effect on students' achievement in science.

CHAPTER 5: SUMMARY, DISCUSSION AND IMPLICATIONS

"Folk Theory" of Getting Ahead

Ogbu's "folk theory" of success suggests that certain minority groups are chronic underachievers because they believe education does not offer any economic or social rewards to help them get ahead in life. This research attempted to determine whether the Country Cove students' "folk theory" of getting ahead could account for part of the students' persistent, disproportionate low achievement. It was hypothesized that the Country Cove students were underachieving because the economic situation and cultural influences have caused the students to question the value of attaining an education.

At the present time, people are able to remain in the Country Cove area because of seasonal employment in the fishery and lumber industries and because of unemployment insurance benefits (May & Hollett, 1986; Statistics Canada, 1988). The Country Cove youth have seen individuals get ahead by working in semi-skilled occupations that require little educational training. There is also little incentive to pursue higher education when the province's economy cannot guarantee to reward educated individuals with employment and social mobility.

School ability, grade, and gender are also expected to account for part of the variance in science achievement, so it was necessary to control these variables in order to

assess the true impact of the students' "folk theory" of getting ahead upon their science achievement.

The students' "folk theory" of getting ahead does have an impact on science achievement. This research discovered that students who value science education, perceive they have support from their parents and teachers, have a future-orientation, and attribute their success or failure in science to internal causal factors have a "folk theory" of getting ahead that promotes science achievement.

However, this research shows that Ogbu's "folk theory" of success does not provide a definitive explanation of the discrepancy in achievement levels of different groups. The students' "folk theory" of getting ahead does not explain the Country Cove students' persistent , disproportionate low science achievement. Instead, the Country Cove students' "folk theory" of getting ahead had a positive effect on their science achievement. As well, even when the effects of school ability, the students' "folk theory" of getting ahead, grade, and gender are taken into account, there remains an unexplained lower performance by the Country Cove students. Also, school ability had a greater effect on the students' science achievement than did their "folk theory" of getting ahead.

It was encouraging to find that the Country Cove students had a "folk theory" of getting ahead that promoted achievement in science. The Country Cove students had a

history of poor performance in science, live in an area of high unemployment, and have few adults with a high level of education to act as role models. Yet, these students still believe that attaining an education in science will help them get ahead in life. Students who are committed to achieving success in science education may be more willing to respond to any extra efforts designed to improve their level of performance. Where there is faith, there is hope.

Although a "folk theory" of getting ahead is a deeply engrained set of beliefs, there are practical things teachers can do to help cultivate a "folk theory of getting ahead that promotes achievement in science. Teachers should emphasis the value of science education by incorporating science and society topics into their courses. Teachers should take advantage of programs such as "Scientists in the Schools". This program invites scientists from Newfoundland to speak to the students about the major role science plays in their lives.

Teachers should show they believe in their students and encourage them to continue trying to achieve.

Teachers should strengthen the students' future-orientation by stressing the importance of attaining a science education for future endeavours. Teachers should stress that a science education will open up more career opportunities and prepare individuals to cope with the future demands of their society.

Teachers should train students to be more persistent at academic tasks they find difficult by continuing to stress that effort, and not just ability, can lead to success.

School Ability

This research has supported the large body of evidence showing that students' level of school ability has a major impact on their level of achievement in science. Students with a low level of school ability will have a lower level of achievement in science. Adjusting the academic science courses to the students' level of school ability may lower the students' frustration and ensure students will pass. However, in the long run this approach does a disservice to students:

> It is clear that the demands of society are such that those who fail to attain reasonable levels of performance are doomed to play a marginal role in the economic and social system, regardless of whether or not they have completed high school in some nominal sense. In other words, unless we can find a way to ensure that students graduating from high school can be certified as having acquired certain knowledge or skill, then the value of a high school certificate will become debased to the point of being useless. (Crocker, 1989b, p. 46)

Simply insisting on improved levels of performance while ignoring the school ability of students will only serve to

worsen the problem. The challenge is to find strategies to help below-average ability students like those in Country Cove to achieve success in the academic courses.

I recommend that schools attempt to recognize the low-ability students as early as possible. These students should receive some remedial reading instruction. Teachers should also meet with the parents and discuss ways to improve the quality of the students' study habits. Both teachers and students will have to be commit themselves to extra instructional time outside of regular classroom hours.

Grade 12 Students

There is a noticeable number of students in this province who reach grade 12 and then withdraw from school. This group of early leavers has persisted in school longer and enjoyed more school success than any other group of early school leavers. Spain and Sharpe (1990) hypothesized that large numbers of students fail to complete grade 12 because of the public examinations:

> Either they do not take the exams, or they fail them. A decision not to take the exams is a de facto decision to dropout. The decision may not be entirely in the hands of the students, either. Because of the implications of high failure rates, it may be that some students are discouraged from attempting the exams. (Spain & Sharpe, 1990, p. 168)

Students may not be prepared for the examinations because the school may have reduced its standards to help those perceived to be at risk of failing. However, the public examinations may also be at fault because it is debatable whether the standards set for the examinations are the most appropriate for judging the attainments of students (Spain & Sharpe, 1990).

Spain and Sharpe (1990) also hypothesized that these students withdrew from the situation because the experience of failure was too stressful to handle:

> In a population that is likely to question the relevance of the experience in any case, failure may simply validate their assessment of the applicability of the school experience to their lives. Add to this, the possibly that they may have had no plans for post-secondary attendance, and it can be seen that motivation to persist would be quite low. (Spain & Sharpe, 1990, p. 169)

The findings in this research appear to verify this hypothesis. The grade 12 students in Earletown and Country Cove are average-ability students who are capable of achieving in science. However, the higher grade level students in this sample are starting to question whether attaining an education in science provides them with something they need in their lives. As the grade level

increases, the students' "folk theory" of getting ahead is less likely to promote achievement in science.

There may be a tendency for teachers to think that higher grade level students are mature individuals who must take responsibility for their own decisions. These students have made the right decisions in the past. They have had success and have persisted in school. However, it appears that when they reach grade 12 these students need even greater support from their teachers. I recommend that senior high schools put students' advisor and peer tutoring programs in place. These programs should follow and support those individuals who are having difficulty with their studies by helping them muster the personal resources to persist in school until they graduate.

Quality of Instruction

The quality of instruction in Earletown and Country Cove appears to be equal. The school board has not neglected its more rural school. This commitment to equal quality of instruction will be tested by funding cutbacks and the introduction of new science and computer curricula. As long as the school board maintains its present course, the students in Country Cove will not be placed at a disadvantage.

Female Students

The female students had a lower level of achievement in science than the male students but had a "folk theory" of getting ahead that was more likely to promote achievement in science. The female students seem to be more convinced than the male students that an education in science is one of the ingredients necessary for achieving success in life. There is a fairly equal balance of females and males enroled in all senior high school science courses (Crocker, 1989b). However, at the post-secondary level females tend to participate in only the life sciences and are under-represented in the engineering technologies (Crocker, 1989b). The challenge may now be to convince the female students to consider entering the more male-dominated sciences.

Teachers should demonstrate that technological careers are also relevant to females. Schools should invite women who have been successful in technological careers to teach the science concepts they use in their work (SCC, 1984). Teachers should also try to be aware of any subtle sexist messages that they might convey to their female students and eliminate minor sexist practices that may occur in the classroom. For example, teachers should not let the females in the laboratory groups become secretaries as the males manipulate the equipment.

Conclusions

The decision to work towards an achieving society is not a revolutionary idea. The Science Council of Canada (SCC, 1984) and the provincial Task Force on Mathematics and Science Education (Crocker, 1989b) both promote the need for Canadian citizens to improve their standards of science education. Ultimately the performance of the Newfoundland economy may decide the issue. The decline of the Atlantic fishery and provincial lumber industry has decreased the demand for practical labour. People in the rural communities of Newfoundland will have to contend with the loss of jobs created by the decline in resource-based industries. Trepassey, Gaultois, and Grand Bank are facing uncertain futures because of the 1989 announcement from Fishery Products International that they would be closing their fish plants in these communities. These and other Newfoundlanders, in similar rural communities, may have to re-evaluate the value they place upon obtaining an education.

An adjustment towards an achieving society will require different efforts from those people in Newfoundland's rural communities. This research has shown that the "folk theory" of success of a community can have an impact on the science achievement of its youth. The community can help improve the performance of its youth by promoting the importance of attaining a higher level of educational achievement. Some

citizens may find that they will have to make substantial adjustments in their lifestyle to achieve this goal.

The decision to abandon a lifestyle that retards the opportunities of future generations may be logical, but it will result in a painful restructuring of the culture of some communities. The value of this research is that it may have helped to identify the potential educational and attitudinal road blocks some rural students will face in attempting to overcome low achievement. By putting more faith in the value of their education, Newfoundlanders may find what they are really doing is restoring some faith in themselves.

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Appendix A

Student Questionnaire

NAME:_____

Male _____ Female _____

Grade Level:_____

Name of School:_____

In this questionnaire, you are asked to read statements about school science and your life in general, and to tell how much you agree or disagree with each.

This is not a test, and there are no right or wrong answers. Nobody will be told what answer you pick. The purpose is to find out how students in general think.

Simply indicate how you ACTUALLY feel about each statement.

Example : Read the statement below. On the right hand side of the page, there are 5 responses from which to choose. Circle the one that best expresses how you feel about the statement.

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

	HOW YOU ACTUALLY FEEL				
Learning science increases a person's knowledge about the world.	SA	A	U	D	SD

Some items may appear to be the same as others. Be sure to answer every item.

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

HOW YOU ACTUALLY FEEL

1. Learning science helps us make the best of our lives.	SA	A	U	D	SD
2. Our teachers tell us to try hard on science tests.	SA	A	U	D	SD
3. People educated in science are better able to adjust to our changing society.	SA	A	U	D	SD
4. When I get poor grades in science, I haven't worked hard enough.	SA	A	U	D	SD
5. My teachers think I am not able to pass science courses offered at the Trade School, Fisheries College, or Nursing School.	SA	A	U	D	SD
6. My parents think I can do as well in science as most of the other students in my school.	SA	A	U	D	SD
7. Whenever I do well in science, it is because I have studied hard.	SA	A	U	D	SD
8. Some of my lower grades in science have been due to bad breaks.	SA	A	U	D	SD
9. A young person who does well in science is admired and respected by the people in my community.	SA	A	U	D	SD
10. Science is of little help to anyone who has common sense.	SA	A	U	D	SD
11. My parents wouldn't get upset if I got bad grades in science.	SA	A	U	D	SD
12. When I do poorly in science, it is often because I didn't try.	SA	A	U	D	SD

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

HOW YOU ACTUALLY FEEL

13. A person can enjoy life better with more education in science.	SA	A	U	D	SD
14. There is little sense in making long term plans when things change as fast as they do today.	SA	A	U	D	SD
15. There is no need to change things if they are alright as they are.	SA	A	U	D	SD
16. It isn't important for me to do well in science.	SA	A	U	D	SD
17. Giving up many things now so that the future will be better is no way to live.	SA	A	U	D	SD
18. Trying to learn science makes life more complicated and stressful.	SA	A	U	D	SD
19. Often I do poorly in science because the teacher hasn't made the course interesting.	SA	A	U	D	SD
20. My parents wouldn't be upset if my high school no longer offered as many science courses.	SA	A	U	D	SD
21. My teachers think I couldn't finish a university science degree.	SA	A	U	D	SD
22. People who plan their futures worry too much in the present.	SA	A	U	D	SD
23. If I received low marks in science, I would question how smart I was in it.	SA	A	U	D	SD
24. A good education in science is of small comfort to someone who has just lost a job.	SA	A	U	D	SD

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

HOW YOU ACTUALLY FEEL

25. Newfoundlanders should accept job losses now so that the fish stocks can rebuild for future generations.	SA	A	U	D	SD
26. My parents believe that they aren't responsible for my home work.	SA	A	U	D	SD
27. When I get good grades in science, it is because of my academic ability.	SA	A	U	D	SD
28. My parents think I could finish a university science degree.	SA	A	U	D	SD
29. Sometimes I do well in science because the material is easy.	SA	A	U	D	SD
30. Science education helps a person lead a healthier lifestyle.	SA	A	U	D	SD
31. Things in this province will get no better for people who really try.	SA	A	U	D	SD
32. If I failed a science course, it would probably be because I lacked skill in that area.	SA	A	U	D	SD
33. My parents don't think I can pass science offered at the Trade School, Fisheries College, or Nursing School.	SA	A	U	D	SD
34. Parents shouldn't have to sacrifice in order to get their children through high school science.	SA	A	U	D	SD
35. When a teacher gets the idea you are a poor student, your work is much more likely to receive poor grades.	SA	A	U	D	SD
36. Life would be boring if I didn't try new things.	SA	A	U	D	SD

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

HOW YOU ACTUALLY FEEL

37. I don't need to learn science to get what I want out of life.	SA	A	U	D	SD
38. My teachers believe that if I worked harder I would do as well in science as most people my age.	SA	A	U	D	SD
39. Sometimes I get low grades in science because teachers mark too hard.	SA	A	U	D	SD
40. A good education in science is of little help in getting a job.	SA	A	U	D	SD
41. I don't expect my family to be better off in the future than my father's and mother's families.	SA	A	U	D	SD
42. If I was having trouble with science my parents would ask me to look for help.	SA	A	U	D	SD
43. Sometimes I do well in science because I am lucky.	SA	A	U	D	SD
44. High school science credits are worth all the time and effort it takes to get them.	SA	A	U	D	SD
45. My teachers believe that the students who do poorly in science cannot do any better.	SA	A	U	D	SD
46. Parents who know more science provide greater opportunities for their children.	SA	A	U	D	SD
47. My parents always urge me to study science harder.	SA	A	U	D	SD
48. If I received good grades in science, that would show how smart I was in science.	SA	A	U	D	SD

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

HOW YOU ACTUALLY FEEL

49. Life is more enjoyable if you have set goals.	SA	A	U	D	SD
50. My teachers think I can pass any senior high school science course.	SA	A	U	D	SD
51. If I work hard, I can do well in science even if I am not smart in it.	SA	A	U	D	SD
52. Learning science helps people use their leisure time better.	SA	A	U	D	SD
53. I would give up any habit if I thought it threatened my health.	SA	A	U	D	SD
54. I can do better in science than my parents believe.	SA	A	U	D	SD
55. Learning science is of little help in meeting the problems of real life.	SA	A	U	D	SD
56. The world doesn't work best when new ways replace the old.	SA	A	U	D	SD
57. I got some bad grades in science because I was in the wrong course at the wrong time.	SA	A	U	D	SD
58. My teachers try to get students who aren't interested in science to like it more.	SA	A	U	D	SD
59. My parents would be disappointed if I did only the science courses I had to in order to complete high school.	SA	A	U	D	SD
60. If you want to work in science you should be prepared to live somewhere you may not like.	SA	A	U	D	SD
61. Fashions and styles will probably improve as time goes on.	SA	A	U	D	SD

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

HOW YOU ACTUALLY FEEL

62. I receive good grades in science because I try hard.	SA	A	U	D	SD
63. There is little advantage in learning science if you wish to own a home in my community.	SA	A	U	D	SD
64. To keep things moving ahead, traditions and religions should change.	SA	A	U	D	SD
65. When I receive a poor grade in science, I usually feel that I haven't studied enough.	SA	A	U	D	SD
66. My teachers think the students in this school cannot do as well in science as students in most of the other high schools in this province.	SA	A	U	D	SD
67. Families with a good education in science get along better.	SA	A	U	D	SD
68. I know my parents would be proud of me if I did well on a science project.	SA	A	U	D	SD
69. Sometimes I feel lucky for the good grades I get in science courses.	SA	A	U	D	SD
70. Science often conflicts with one's religious beliefs.	SA	A	U	D	SD
71. I find it worth the effort to plan ahead.	SA	A	U	D	SD
72. If I did poorly in science, I probably wouldn't be smart enough to do it.	SA	A	U	D	SD
73. I can do better in science than my teachers believe.	SA	A	U	D	SD
74. My parents rarely compliment me when I do well in science.	SA	A	U	D	SD

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

HOW YOU ACTUALLY FEEL

75. The most important thing in learning science is how smart I am.	SA	A	U	D	SD
76. People who strive to attain goals put too much pressure on themselves.	SA	A	U	D	SD
77. Our teachers don't care if students get bad grades in science.	SA	A	U	D	SD
78. I have gotten some good grades in science because the teacher graded easily.	SA	A	U	D	SD
79. A person who doesn't try to learn science has no sense of pride.	SA	A	U	D	SD
80. I get some good grades in science because the courses are easier than most.	SA	A	U	D	SD
81. One solution to Newfoundland's economic troubles is for students to learn more science.	SA	A	U	D	SD
82. Teachers in this school care more than teachers in other schools about how well their students learn science.	SA	A	U	D	SD
83. Sometimes when I do poorly in science, I am just unlucky.	SA	A	U	D	SD
84. My teachers give me extra help if I have trouble with my science.	SA	A	U	D	SD
85. I get some good grades in science because the right questions show up on the exams.	SA	A	U	D	SD

Table A.1

The List of the Success and Failure Items for Each Attribution

Attribution	Success	Failure
Ability	27,48,75	23,32,72
Effort	7,51,62	4,12,65
Context	29,78,80	19,35,39
Luck	43,69,85	8,57,83

Table A.2

The List of Positively and Negatively Worded Items in Each Subscale

Subscale	Positively Worded	Negatively Worded
Value	1,3,13,30,44,46,52 67,79,81	9,10,16,18,24,34,37 40,55,60,63,70
Teacher	2,38,50,58,82,8	5,21,45,66,73,77
Parent	6,28,42,47,59,68	11,20,26,33,54,74
Time	25,36,49,53,61,64,71	14,15,17,22,31,41 56,76
Attribution Locus of Control	4,7,12,23,27,32,48 51,62,65,72,75	8,19,29,35,39,43,57 69,78,80,83,85
Attribution Stability	4,7,8,12,43,51,57 62,65,69,83,85	19,23,27,29,32,35 39,48,72,75,78,80

Appendix B

Dear Parent or Guardian:

I am presently preparing to conduct a study in your child's school. This letter asks your permission for your child to take part.

I am a graduate student at Memorial University of Newfoundland. The research I am conducting aims to discover why certain groups of individuals underachieve in science. As part of my research I have developed a questionnaire designed to determine

1. the students' attitudes towards the value of school science.
2. the students' perception of the amount of support they receive from teachers and parents.
3. the students' attitudes towards accepting new ways and planning for the future.
4. to what the students' attribute their success and failure.

In order to see how well the questionnaire works, I have to get students to take it and then study their answers. The principal of your child's school has agreed that I can test some senior high school students in his school, as long as the students and parents agree. If your child takes part in my study, "he or she" would miss one class period.

I am not trying to find out things about your child, but trying to find out how well the questionnaire works. I will not record your child's name, nor return the questionnaire results to the school. No one will find out how "he or she" answered the questionnaire. There is no risk that taking part would affect your child's grades in school.

If you give your permission for your child to participate, "he or she" will still be given the opportunity to refuse to take part or withdraw "his or her" participation at any time.

Please indicate below whether or not you allow your child to participate.

Sincerely,

The research will be conducted from April, 23 1990 to April, 27 1990.

I agree to allow my child to participate._____
(Parent's Signature)

I agree to participate._____
(Student's Signature)

Appendix C

May 2, 1990

Dear Parent or Guardian:

I am presently preparing to conduct a study in your child's school. This letter asks your permission for your child to take part.

I am a graduate student at Memorial University of Newfoundland. The research I am conducting aims to discover why certain individuals do poorly in science. To complete my research the senior high school students in your child's school would have to complete:

a) a test that measure general school ability;
b) a general science test for senior high school students; and
c) a questionnaire.

The principal of your child's school has agreed that I can do this research as long as the students and parents agree. If your child takes part in my study, your child would miss about three class periods.

Your child's name will be recorded but results will be kept strictly confidential. As well, the name of the school will not be identified in reports and tests results will not be returned to the school.

If you give your permission for your child to participate, your child will still be given the opportunity to refuse to take part or withdraw participation at any time.

Please indicate below whether or not you allow your child to participate, and have your child return this letter to the school.

Sincerely,

_____
Michael Rogers
Graduate Student

I agree to allow my child to participate. ☐

I do <u>not</u> agree to allow my child to participate. ☐

Parent's Signature: _____

Child's Name: _____
(Please Print)