THE RELATIONSHIP BETWEEN LOCUS OF CONTROL, PERFORMANCE IN EARTH/ENVIRONMENTAL SCIENCE CLASS, AND RESPONSIBLE ENVIRONMENTAL BEHAVIOR

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ABSTRACT

This study explored the relationship between students' locus of control, performance in earth/environmental science class and responsible environmental behavior in the context of small schools. Eighty three high school students in earth/environmental science classes in eastern Wake County were administered the 21-question Nowicki-Strickland locus of control scale and ten-question environmental stewardship scale. Students represented six different small school environments including charter, early college and redesigned theme schools. Four of the schools (one early college and three redesigned) were designated STEM schools. Performance data of grade in course, grade on standardized test and attendance were collected. Data were analyzed in the correlations/ regressions of their locus of control, performance and responsible environmental behavior. Implications for schools were discussed.

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CHAPTER 1.

Does students' locus of control impact the relationship between their performance in earth/environmental science class and their responsible environmental behavior? In other words, do students with categorically different levels of perceived control exhibit different correlations between their grades and responsible environmental behavior? Or, if students feel more in control of their learning in the classroom, do they carry that learning outside of the classroom to their behavior in the "real world"? The researcher for this study was a high school earth/environmental science teacher and graduate student in Environmental Education (EE) specifically interested in connecting high school students' performance in science class to their behaviors outside of science class.

What is the goal of EE? According to the North American Association of Environmental Education (NAAEE), "the ultimate goal of environmental education is the development of an environmentally literate citizenry" (NAAEE, 2009, p 3). To this end, guidelines are organized into four strands or levels depicting expectations of learner performance and achievement through elementary, middle and secondary formal education. Each strand can function independently, but the strands also build upon each other. The first three strands develop basic knowledge of the earth, understandings of how humans impact the environment, and skills needed to create solutions to environmental issues and problems.

The last level culminates in personal and civic responsibility. This forth strand is defined as "understanding societal values and principles, recognizing citizens' rights and responsibilities, recognizing efficacy, and accepting personal responsibility" (NAAEE, 2009, p 87). The learner, or student, is considered an active participant in the learning process (NAAEE, 2009).

A 2013 *TIME Magazine* article by Joel Stein and Josh Sanburn (2013) titled "The New Greatest Generation" discusses the attitudes and behaviors of millennials, or generation Y. Students in this biggest age grouping in American history (born between 1980 and 2000) are described as lazy, narcissistic, entitled, computer-driven, slow to grow up, and uncaring about many issues (Stein & Sanburn, 2013). A millennial's predisposition appears to be in direct conflict with the goal of environmental education to promote citizen responsibility. Students are expected to understand, recognize and take action on issues impacting the environment and our world (NAAEE, 2009) while their generational tendency is to sit back and do nothing (Stein & Sanburn, 2013).

A personality construct tied to a student's responsibility in learning or in caring for the environment is known as a locus of control (Hines, Hungerford & Tomera, 1987; Hueber & Lipsey, 1981). Locus of control describes how a person perceives control over his own behavior or expects to be reinforced for a demonstrated behavior (Hadsell, 2010; Rotter, 1966). A person with an internally oriented locus of control would view personal control over circumstances as coming from within himself; a person with an externally oriented locus of control would view something outside of himself, such as chance, fate, or another person, as having control over his circumstances (Hadsell, 2010; Rotter, 1966).

Students with more internally oriented locus of control have been shown to perform significantly higher in school responsibilities (Grimes, Millea & Woodruff, 2004; Kulas, 1996; Miller, Fitch & Marshall, 2003). Measures of individual student performance include class attendance (Miller et al., 2003), grade in course (Grimes et al., 2004; Kulas, 1996) and grade on a standardized test (Kulas, 1996). Hungerford & Volk (1990) list locus of control as a major

empowerment variable contributing to responsible citizenship behavior that leads to environmental literacy and environmentally responsible behavior.

Several types of nontraditional schools appeared in North Carolina education with the intention of helping students perform at higher levels on standardized tests and improving graduation rates (Ancess & Allen, 2006; Shaw, 2006). Charter Schools, redesigned small schools, and early college high schools have improved attendance and increased test scores of typically low performing racial and ethnic groups (Gates Educational Policy Paper, 2003; Habit, 2013; Le & Frankfort, 2010).

Research suggests that students with more internally oriented locus of control and in small school environments may have better performance in attendance and grades (Ancess & Allen, 2006; ECHSI, 2013; Habit, 2013; Le & Frankfort, 2010; Shaw, 2006). However, many characteristics of small school strategies resulting in better performance in attendance and grades (Ancess & Allen, 2006; Gates Educational Policy Paper, 2003; Habit, 2013; Le & Frankfort, 2010; Shaw, 2006) might have negative consequences to building student responsibility. If developing student responsibility is delayed or hindered, the goal of developing environmental literacy and thus demonstrating responsible environmental behavior could be negatively impacted. There is a gap in the literature concerning the dynamic between students' locus of control, students' performance in attendance and grades, and students' responsible environmental behavior in the context of small schools.

Purpose

The purpose of this study is to examine the relationship between students' locus of control, their performance in earth/environmental science class, and their responsible environmental behavior in the context of small schools.

Definitions

Locus of control (LOC). The personal perception of an individual's ability to influence achievements and failures (Hines et al., 1987); a major component affecting an individual's behavior towards the environment (Hungerford & Volk, 1990).

Internal LOC. The tendency to believe achievements and failures are the result of an individual's own effort, ability, or motivation (Hadsell, 2010; Nowicki & Strickland, 1972; Rotter, 1966).

External LOC. The tendency to believe achievements and failures are due to circumstances outside of the individual's control, such as chance, luck, fate, or another person's actions (Hadsell, 2010; Nowicki & Strickland, 1972; Rotter, 1966).

Performance. For the purpose of this study, performance will be measured by students' course grade, standardized test grade, and attendance (Grimes et al., 2004; Kulas, 1996; Miller et al., 2003; Lynch et al., 2002).

Responsible Environmental Behavior (REB). Range of observable environmental problem-solving behaviors (Marcinkowski, 2001). Variables that influence REB include knowledge, locus of control, and intention to act (Hungerford & Volk, 1990). REB is the manifestation of environmental literacy, the expressed goal of environmental education (Marcinkowski, 2001; Simmons, 1991; Volk & Cheak, 2003). For the purpose of this study, an

indication of REB is measured by environmental stewardship (Russ, 2014; Stern, Powell & Ardoin, 2008).

Small school. Intentionally less than 400 students, small schools are built around a theme or focus for the expressed purpose of engaging students in specific ways (Ancess & Allen, 2006; Shaw, 2006).

CHAPTER 2.

LITERATURE REVIEW

Goals of Environmental Education (EE)

Environmental literacy is the ultimate goal of Environmental Education (EE), based on the mandate to educate future decision makers to be able to make quality decisions when asked (NAAEE, 2009). The North American Association for Environmental Education (NAAEE) has published environmental guidelines for primary and secondary education. These guidelines are organized into four unique strands or levels which build upon each other. Strand one includes questioning, analysis, and interpretation skills (NAAEE, 2009). Strand two expands knowledge of environmental processes and systems (NAAEE, 2009). Strand three utilizes skills for understanding and addressing environmental issues (NAAEE, 2009). Strand four expects learners to utilize personal and civic responsibilities (NAAEE, 2009).

The first three strands of developing skills, acquiring knowledge, and understanding issues are foundational to the culminating fourth strand of application as responsible citizens. Learners should recognize citizen rights and responsibilities and accept personal responsibility for their actions (NAAEE, 2009). When demonstrating responsible environmental behavior (REB), citizens are demonstrating environmental literacy which is the ultimate goal of EE.

The ultimate goal of this study is to examine responsible environmental behavior (REB) of students who have completed an earth/environmental science class. Has the student's perceived locus of control impacted the relationship between their performance in the class and their responsible environmental behavior? And, to what extent has the student's small school environment impacted their perceived locus of control?

Locus of Control (LOC)

The personality construct LOC has been shown to be significant in predicting REB (Hines, Hungerford & Tomera, 1987; Sia, Hungerford & Tomera, 1985). Internal orientation of LOC has been linked to higher academic achievement (Parameswari & Shamala, 2012), higher education aspirations (Flowers, Milner & Moore, 2003), stronger leadership tendencies (Chubb, Fertman & Ross, 1997; Ignat & Clipa, 2010) and positive citizenship behavior (Hines et al., 1987).

External orientation of LOC has been linked to academic disinterest (Hadsell, 2010), procrastination (Janssen & Carton, 1999), self-damaging choices (Miller, Fitch & Marshall, 2003), and less resiliency (Steese et al., 2006) in students. Relevant to this study is the measurement and correlation of the type of LOC, internal or external, to REB.

The type of LOC in adolescents has been widely studied. Contributing factors to LOC development are listed in Table 1. It should be noted that LOC research on age and gender differences is inconclusive. Research has often tied high parental education level and high socioeconomic status to an internal LOC. Additional research is warranted in these areas.

Table 1

Studies related to locus of control (LOC) development.

Study	Findings
Chubb, Fertman & Ross, 1997	LOC becomes more internal during high school years No significant difference between males and females
Howerton, Enger & Cobbs, 1992	More external LOC in at-risk adolescent males Lower academic achievement in at-risk adolescent males
Huebner & Lipsey, 1981	LOC may shift with changing circumstances and experiences

Kulas, 1996	LOC remains stable in adolescence, no significant change over 3-year period No significant difference between males and females
Lynch, Hurford & Cole, 2002	Internal LOC higher when parents were older and had higher levels of education Parental Enabling associated with an external LOC and at-risk academic status
Miller, Fitch & Marshall, 2003	No significant difference between males and females More external locus of control in Caucasians
Nowicki & Strickland, 1973	No significant difference between males and females More external LOC in African Americans More internal LOC in white culture LOC becomes more internal as person gets older Internal locus of control in higher socio economic levels and in white culture, especially for males More internal LOC in higher levels of parental education
Parameswari & Shamala, 2012	No significant difference between males and females
Steese, et al., 2006	LOC stable during adolescence Females more external LOC than males, can become more internal under targeted circumstances

Knowledge of LOC influencers could inform instruction of environmental teaching. Understanding of LOC as a construct of personal and civic responsibility could inform earth/environmental science instruction. Continued research concerning the relationship between high school students' LOC and age, gender, race, and socioeconomic status is warranted.

Research suggests it is possible to influence short term LOC orientation with targeted interventions (Chubb et. al., 1997; Huebner & Lipsey, 1981; Kulas, 1996; Nowicki & Barnes, 1972, Steese et al., 2006) but long term LOC seems to remain relatively stable during the adolescent and high school years (Kulas, 1996; Steese et al., 2006). Early studies reported at least short term changes in LOC affected by environmental conditions (Nowicki & Strickland,

1973). In a structured camp environment, 291 predominantly black junior high school males from inner–city, ghetto schools were counseled concerning their behaviors and their rewards. At the end of their session, typically one week in length, campers measured significantly more internal LOC (Nowicki & Barnes, 1972). Huebner and Lipsey (1981) measured shifts in activists' LOC that experienced a disappointing political defeat concerning nuclear pollution.

Later studies have reported a more stable LOC. Kulas (1996) measured LOC in 84 adolescent boys and girls in a three-year longitudinal study. Boys tended to have a more internal LOC than girls, but over the course of the study, the values of neither gender changed significantly. During a four-year longitudinal study executed by Chubb et al. (1997) and the original third through twelfth grade cross sectional study by Nowicki and Strickland (1973), both males and females moved towards more internal LOC which implied a higher degree of empowerment in higher grades (Chubb et al., 1997; Nowicki & Strickland, 1973).

Steese et al. (2006) investigated the potential for a shift in LOC in the context of a ten-week female intervention model called a Girls' Circle aimed at helping adolescent, minority girls. While there was a significant increase in body image, social support, and self-efficacy, LOC scores did not change from pre-test to post-test (Steese et al, 2006). Students' LOC correlated to age, gender, race and socioeconomic status and how it relates to performance in earth/environmental science class is relevant to this study.

Student Performance in Relation to LOC

Student performance can be measured by student's attendance (Lynch, Hurford & Cole, 2002), course grade (Bolek, 2011; Grimes, Millea & Woodruff, 2004; Hadsell, 2010; Kulas, 1996), and standardized test grade (Bolek, 2011; Howerton, Enger & Cobbs, 1992; Janssen &

Carton, 1999). Bolek (2011) compared course grades to state and national standardized tests over a four year period in Colorado. Strong, positive correlations were found between science course grades and the state standardized test, the Colorado Student Assessment Program or CSAP (Bolek, 2011). A definitive relationship was not found between science course grade and the national standardized test, the American College Test or ACT (Bolek, 2011). Hadsell (2010) compared LOC and academic achievement. He found that students with a more external locus of control did not find the class interesting or enjoyable (Hadsell, 2010). Howerton et al. (1992) studied the relationship between locus of control and academic achievement in 42 black, adolescent males. They found lower school grade averages and lower averages on the Stanford Achievement Test (SAT) in the teacher-identified at-risk students as compared to the mean student performance (Howerton et al., 1992). Relevant to the populations of at-risk students in the current study, the at-risk students in Howerton's study were identified as having poor motivation and performance (Howerton et al., 1992).

Ignat and Clipa (2010) measured locus of control in teachers of varying experiences and ages. When the teachers were studied as learners, a direct correlation between their internal orientation of locus of control and their academic achievement was found to exist (Ignat & Clipa, 2010). Lynch et al. (2002) examined parental differences in honors and at-risk students. At-risk students were identified as having at least two of three identified at-risk behaviors in attendance, failing grades and/or discipline. Honors students were identified as meeting a high GPA requirement and not having any of the attendance, failing grade, or discipline behaviors (Lynch et al., 2002). Honors students were more internal in their locus of control; at-risk students were

more external in their locus of control (Ignat & Clipa, 2010; Lynch et al., 2002). Delineation of at-risk and honors students is relevant to the populations of students in the current study.

Parents of at-risk students tended to be more external in their LOC (Lynch et al., 2002). Parents of at-risk students also tended to have enabling characteristics, meaning they prevented their children from experiencing the natural cause and effect of consequences of their actions, often shielding them from bad decisions or reinforcing dependent behavior (Lynch et al., 2002). Parents of at-risk students also tended to be younger and were not as highly educated (Lynch et al., 2002). The inclusion of first generation college students in the Early College program are of particular interest to this study (Edmunds, 2011). Since the Early College program reports to target families where the parents are not as highly educated, the students might demonstrate more at-risk behaviors and more external LOC. Parental factors associated with children having an internal LOC were parental warmth, consistency of parental discipline, and rewarding and encouraging independence (Lynch et al., 2002; Parameswari & Shamala, 2012).

Grimes, Millea, and Woodruff (2004) examined the relationship between students' LOC, academic performance, and how these students evaluated teachers in a traditional, undergraduate college course. They correctly predicted students with more internally oriented LOC would exhibit more of the characteristics that made them good students so they would achieve higher grades and therefore give higher evaluations to their teachers. Students with more externally oriented LOC did not perform as well academically and were believed to blame the teachers for their lack of success, rating their teachers with lower evaluation marks (Grimes et al., 2004).

Other characteristics of students with an external LOC included the belief that their instructor might act randomly in assigning grades and the frustration and anxiety that might

accompany such a belief in random grade assignment (Grimes et. al., 2004). Interestingly, externally oriented students who gave negative evaluations of instructor performance did not give negative evaluations of their own learning in the course (Grimes et. al., 2004).

The alternative school students in Miller's 2003 study, the at-risk students in Lynch's 2002 study, and the procrastinators in Janssen's 1999 study all had a more external LOC than their regular education school, honors, and proactive counterparts (Janssen & Carton, 1999; Lynch et. al., 2002; Miller et. al., 2003). Student performance measured by on-time attendance in class, grade earned for work done throughout the semester for the class, and grade earned on a one-time standardized test is relevant to this study.

Responsible Environmental Behavior (REB)

Hines, Hungerford and Tomera (1987) describe variables contributing to positive citizenship behavior, sometimes called responsible environmental behavior (REB). These variables include action skills, knowledge of action strategies, knowledge of issues, and personality factors (Hines et al., 1987). Personality factors in the model include attitudes, locus of control and personal responsibility (Hines et al., 1987). Other definitions of REB found in the literature are listed in Table 2. Environmental stewardship represents attitude and intention (Russ, 2014; Stern, Powell & Ardoin, 2008) and is a more recent term describing a piece of REB.

Table 2

Definitions of Responsible Environmental Behaviors (REB)

Study	Definition of REB and its associated factors
Chao & Lam, 2011	A list of 5 types of pro-environmental behaviors which include shutting down the computer before leaving for hours, turning off the table lamp before leaving temporarily, avoiding taking

	stores' free plastic bags, sorting garbage for recycling, and collecting small plastic bags for reuse
Cleveland, Kalamas & Laroche, 2005	Environmental attitudes, environmental locus of control (ELOC), pro-environmental behaviors (PEB)
Cottrell & Graffe, 1997	Any individual or group action aimed to do what is right to help protect the environment
Hines, Hungerford & Tomera, 1987	Knowledge of issues, knowledge of action strategies, LOC, attitudes, verbal commitment, and individual sense of responsibility
Hungerford & Volk, 1990	Awareness, Sensitivity, Attitudes, Skills, Participation
Lahiri, 2011	Behaving sensibly towards the environment and contributing towards sustainable development
Marcinkowski, 2001	Range of observable problem-solving behaviors, manifestation of environmental literacy
Oskamp, 2002	Behavior of achieving a sustainable level of human impact on the environment
Powell, Stern, Krohn & Ardoin, 2011	Respect of local environments and communities
Russ A (ed.), 2014	Positive attitude towards environmental stewardship
Simmons, 1991	Knowledge of issues, knowledge of natural systems, problem-solving skills, attitudes, and development of self-esteem
Stern, Powell & Ardoin, 2008	Environmental stewardship
Urban & Martin, 2008	Pro-environmental behaviors
Vaske & Kobrin, 2001	When the actions of an individual or group advocate the sustainable or diminished use of natural resources
Volk & Cheak, 2003	Environmental literacy

EE programs have the goal of building knowledge and action skills (NAAEE, 2009) and REB (Hungerford, Peyton & Wilke, 1980) by increasing responsible reinforcement and possibly

improving an internal LOC development (Hungerford & Volk, 1990). Studies related to REB are listed in Table 3.

Table 3

Studies related to Responsible Environmental Behavior (REB)

Study	Findings
Cottrell & Graffe, 1997	Attitude and knowledge predicted specific REB
Dimopoulos, Paraskevopoulos & Pantis, 2008	Significant positive gains in knowledge and attitudes regarding wildlife conservation after classroom EE lessons designed with all four levels of EE guidelines, score for variable locus of control (LOC) increased with score for variable understanding and concern
Hines, Hungerford & Tomera, 1987	REB model was found to be determined by intention to act (action skills, knowledge of action strategies, knowledge of issues and personality factors such as attitudes, LOC, and personal responsibility) and situational factors (economic constraints, social pressures and opportunity).
Huebner & Lipsey,1981	LOC is associated with environmental activism and personal conservation attitudes LOC shifted among activists after a disappointing political defeat concerning nuclear pollution
Hungerford Peyton & Wilke, 1980	Goal of EE is REB. Objectives of EE include awareness, knowledge, attitudes, skills, participation
Hungerford & Volk, 1990	EE is effective in promoting responsible citizenship behavior, or REB Educational agencies should attempt to develop an internal LOC in learners by increasing responsible reinforcement
Lahiri, 2011	Low correlation between REB and environmental attitude; High correlation between REB and scientific attitude
Powell, Stern, Krohn & Ardoin, 2011	Interpretation of REB might look different for different groups of people Environmental responsibility index developed to measure outcomes of the specific EE center (NorthBay)

Sia, Hungerford & Tomera, 1985	7 predictors of REB include sensitivity, knowledge, skill, gender, individual and group LOC, attitude
Simmons, 1991	5 contributing variables to REB include knowledge of issues, knowledge of natural systems, problem-solving skills, attitudes, and development of self-esteem
Stern, Powell & Ardoin, 2008	Environmental responsibility index can be developed to measure the mission and outcomes of a specific EE center (Tremont, GSMNP)
Urban & Martin, 2008	LOC influences translation of knowledge into action
Vaske & Kobrin, 2001	Place attachment facilitates the development of REB
Volk & Cheak, 2003	EE programs promoting REB positively influence literacy and community involvement

Socioeconomic status is considered a situational factor that could strengthen or weaken REB (Hines et al., 1987; Hungerford & Volk, 1990). Hines et al. (1987) compiled a meta-analysis of demographic variables assessed in association with REB, including income, education, age and gender. A weak relationship was found between income and REB, with higher income individuals appearing to be only slightly more likely to be engaging in REB (Hines et al., 1987). A weak relationship was also found between educational level and REB, with more highly educated individuals appearing to be only slightly more likely to be engaging in REB (Hines et al., 1987). Finally, a very weak relationship was found between age and REB, with younger individuals being more likely to engage in REB (Hines et al., 1987). There appears to be no relationship between gender and REB in the four studies coded (Hines et al., 1987). Powell, Stern, Krohn and Ardoin (2011) report that African-Americans are on average less likely to care about and take action to protect their environment (Powell et al., 2011). Relevant to this study, basic demographic data on students and schools inform the understanding of how the

personality factor of LOC might impact the relationship between students' performance in earth/environmental science class and their REB.

School Culture and LOC

Some studies have explored how the school environment might impact student behavior (Miller et al., 2003; Wood, Hillman & Sawilowsky, 1996). Miller et al. (2003) compared locus of control of adolescents in regular education high schools and in alternative schools. Students in alternative schools exhibited a higher degree of external locus of control orientation, as measured by the Nowicki-Strickland Control Scale for Children and Adolescents (Miller et al., 2003). Miller et al. (2003) did not find a statistically different locus of control orientation based on gender.

Wood et al. (1996) also used the Nowicki-Strickland Control Scale to provide locus of control numerical data for identified at-risk African-American adolescents. These studies suggest that there is value in structuring the school environment with consistency to help students develop internally oriented locus of control (Miller et al., 2003). Other studies suggest engaging students through small learning communities (Edmunds, 2011; Erb, 1996; Le & Frankfort, 2011). Erb (1996) found positive results with putting biology students in cooperative learning groups to hold each other accountable and reduce absenteeism (Erb, 1996). Other studies show social support, project based learning, and 21st century collaboration skills hold students accountable and reduce absenteeism (Edmunds, 2011; Steese et. al., 2006).

The small school movement began in the 1980s to engage students around themes for learning, increase achievement on standardized tests and improve graduation rates (Ancess & Allen, 2006; Shaw, 2006). North Carolina passed charter school legislation in June of 1996,

allowing public charter schools flexibility in making school based decisions while still being tied to all of the standardized tests (NCPCSA, 2013). The Early College High School Initiative began in 2002 with a primary goal of helping typically low performing racial and ethnic groups succeed in secondary and post-secondary education as evidenced by standardized tests (ECHSI, 2013).

In 2003, North Carolina joined with the Bill and Melinda Gates Foundation to create NC New Schools Project, an intermediate organization facilitating small school initiatives (Gates Educational Policy Paper, 2003; Habit, 2013; Le & Frankfort, 2010). Large, comprehensive high schools are "redesigned" to smaller school-within-a-school entities with an engaging theme and a student body cap of no more than 400 students (Ancess & Allen, 2006; Gates Educational Policy Paper, 2003; Shaw, 2006). Schools target increasing test scores and graduation rates in their homework, late work, and attendance policies (Herman & Golan, 1993; Popham, 2001; Sowder & Harward, 2001; Visone, 2009). Strategies include students never receiving a zero for an assignment, being able to turn in work at any time and retaking tests to make higher grades (O'Connor, 2007; Schlechty, 2002). Additional research is warranted in area of small school impact on student learning. Research is lacking in the small school impact on student LOC and REB. The relationship between students' locus of control, their performance in earth/environmental science class, and their responsible environmental behavior in the context of small schools is relevant to this study.

Need for this study

Findings of research have been used to indicate that students with more internally oriented locus of control would have higher performance in attendance and grades (Chubb et al.,

1997; Flowers et al., 2003; Hadsell, 2010; Ignat & Clipa, 2010; Janssen & Carton, 1999; Miller et al., 2003; Parameswari & Shamala, 2012). Results of research also have shown that students with more internally oriented LOC would demonstrate more REB (Hines et al., 1987; Sia et al., 1985). Research asserts that students in small school environments would have higher performance in attendance and grades (Ancess & Allen, 2006; Gates Educational Policy Paper, 2003). Research is lacking in the area of small school environment impact on REB. Small school strategies might embody enabling environments that do not allow students to experience natural consequences for their behaviors and would predict a more externally oriented LOC (Grimes et al., 2004). This study will examine the relationship between students' LOC, their performance in earth/environmental science class, and their REB in the context of small schools.

CHAPTER 3.

METHODOLOGY

A cross sectional, mixed method, between group study (Creswell, 2009) was conducted to determine the relationship between students' LOC, performance in earth/environmental science class, and their responsible environmental behavior (REB) in the context of small schools. Information about schools in eastern Wake County was collected from interviews, emails and newspaper articles. Principals and earth/environmental science teachers were interviewed. Teachers provided student performance data of attendance, grade in course, and standardized exam score and attendance. Students in each of six small schools that had recently completed an earth/environmental science class were asked to complete an on-line survey measuring LOC and REB. Appropriate permissions and procedures were followed in collecting data after the Montreat College Institutional Review Board (IRB) approved the study.

Participants

The Wake County Public School System is the largest school system in the state of North Carolina and the 16th largest school system in the nation. Encompassing the state capital's population of Raleigh, NC, the school system includes 168 schools serving over 150,000 students. There are five Colleges/Universities in Wake County, a major technology, research and development hub in the adjacent Research Triangle Park, and a large government work force. This study includes subjects from eastern Wake County. Demographic information in Table 4 is provided by Wake County Public Schools (WCPSS, 2013) for Knightdale, Wendell and Zebulon, the three towns that are in the easternmost part of Wake County and served by East Wake High School.

Table 4

Eastern Wake County Demographics and Comparison to Wake County

	Knightdale	**Wendell**	**Zebulon**	**Wake County**
Population	11,401	5,845	4,433	900,993
% White	45.9%	58%	42%	65.3%
%Black	38.3%	30%	37.8%	21.5%
%Hispanic	11.4%	11.5%	15.9%	8.4%
Median Household Income	$68,308	$38,571	$47,487	$63,770
% of Households with parent having 4 year degree	39.9%	22%	10.8%	47.5%

Six small school, public high schools in suburban eastern Wake County, North Carolina were chosen for this study since they encompass the majority of public school students in the easternmost part of the County. The schools include five public high schools that are a part of the Wake County Public School System local education agency and one public charter school with its own administrative control. East Wake School of Arts, Education and Global Studies (Arts), East Wake School of Engineering Systems (SES), East Wake School of Health Science (SHS) and East Wake School of Integrated Technology (SIT) are four redesigned themed high schools that share one campus, formerly known as East Wake High School. Wake North Carolina State University STEM Early College High School (STEM-ECHS) is housed adjoining the NCSU campus in central Wake County and draws students from all over the county, including eastern Wake County. East Wake Academy (EWA) is a K-12 public charter school in eastern Wake County but is not a part of the Wake County Public School System (Early College High School Institute (ECHSI), 2013; North Carolina Public Charter School Association (NCPCSA), 2013; Wake County Public School System (WCPSS), 2013).

Termed "small school," each high school is intentionally less than 400 students and has a theme or focus for the expressed purpose of engaging students in specific ways. Each of the six small school public high schools in this study has its own principal and one predominant earth/environmental science teacher. Each of the six small schools in the study follows the same college preparatory curriculum (ECHSI, 2013; NCPCSA, 2013; WCPSS, 2013). The students at each small school were given a level of choice of school assignment (ECHSI, 2013; NCPCSA, 2013; WCPSS, 2013). Students in eastern Wake County are assigned to East Wake High School as their base public high school, and parents and students choose which of the four small schools the student will attend (Arts, SES, SHS, SIT). Students may request to transfer to one of the other three high schools on campus one time during their four years of high school. Students who do not initially choose a school or who move to eastern Wake County during the middle of the year are assigned to the school with the lowest enrollment.

Wake North Carolina State University STEM Early College High School (STEM-ECHS) is a magnet public high school begun in 2011 following the early college model. It does not have a base student population. Students are accepted by lottery of those making a two-tiered online application in the spring, with 50 percent of each class designated first generation college students. In 2013, 350 students applied for 48 slots (ECHSI, 2013; WCPSS, 2013). East Wake Academy (EWA) is a free, public, K-12 charter school located in eastern Wake County. It does not have a base student population and has its own board of governance. Started in 1998, EWA has a waiting list of over 100 families each year. Students are accepted by lottery of those making an application in the spring (NCPCSA, 2013). Demographic questions were asked of each student in the survey to evaluate differences in school populations. Demographic questions

include name of small school, age, gender, ethnicity, socioeconomic status, highest level of parental education and past performance (grade in course and attendance).

The latest standardized testing information for each of the six small schools in the study (Bonner, 2013; NCDPI, 2013) and the school population for the 2013-2014 school year is shown in Table 5. The researcher contacted teachers and students multiple ways and multiple times to obtain student data. Students who did complete the survey (N= 83) are ages 14-17 and were enrolled in freshman level earth/environmental science classes during the spring 2014 semester.

Table 5

School Information gathered from newspaper, principals and teachers.

School	**2013 Test scores**			**2013-2014 population**		**Study**	
	% at grade level	Goal	% free or reduced lunch	# students in school	# freshmen in school	# students in class, Spring 2014	Sample Size
Arts	41.9	Exceed	55	386	96	31	5
SES	29.5	Not met	45	369	110	32	0
SHS	37.5	Met	47	386	111	30	9
SIT	24.1	Met	57	333	114	33	0
STEM-ECHS	73.8	Met	39	165	56	57	52
EWA	54.5	Not met	NA	296	84	50	17

Years of principal experience and teacher experience for each of the six small schools in the study is shown in Table 6. Teachers also noted whether they held an advanced degree and were certified as environmental educators. At the time of the survey, none of the teachers had been certified as North Carolina environmental educators.

Table 6

Teacher and Principal Information

	Principal # years experience	**Principal # years small school experience**	**Teacher # years experience**	**# years teaching earth/ env. science**	**Teacher Holds Advanced Degree**	**Teacher EE Certified**
Arts	3	3	5	5	Yes	No
SES	7	7	1	1	No	No
SHS	5	1	23	16	Yes	No
SIT	4	3	18	1.5	No	No
STEM-ECHS	15	3	6.5	6.5	Yes	No
EWA	8	8	10	10	Yes	No

Note: Information is provided from a questionnaire (see Appendix A) given in the fall of 2013 (R. Bazzell, personal communication, December 2, 2013; L. Berube, personal communication, December 2, 2013; W. Burgess, personal communication, November 30, 2013; C. Hillman, personal communication, December 3, 2013; M. James, personal communication, December 2, 2013; R. Johnson, personal communication, December 3 , 2013; R. Mathinson, personal communication, December 5 , 2013; S. Shipp, personal communication, November 30, 2013; T. Thomlinson, personal communication, December 5, 2013; E. Thomas, personal communication, December 5 , 2013; H. Thomas, personal communication, December 4 , 2013).

Information about attendance, tardy, homework and late work policy variations was provided by the teachers and is included at the end of this study. General attendance policy is set by the school board in accordance with the legislative laws, but each school decides how the attendance policy will be implemented and what structures will be put in place to account for student truancy (see Appendix F). Tardy policy is solely determined and enforced by teachers and administration at the school level (see Appendix G). Wake County School Board policy directs the percent of a student's grade that may be determined by homework assignments and ensures absent students have time to make up assignments, but homework and late work policies are ultimately enforced by the teacher on the classroom level. Small school administrations might direct policies in order to achieve consistency within the school (see Appendix H).

Measures

Instrument for measuring locus of control. The 21-question modified Nowicki-Strickland Locus of Control Scale (see Appendix D) measures the degree to which students perceive achievement and failures as the result of their own behavior (internal locus of control) or the result of factors beyond their control (external locus of control) (Nowicki & Strickland, 1973). For each question on the instrument, students responded either yes or no. Each external response received one point and each internal response received zero points; scores ranged from 0 to 21. Scores of 13 or less were considered internal, scores above 13 were considered external (Hadsell, 2010). A higher score indicated a more externally oriented locus of control. Nowicki and Strickland (1973) reported the internal consistency coefficient, corrected by the Spearman-Brown formula, to be .741 and a 6-week test-retest reliability coefficient of .66 for seventh graders and .71 for the tenth graders. Validity has been reported through correlation with the Bialer-Cromwell Scale and Rotter Scale and the relationships were in expected directions (Miller et al., 2003).

Mechanism for measuring performance. For the purpose of this study, performance was measured by grade in the course, grade on the state mandated standardized test, and days in attendance of the course. EWA is a public charter school and its students are not required to take the state mandated standardized test. All schools, except STEM-ECHS, operate on a 90-day semester schedule. STEM-ECHS operates on a 180-day yearlong schedule and days were weighted for comparison. Performance information of grade in course, grade on state mandated standardized test and days in attendance was provided by the teacher or school.

Instrument for measuring responsible environmental behavior (REB). For the purpose of this study, REB was measured by the 10 question environmental stewardship scale (see Appendix E) modified from Stern (Stern, Powel & Ardoin, 2008) and Pedersen (Russ, 2014). Statements were measured using a 5-point Likert-type scale ranging from "strongly disagree" (1 point) "somewhat disagree" (2 points), "Neutral" (3 points), "somewhat agree" (4 points), and "strongly agree" (5 points) (Russ, 2014). Scores ranged from 10 to 50; a higher score indicated a higher level of environmental conservation and intention regarding environmental behavior.

Procedures

A mixed method study measuring student locus of control as it related to performance in a small school setting was conducted. Using a cross sectional design between groups, students (N = 83) in six different small school settings in eastern Wake County completed an on-line survey assessing demographic variables, locus of control, performance and REB.

The parental consent letter was distributed and collected after Institutional Review Board (IRB) approval. A pilot study was conducted with 12th grade Advanced Placement Environmental Science (APES) students at EWA at the end of the spring semester of 2014 to test the ease of the online survey process. It was revealed that some earth/environmental courses are 180-days in length and some earth/environmental courses are 90-days in length. An adjustment was made by weighting 180- day courses attendance data for comparison.

Science teachers in each of the small schools participating in the study were trained by the principal researcher in administering the on-line survey. Confidentially was honored when each student was given a code number to enter when taking the on-line survey. This number was

provided to the teachers in training and was used to facilitate data analysis and ensure anonymity. Only students with completed parental consent letters on file were used for the study. Teachers had the option of providing incentives such as extra credit points for completing the surveys (Hadsell, 2010). Two schools, SHS and SIT, chose to give extra credit points for completing the survey. SHS had a total of 32 students take the survey but 23 were unusable because the student had never taken the earth/environmental science class. SIT and SES did not have any students take the survey. Table 7 describes how the small schools chose to administer the survey. Wake County Public School System Central Office required that class time not be used for students to take the survey.

Table 7

Survey Method chosen by each School

School	**Student Survey Method**	**# students completed survey**
Arts	Advisory assignment	5
SES	Homework assignment	0
SHS	Extra Credit assignment	32
SIT	Extra Credit assignment	0
STEM-ECHS	Homework assignment	52
EWA	Homework assignment	17
Total		**106**

The student survey method of Arts, SIT and SES was mirrored by the other schools where a higher percentage of students took the survey. SES (n=0) students were given the survey as a homework assignment as were the students of STEM-ECHS (n=52) and EWA (n=17). SIT (n=0) students were given the survey as an extra credit assignment as were the students of SHS (n=9). SHS had a total of 32 students take the survey but 23 were unusable because the student had not taken an earth/environmental science course.

Students took the one-time on line survey during the beginning of the fall semester of 2014. The survey had three main parts: demographic and performance information, LOC questions, and environmental stewardship questions as well as questions addressing the possible influence of summer experiences. It took students approximately 20 minutes to complete the survey. Students self-reported demographic information including age, gender, grade in school, ethnic group, parents' highest level of education and socioeconomic status (see Appendix C). Grade in the course, standardized test score, and attendance were collected from the earth/environmental science teacher at the small school. Students also completed the modified Nowicki - Strickland Locus of Control Scale (see Appendix D) and the Environment Stewardship Scale (see Appendix E).

Data Analysis

Students were grouped according to their LOC score, external LOC (greater than or equal to 13) or internal LOC (less than 13). Of all 106 students who completed the survey, 83 were used for data analysis. Twenty three of the 106 surveys were unusable because the student had not taken an earth/environmental science course.

Means, standard deviations and range of scores are reported. Correlations between LOC, performance variables and REB are reported in Table 11. Due to the three different means of assessing performance - grade in course, grade on standardized exam, and attendance – a multivariate analysis of variance (MANOVA) was conducted to test for differences between groups. Demographic data were analyzed using an analysis of variance (ANOVA) to investigate

potential moderating effects of gender, type of small school, age, ethnicity, socioeconomic status, father's highest level of education and mother's highest level of education.

CHAPTER 4.

RESULTS

Survey Data

Survey Data for each school is reported in Table 8. The average locus of control (LOC) score of all students is 8.22. The study originally intended to look at differences between the two different types of LOC classifications (internal and external), but there were not enough students whose scores reflected external LOC; 7.22% of the students tested demonstrated an external LOC score while 92.78% of the students tested demonstrated an internal LOC score. EWA and STEM-ECHS small schools had the largest percentage of students complete the survey. EWA (34% completed the survey) and STEM-ECHS (91% completed the survey) do not have an assigned base student population and are comprised of completely voluntary students. These schools reported the highest percentage of students at grade level as measured in 2013, EWA 54.5% and STEM-ECHS 73.8% (Bonner, 2013). In the school group of STEM-ECHS, 90.4% of the students rated internal LOC.

Table 8

Summary of Data for each school (N=83)

School	Surveys	External LOC (≥14)	Internal LOC (≤13)	μ LOC	μ REB	μ Course Grade	μ Exam	μ Attendance
Arts	5	0	5	10.00	36.60	87.8	82.2	86.4
SES	0	--	--	--	--	--	--	--
SHS	9	1	8	9.78	37.67	88.11	81.78	88.86
SIT	0	--	--	--	--	--	--	--
STEM-ECHS	52	5	47	8.13	38.17	88.79	89.10	88.41
EWA	17	0	17	7.12	38.59	89.18	--	86.88
Total	**83**	**6**	**77**	**8.22**	**38.11**	**88.73**	**87.58**	**87.99**

Survey data were absent for two schools, SIT and SHS. It should be noted that SIT and SES reported the lowest percentage of the schools in this study of students at grade level as measured in 2013 (Bonner, 2013), SIT (24.1%) and SES (29.5%). Schools in this study that reported a higher percentage of students at grade level as measured in 2013 (Bonner, 2013), Arts (41.9%) and SHS (37.5%), had a small number of students take the survey, Arts (n=5) and SHS (n=9). EWA reported 54.5% of its students at grade level in 2013 (Bonner, 2013) and had 17 students complete the survey. The school in this study that reported the highest percentage of students at grade level as measured in 2013, (Bonner, 2013), STEM-ECHS (73.8%), also had the highest number of students complete the survey (n=52). Percentage of students at grade level and percentage of students with free or reduced lunch is shown in Table 5. SIT had the lowest number of students at grade level (24.1%), the highest number of students with free or reduced lunch (57%) and did not have any students take the survey. STEM-ECHS had the highest number of students at grade level (73.8%), the lowest number of students with free or reduced lunch (39%) and had 52 students take the survey, the highest number of students taking the survey of any of the schools in the study. As a public charter school, EWA does not provide free and reduced lunch data.

Descriptive Statistics and Correlations

Locus of Control (LOC). Students who took the survey had LOC scores between 2 and 17 as shown in Table 9. Arts (n=5) students' LOC scores ranged 5 -13. No students reported external LOC scores and the average score was 10.00. SHS (n = 9) students' LOC scores ranged 4-17. One student reported an external LOC score, and the average score was 9.78. STEM (n=52) students' LOC scores ranged 2-16. Five students reported external LOC scores, and the

average score was 8.13. EWA (n=17) students' LOC scores ranged 2-12. No students reported external LOC scores, and the average score was 7.12. The average LOC score of all students taking the survey (N=83) was 8.22.

Table 9

LOC Summary Data

School	# Surveys	Range	Minimum	Maximum	# External	Average LOC
Arts	5	8	5	13	0	10.00
SHS	9	13	4	17	1	9.78
STEM-ECHS	52	14	2	16	5	8.13
EWA	17	10	2	12	0	7.12
Total	83	15	2	17	6	8.22

Note: School includes four schools on one campus and two other high schools. Arts (East Wake School of Arts, Education and Global Studies), SES (East Wake School of Engineering Systems), SHS (East Wake School of Health Science), SIT (East Wake School of Integrated Technology), are on one campus formerly known as East Wake High School. STEM-ECHS (NC State University Early College High School) is a county-wide early college small school and EWA (East Wake Academy) is a public charter school.

There were 83 total subjects, 77 internal and 6 external. The study originally intended to look at the two groups independently, but there were not enough students in the external LOC group (n=6) to produce statistically significant results. There were a larger number of internal LOC subjects (n=77). Internal LOC has been extensively studied as a predictor of performance (Hadsell, 2010; Janssen & Carton, 1999; Lynch, Hurford & Cole, 2002; Miller, Fitch & Marshall, 2003). LOC was treated as a continuous variable in the data analysis.

Responsible Environmental Behavior (REB). Students who took the survey had REB scores between 22 and 48. Arts (n=5) students' REB scores ranged 27 -43. The average score was 36.60. SHS (n=9) students' REB scores ranged 31-45. The average score was 37.67. STEM (n=52) students' REB scores ranged 22-48. The average score was 38.17. EWA (n=17) students' REB scores ranged 32-47. The average score was 38.59. The average REB score of all

students taking the survey (N=83) was 38.11. Whole group descriptive statistics are shown in Table 10.

Table 10

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
LOC	83	15	2	17	8.22	3.69	13.64
REB	83	26.00	22.00	48.00	38.11	5.83	33.98
Course	83	26.00	73.00	99.00	88.73	5.80	33.59
Exam	66	42.00	58.00	100.00	87.58	8.34	69.48
Attendance	83	8.00	82.00	90.00	87.99	1.97	3.89
Valid N (listwise)	66						

The mean REB score was 38.11 on a scale of 10 to 50 as shown in Table 10, indicating that most of the students who took the survey gave positive responses towards environmental conservation and intention regarding environmental behavior, based on their responses to the survey. The 8-point high school grading scale rates grades of 100 - 93 as A, 92 - 85 as B, 84 - 77 as C, 76 - 70 as D and below 70 as failing. The mean course final grade of those completing the survey was 88.73 as shown in Table 10, signifying the average earth/environmental science course grade of the students who took the survey was a B. The mean standardized exam grade was 87.58, B, as shown in Table 2. The NC Department of Public Instruction is responsible for administering the standardized final exam and correcting raw scores to the same 8-point scale stated earlier. Some students were present and on time all 90 days of the course. The highest number of days tardy or absent from the course was 8. The mean attendance was 87.99 as shown in Table 10. On average, a student who took the survey was either absent or tardy for a total of 2 times during the course.

Interpretation of differences in each of the small schools addressed the research question: what is the relationship between students' locus of control, their performance in earth/environmental science class, and their responsible environmental behavior? Correlations between students' locus of control score, their REB score and student's performance in earth/environmental science class in the context of small schools are reported in Table 11. Statistical significance in each analysis is determined by an alpha of .05. A positive correlation indicates that as one variable increases, the other variable also increases; a negative correlation value indicates that as one variable increases the other variable decreases.

Table 11

Correlations

		LOC	REB	Course	Exam
LOC	Pearson Correlation				
	Sig. (2-tailed)				
	N				
REB	Pearson Correlation	-.195			
	Sig. (2-tailed)	.077			
	N	83			
Course	Pearson Correlation	-.405**	.373**		
	Sig. (2-tailed)	.000	.001		
	N	83	83		
Exam	Pearson Correlation	-.444**	.259*	.743**	
	Sig. (2-tailed)	.000	.035	.000	
	N	66	66	66	
Attendance	Pearson Correlation	-.035	.128	.118	.025
	Sig. (2-tailed)	.754	.249	.287	.842
	N	83	83	83	66

*p < .05. **p < .01.

As expected, a significant correlation exists between grade in course and grade on the standardized exam (r=.743, p < .01). This correlation suggests that a student with a higher grade in earth/environmental science would also have a higher grade on the standardized exam for that

course. A significant correlation exists between grade in course and REB (r= .373, p < .01), indicating that a student with a higher grade in earth/environmental science would also have a higher REB score. Another significant relationship is shown between grade in course and LOC (r=-.405, p < .01), implying that a student with a higher grade in earth/environmental science would have a lower, or more internal, LOC. A significant relationship exists between standardized exam score and REB (r=.259, p< .05), thereby suggesting that a student with a higher grade on the final, standardized exam would have a correspondingly higher level of REB. Finally, a significant correlation exists between standardized exam score and LOC (r=-.444, p<.01). This means that a student with a higher grade on the standardized exam would be expected to have a lower, or more internal, LOC.

A marginal relationship exists between REB and LOC (r=-.195, p=.077). This means that a student with a higher level of REB would have a lower, or more internal, LOC. While this correlation did not reach the desired significance of p < .05, it does indicate the students' responsible environmental behaviors are related to their self-reported locus of control. Attendance did not correlate significantly with any of the other variables in the study and was removed from subsequent analysis.

Predictors of Responsible Environmental Behavior (REB)

Multiple regressions were run to assess the relationship between REB and academic performance in the classroom setting. A multiple regression was performed between REB as the dependent variable and course grade, standardized exam grade, and LOC as independent variables. Analysis of the data was performed using SPSS software. The results are shown in Table 12.

Table 12

Summary of Multiple Regression Analysis between the performance variables and REB

Multiple R-square = .132

Analysis of variance (ANOVA)

Model	Sum of squares	Df	Mean square	F	*p*
Regression	360.418	3	102.139	3.137	.032*
Residual	2018.567	62	32.558		
Total (corrected)	2324.985	65			

Note. Predictors: LOC, Standardized test Grade, Course Grade
* = $p < 0.05$ (Significant result)

Table 12 shows the analysis of the combined effect of LOC, Standardized test grade and Course grade on REB of students enrolled in small school environments in eastern Wake County. This model significantly predicted REB of secondary school students in the small school environment, $F(3,62) = 3.137$, $p < 0.05$, $R^2 = .132$

Table 13

Relative Contribution of the Performance Variables to the Prediction

	Unstandardized Coefficients		Standardized Coefficients			95% Cl	
Variable	b	seb	b	t	p	LL	UL
Constant	1.968	11.920		.165	.869	-21.859	25.795
Course grade	.412	.192	.386	2.140	.036	.027	.797
Exam grade	-.007	.127	-.010	-.056	.955	-.261	.246
LOC	1.522	2.570	.074	.592	.556	-3.615	6.659

Note. N = 83. Cl = confidence interval for β; LL = lower limit; UL = upper limit.

While the full model was significant, the relative contribution of each independent variable, shown in Table 13, reveals that the only independent variable that made a significant

contribution to the prediction of REB was final grade in course ($\beta = 0.412$, $t = 2.140$; $p < 0.05$). The data indicate with a high level of confidence that the student's final grade in the course (as opposed to the standardized exam score) is a good predictor of the student's REB.

Since final grade in course is the only significant predictor variable, a simple regression was performed with that predictor variable alone in the model. Analysis was performed using SAS software and is shown in Table 14. The data base was enriched by excluding two predictor variables, adding to the significance of the final grade as there are more degrees of freedom for error.

Table 14

Summary of Simple Regression Analysis between Performance Variable Course Grade and REB

R-square = .139

Analysis of variance (ANOVA)

Model	Sum of squares	Df	Mean square	F	*p*
Regression	388.49	1	388.49	13.12	.0005**
Residual	2397.54	81	29.60		
Total (corrected)	2786.02	82			

** = p < 0.01 (Significant result)

Regression equation: REB = 4.7822 + .37557 Course Grade
t for intercept = .52, *p* > t=.6053
t for slope = 3.62, *p* > t=.0005**

Demographic Analysis

Demographic information is shown in Tables 15 and 16. Demographic data were analyzed using ANOVA to investigate gender, type of small school, age, ethnicity, socioeconomic status, and parent's highest level of education. Means, standard deviations, and range of scores were reported.

Table 15

Gender, Age, Socioeconomic Status and Ethnicity Demographic Information (N=83)

	Total (N=83)	**Arts (n=5)**	**SHS (n=9)**	**STEM-ECHS (n=52)**	**EWA (n=17)**
Gender					
Male	32	1	3	26	2
% Male	38.55%	20.%	33.33%	50.%	11.76%
Female	51	4	6	26	15
% Female	61.45%	80.%	66.67%	50.%	88.23%
Average Age (years)	15.02	15.2	15.33	14.96	15
Socioeconomic Status					
Qualify for Free/Reduced Lunch	25	4	4	16	1
% Qualify Free/Reduced Lunch	30.12%	80.%	44.44%	30.77%	5.89%
Do not qualify Free/Red. Lunch	58	1	5	36	16
% Do not qualify Free/Reduced	69.88%	20.%	55.56%	69.23%	94.12%
Ethnicity					
American Indian	0	0	0	0	0
Asian	8	0	0	8	0
% Asian	9.64%	0%	0%	15.38%	0%
African American	20	1	1	15	3
% African American	24.10%	20.%	11.11%	28.85%	17.65%
Hispanic	10	1	3	5	1
% Hispanic	12.05%	20.%	33.33%	9.62%	5.88%
Caucasian	42	1	5	23	13
% Caucasian	50.60%	20.%	55.56%	44.23%	76.47%
Prefer not to answer	3	2	0	1	0
% Prefer not to answer	3.61%	40.%	0%	1.92%	0%

The survey was taken by 51 females and 32 males as reported in Table 15. Female students in the East Wake small schools (Arts 80% female, SHS 66.67% female) and EWA (88.23% female) were more likely to take the survey than males. Students from STEM-ECHS school taking the survey were equally distributed, 50% were female and 50% were male.

Age shown in Table 15 is reported as the student's age on October 17, 2014 since students had to be 5 years old on or before October 16, 2004 in order to register for kindergarten. Three students in two different schools reported being 14 years old. Three students in three different schools reported being 16 years old and one student reported being 17 years old. Two students taking the survey indicated they were in the 9th grade, 81 students taking the survey indicated they were in the 10th grade. However, the teachers reported that all 83 students of the students who took the survey were in the 10th grade. A possible reason for the conflicting responses on grade level is that the students were in the 9th grade when they took earth/environmental science but were in 10th grade when they took the survey and then were confused about what the question was asking.

Socioeconomic Status shown in Table 15 is reported as percentage of students qualifying for free or reduced lunch. In the Arts school, 80% of the students taking the survey reported to qualify for free or reduced lunch as shown in Table 15 compared to 55% of the school population reported by the school (Bonner, 2013) and shown earlier in Table 5. In SHS, 44.4% of the students taking the survey reported to qualify for free or reduced lunch as shown in Table 15 compared to 47% of the school population reported by the school (Bonner, 2013) and shown earlier in Table 5. In STEM-ECHS, 30.8% of the students taking the survey reported to qualify for free or reduced lunch as shown in Table 15 compared to 39% of the school population reported by the school (Bonner, 2013) and shown in Table 5. In EWA, 5.89% of the students taking the survey reported to qualify for free or reduced lunch as shown in Table 7. EWA is a public charter school and does not report free and reduced lunch data (Bonner, 2013). SIT and SES did not have any students take the survey to report free and reduced lunch data. 57% of SIT

students and 45% of SES students qualify for free or reduced lunch as reported by the school (Bonner, 2013) and shown in Table 5.

Ethnicity data are reported in Table 15. Of the students who took the survey, 50.6% reported their ethnicity as Caucasian/ White, 24.1% reported their ethnicity as Black/African American, 12.1% reported their ethnicity as Hispanic, 9.6% reported Asian, and 3.6% preferred not to answer. The four schools of East Wake High's base population come from three towns in the eastern most part of the county. Knightdale (45.9%), Wendell (58%) and Zebulon (42%) report Caucasian demographics below that of the general Wake County population (65.3%), (WCPSS, 2013) as shown earlier in Table 4. However, the four schools of East Wake High are even lower, Arts (32.9%), SES (44.5%), SHS (41.1%) and SIT (26.1%), (WCPSS, 2013). Knightdale (38.3%), Wendell (30%) and Zebulon (37.8%) report African American demographics higher than that of the general Wake County population (21.5%), (WCPSS, 2013) as shown earlier in Table 4. However, the four schools of East Wake High are even higher, Arts (38.6%), SES (36.0%), SHS (35.1%) and SIT (42.9%), (WCPSS, 2013).

Table 16

Parents' Education Level Demographic Information (N=83)

	Total (N=83)	**Arts (n=5)**	**SHS (n=9)**	**STEM-ECHS (n=52)**	**EWA (n=17)**
Mother's					
Highest level of school					
Less than high school	8	2	3	2	1
% Less than high school	9.64%	40%	33.33%	3.85%	5.88%
High school or GED	10	2	2	4	2
% High school or GED	12.05%	40%	22.22%	7.69%	11.76%
Some college, no degree	15	1	1	10	3
% Some college, no degree	18.07%	20%	1.11%	19.23%	17.65%
Associate degree	11	-	1	5	5
% Associate degree	13.25%	-	1.11%	9.62%	29.41%
Bachelor degree	27	-	2	21	4
% Bachelor degree	32.53	-	22.22%	40.38%	23.53%
Graduate degree	12	-	-	10	2
% Graduate degree	14.46%	-	-	19.23%	11.76%
Father's					
Highest level of school					
Less than high school	8	2	3	2	1
% Less than high school	9.64%	40%	33.33%	3.85%	5.88%
High school or GED	20	1	3	11	5
% High school or GED	24.10%	20%	33.33%	21.15%	29.41%
Some college, no degree	13	2	1	6	4
% Some college, no degree	15.66%	40%	1.11%	11.54%	23.53%
Associate degree	8	-	1	6	1
% Associate degree	9.64%	-	1.11%	11.54%	5.88%
Bachelor degree	15	-	1	12	2
% Bachelor degree	18.07%	-	1.11%	23.08%	11.76%
Graduate degree	19	-	-	15	4
% Graduate degree	22.89%	-	-	28.85%	23.53%

Parents were less educated in the small schools of East Wake High School. The highest level of education of either parent of an Arts school student is some college, no degree as shown in Table 16. The highest level of education of either parent of a SHS school student is a college

bachelor degree. Both STEM-ECHS and EWA students reported mothers and fathers with graduate degrees.

Gender. A one-way repeated measures ANOVA was conducted using SPSS software to compare the effect of gender on course grade, standardized exam grade, and LOC. The main effect of gender was significant as shown in Table 17, F (3,62) = 5886, p = .000.

Table 17

Means, Standard Deviations, and One-Way Analysis of Variance for the Effects of Gender on Four Dependent Variables

	Gender			
Variable	M	SD	F (3,62)	*p*
Grade in Course	514460.129	514460.129	16170.135	.000**
Exam Score	503972.182	503972.182	7530.275	.000**
LOC	.517	.517	6.104	.016

*p < .05. **p < .01. (Significant result)

Further analysis to explore gender contribution was performed using SAS software and is shown in Table 18. Means, standard deviation and number of students for each gender are reported. Female students (n=51) taking the survey tended to have higher REB scores and more external LOC. Male students (n=32) taking the survey tended to have higher grades in the earth/environmental course and higher grades on the standardized exam as shown in Table 18.

Table 18

Male and Female Means for Four Dependent Variables

	Gender – Male				Gender - Female			
Variable	n	M	min	Max	n	M	min	max
REB	32	36.59	22	47	51	39.06	25	48
Course Grade	32	88.94	78	99	51	88.61	73	98
Exam Score	30	89.63	76	100	36	85.86	58	99
LOC	32	7.81	3	16	51	8.47	2	17

There was more tendency to have differences in means of genders in the LOC variable than in any others. Separate regressions were run to determine if the relationship between course grade and LOC was uniform over the two genders. The slope for female was significant at the .02% level whereas for male, it was considerably stronger. Regressed course grade on LOC for both genders combined was significant, which meant that the relationship coming from the male gender was strong enough to overcome the lack of a relationship in the female gender. Since females students did not show a strong relationship between the two variables, the significance can be attributed to the male students.

Type of Small School. A one-way repeated measures ANOVA was conducted using SPSS software to compare the effect of type of small school on course grade, standardized exam grade, and LOC. Statistical testing analysis determined the main effect of small school was found to be significant as shown in Table 19.

Table 19

Means, Standard Deviations, and One-Way Analysis of Variance for the Effects of Type of Small School on Three Dependent Variables

	Small School			
Variable	M	SD	F (3,61)	*p*
Grade in Course	212101.062	212101.062	6555.444	.000**
Exam Score	193879.186	193879.186	3093.131	.000**
LOC	.130	.130	1.515	.223

*p < .05. **p < .01. (Significant result)

There was a significant effect of small school, F (3,61) = 2404, p = .000. The type of small school had a statistically significant effect on grade in course and grade on standardized exam.

Age. A one-way repeated measures ANOVA was conducted using SPSS software to compare the effect of age on course grade, standardized exam grade, and LOC. Statistical testing analysis determined the main effect of age was found to be significant as shown in Table 20.

Table 20

Means, Standard Deviations, and One-Way Analysis of Variance for the Effects of Age on Three Dependent Variables

	Age			
Variable	M	SD	F (3,60)	*p*
Grade in Course	59447.325	59447.325	1918.891	.000**
Exam Score	56786.822	56786.822	804.071	.000**
LOC	.005	.005	.055	.815

*p < .05. **p < .01. (Significant result)

There was a significant effect of age, F (3,60) = 712, $p = .000$. The student's age had a statistically significant effect on grade in course and grade on standardized exam.

Ethnicity. A one-way repeated measures ANOVA was conducted using SPSS software to compare the effect of ethnicity on course grade, standardized exam grade, and LOC. Statistical testing analysis determined the main effect of ethnicity was found to be significant as shown in Table 21.

Table 21

Means, Standard Deviations, and One-Way Analysis of Variance for the Effects of Ethnicity on Three Dependent Variables

	Ethnicity			
Variable	M	SD	F (3,59)	*p*
Grade in Course	297949.594	297949.594	11566.109	.000**
Exam Score	285832.829	285832.829	4651.070	.000**
LOC	.786	.786	9.286	.003**

*p < .05. **p < .01. (Significant result)

There was a significant effect of ethnicity, F (3,59) = 4320, p = .000. The student's race had a statistically significant effect on grade in course, grade on standardized exam and LOC.

Socioeconomic status. A one-way repeated measures ANOVA was conducted using SPSS software to compare the effect of socioeconomic status on course grade, standardized exam grade, and LOC. Statistical testing analysis determined the main effect of socioeconomic status was found to be significant as shown in Table 22.

Table 22

Means, Standard Deviations, and One-Way Analysis of Variance for the Effects of Socioeconomic Status on Three Dependent Variables

	Socioeconomic Status			
Variable	M	SD	F (3,62)	*p*
Grade in Course	473152.002	473152.002	17457.279	.000**
Exam Score	459806.548	459806.548	7423.495	.000**
LOC	.487	.487	5.717	.020*

*p < .05. **p < .01. (Significant result)

There was a significant effect of socioeconomic status, F(3,62) = 6501, p = .000. The student's socioeconomic status had a statistically significant effect on grade in course, grade on standardized exam and LOC.

Parent's Education Level. A one-way repeated measures ANOVA was conducted using SPSS software to compare the effect of father's highest level of education on course grade, standardized exam grade, and LOC. Statistical testing analysis determined the main effect of father's education level was found to be significant as shown in Table 23.

Table 23

Means, Standard Deviations, and One-Way Analysis of Variance for the Effects of Father's Highest Level of Education on Three Dependent Variables

	Father's Level of Education			
Variable	M	SD	F (3,58)	*p*
Grade in Course	458974.758	458974.758	18548.531	.000**
Exam Score	444564.842	444564.842	7572.758	.000**
LOC	.565	.565	6.727	.012

*p < .05. **p < .01. (Significant result)

There was a significant effect of father's education level, F(3,58) = 7128, *p* = .000. The father's highest level of education had a statistically significant effect on the student's grade in course and grade on standardized exam.

A one-way repeated measures ANOVA was conducted using SPSS software to compare the effect of mother's highest level of education on course grade, standardized exam grade, and LOC. Statistical testing analysis determined the main effect of mother's education level was found to be significant as shown in Table 24.

Table 24

Means, Standard Deviations, and One-Way Analysis of Variance for the Effects of Mother's Highest Level of Education on Three Dependent Variables

	Mother's Level of Education			
Variable	M	SD	F (1,58)	*p*
Grade in Course	418830.504	418830.504	14485.911	.000**
Exam Score	404101.154	404101.154	6821.481	.000**
LOC	.263	.263	3.113	.083

*p < .05. **p < .01. (Significant result)

There was a significant effect of mother's education level, F (3,58) = 5674, *p* = .000. The mother's highest level of education had a statistically significant effect on the student's grade in course and grade on standardized exam.

CHAPTER 5.

DISCUSSION AND RECOMMENDATIONS

Discussion

This study contained a large number of internal LOC students in the self-selected populations of EWA and STEM-ECHS. EWA and STEM-ECHS do not have base student populations assigned to them; each student volunteers and self-selects these schools. The large number of students determined to have an internal LOC in this study is consistent with other studies linking internal LOC to higher educational aspirations (Flowers, Milner & Moore, 2003) and higher academic achievement (Grimes, Millea & Woodruff, 2004; Parameswari & Shamala, 2012). For example, Grimes et al. (2004) found that internally oriented LOC college students were better students who earned higher grades and were more likely to express their satisfaction in positive evaluations of their professors.

The large number of internal LOC students in the self-selected populations of EWA and STEM-ECHS is also consistent with studies linking internal LOC to higher parental education levels (Lynch, Hurford & Cole, 2002; Nowicki & Strickland, 1973). In this study, EWA and STEM-ECHS students reported the highest levels of parental education and the highest percentages of parents with associate, bachelor, and graduate degrees. Lynch et al. (2002) found that students with graduate-trained parents had the most internal LOC, while students with parents having only a high school diploma had the most external LOC. It is to be noted that STEM-ECHS has a directive to enroll low income and first generation college students (ECHSI, 2013; Edmunds, 2011).

This study did not have a significant number of external LOC students. It is possible that more students taking the survey would have provided more external LOC data and could have shown a stronger correlation between LOC and REB. It is also possible that more students taking the survey would have provided more external LOC data and allowed for meaningful comparison of internal and external LOC.

The findings reported in the literature review would predict more external LOC in at-risk (Lynch et al., 2002) and in predominately African-American populations (Howerton, Enger & Cobbs, 1992; Nowicki & Strickland, 1973). The populations of SIT and SES are predominately African-American (Bonner, 2013) and at-risk as defined by free and reduced lunch and percentage of students at grade level (Bonner, 2013). The number of external LOC survey responses might have been higher if the researcher had been able to secure data from SIT and SES students. Further research is warranted with more external survey responses for more meaningful comparison of internal and external LOC.

There were six different small schools that were asked to participate in this study. The study sample of 83 students hailed from four different schools. There were six total external LOC surveys; one from SHS and five from STEM-ECHS. The SHS students were offered extra credit for completing the survey and STEM-ECHS were assigned the survey to complete for a homework assignment. SIT students were also offered extra credit for completing the survey but no students took the survey. SES students were also assigned the survey to complete for a homework assignment but no students took the survey. The three schools assigning the survey as a homework assignment had from zero percent to 91 percent of students complete the assignment and had very different homework policies (see Appendix H). O'Connor (2007)

suggests flexibility in homework policy to increase course grade but the school with the highest percentage of students completing the survey had a more strict policy (see Appendix H). The student survey method chosen by each school yielded inconsistent numbers of students completing the survey for each school. It is possible that the method chosen by each school was not the best method to externally motivate students and if the same method had been chosen by each school, more surveys would have been completed. Further exploration of the small schools' assignment policies effect on internal and externally motivated students is warranted.

This study found significant correlations in five areas. One significant correlation was found between course grade and LOC. Another significant correlation was found between the standardized exam grade and LOC. These are both congruent with other studies linking higher academic achievement with internal LOC and lower academic achievement with external LOC (Flowers et al., 2003; Grimes et. al., 2004; Hadsell, 2010; Howerton et al., 1992; Kulas, 1996; Parameswari & Shamala, 2012). For example, Howerton et al. (1992) found that identified at-risk, black males scored .5 to .8 standard deviations below their school peers in a standardized SAT test and were more externally controlled than their normative sample as measured by the 40-question Nowicki-Strickland Locus of Control Scale.

This study found a significant correlation between course grade and REB. This study also found a significant, although not as strong, correlation between the standardized exam grade and REB. These are both congruent with other studies linking content knowledge with higher levels of REB (Hines, Hungerford & Tomera, 1987; Sia, Hungerford & Tomera, 1985). Hines et al. (1987) reported that knowledge is better affected by EE than LOC in a meta-analysis of REB. Sia et al. (1985) reported that knowledge predicts REB. As students' knowledge of

earth/environmental science increased, students' demonstrated REB as measured by this survey also increased. This study supports education as an important factor in increasing environmental literacy.

Consistent with Bolek (2011), this study found a significant correlation between course grade and standardized exam grade. This was the highest degree of correlation in the study. The standardized exam is designed to measure the objectives taught by the earth/environmental science curriculum. The Wake County Public School System district policy directs that the standardized exam score count at least 20% of the course grade, teachers and administrators have the liberty of increasing this percentage up to 100% (WCPSS, 2013). Since the standardized exam grade is factored into the course grade and is designed to correlate to the course curriculum, a significant correlation was expected between course grade and standardized exam grade.

Contrary to the findings of this study, Tretter and Jones (2003) did not find a correlation between course grade and standardized exam grade. When inquiry based teaching strategies were used, course grades and student attendance increased but standardized exam grades did not increase (Tretter & Jones, 2003). Teacher-made evaluation and grading may be more directly related to the earth/environmental science curriculum and was more impacted by inquiry based teaching strategies. The relationship between teacher-made exam and REB was not analyzed in this study but may be a point of future study. Inquiry based teaching strategies were not assessed by this study, however many educational initiatives equate EE and STEM with inquiry based strategies (NAAEE, 2009; Popham, 2001; Tretter & Jones, 2003). Four of the small schools in

this study are designated STEM schools and the researcher is a graduate student in EE. Further research on the effect of inquiry based teaching strategies on course grade is warranted.

In this study, a significant correlation was found between LOC and grade on final standardized test and a significant correlation was found between final standardized test and REB. This study found a marginal relationship between LOC and REB. A significant correlation between LOC and REB is congruent with studies linking individual and group LOC with REB (Sia et al., 1985) and with studies linking environmental locus of control (ELOC) with pro-environmental behaviors (Cleveland, Kalamas & Laroche, 2005). Cleveland et al. (2005) observed several pro-environmental behaviors and determined two related to an external LOC (biospheric-altruism, corporate skepticism) and two related to an internal LOC (economic motivation, individual recycling efforts). It is possible that the relationship between LOC and REB was not as strong because the REB scale used in this study reflected both internal and external orientations. It is also possible that the marginal relationship between LOC and REB is due to the small number of external LOC oriented students. Future research is warranted to examine of the relationship between LOC and REB.

Consistent with Sia et al. (1985), this study found that the course grade was the only independent variable that made a significant contribution to the prediction of REB. The earth/environmental science teacher and EE graduate student researcher conducting this study felt particularly affirmed by this finding. Knowledge, evidenced by grade in course, predicts REB (Sia et al., 1985). Perhaps the diversity of assessments planned and administered by an earth/environmental science teacher and reflected in a grade the student earned over a period of

time in the earth/environmental course best represent the manifestation of environmental literacy as described by Marcinkowski (2001) and Simmons (1991).

Multiple regression analysis determined grade in course accounted for 13% of the REB. There are other unidentified predictor variables that have not been accounted for in this study. Possible predictor variables include demographic factors such as ethnicity, socioeconomic status (Nowicki & Strickland, 1973; Howerton et al., 1992) or parental level of education (Grimes et al., 2004). Hines et al. (1987) reported that knowledge is affected by EE. Perhaps classroom EE inquiry strategies could be used to improve earth/environmental science knowledge and thus improve REB.

Hungerford and Volk (1990) encouraged educational agencies to provide instructional settings that required students to act in responsible ways. Pedagogy includes teaching about environmental issues and developing skills with a willingness to deal with the environmental issues (Hungerford, Peyton & Volk, 1980, Oscamp, 2002). Dimopoulus, Paraskevopoulos & Pantis (2008) demonstrated the benefits of EE in building responsibility of school groups. This affirms the goal of environmental educators in developing environmentally literate citizenry (NAAEE, 2009).

There has been much focus on increasing standardized test scores as the four small schools on the East Wake Campus (Arts, SES, SHS, and SIT) were redesigned from the larger comprehensive high school in order to increase test scores (Bettis, 2015). Current emphasis on raising standardized test scores is not equivalent to placing emphasis on increasing content knowledge (Allchin, 2011; Aydeniz & Southerland, 2012; Berube, 2004; Hobden, 2005; Scot, Callahan, & Urquhart, 2009; Wideen, O'Shea, Pye, & Ivany, 1997). Emphasis by the school on

the course grade rather than on the standardized test grade might shift the classroom focus of teacher and student to pedagogy relevance and content knowledge. Perhaps more earth/environmental science teachers could be encouraged to become EE certified.

Attendance, tardy, homework and late work policy variations for each of the small schools in the study are inconsistent as indicated in Appendices F-H. O'Connor (2007) suggests strategies reflected in each of the small schools' policies for fixing students' grades to reflect learning including unlimited time to turn in assignments. Kulas (1996) reports that academic success does not shift LOC internally and does not increase GPA. Perhaps it is preferable to target strategies aimed at shifting LOC more internally in order to create academic success. Since this study found a significant correlation between LOC and course grade in course and standardized exam grade, it is possible that some of the policies aimed at improving students' grade on the standardized exam might adversely affect the students' REB but further research in this area is needed.

This study did not find a significant correlation between attendance and any of the tested variables. Of the small schools in the survey, three schools did not consistently enforce a tardy/attendance policy and three schools did consistently enforce a tardy/attendance policy (see Appendices F and G). The schools that consistently enforced the school tardy/attendance policy had students complete the survey (Arts, n=5; STEM-ECHS, n=52; EWA, n=17). Of the three schools that did not consistently enforce the tardy/attendance policy, two of the schools did not have any students complete the survey (SES, n=0; SIT, n=0), and one had more invalid surveys than valid surveys (SHS, n=9). In the literature, attendance was measured consistently for each study (Ancess & Allen, 2006; Habit, 2013; Le & Frankfort, 2010; Miller, Fitch & Marshall,

2003; Shaw, 2006). It is possible that the lack of significant correlation between attendance and any of the other variables is caused by attendance not being uniformly or consistently implemented in each school and the different impact on students but further research is warranted.

It is also possible that school policies, such as student suspension policies, could impact student performance in positive ways. If school suspension is a part of a method designed to help students experience consequences for circumstances under their own control and require students to act in responsible ways (Hungerford and Volk, 1990), students could develop a more internal LOC resulting in grade and attendance improvement (Grimes et al. 2004; Howerton et al., 1992; Lynch et al., 2002; Miller et al., 2003; Steese et al., 2006).

Limitations

This study had several limitations. The first limitation is the small number of students who completed the survey, due to the lack of entire schools' students who did not complete the surveys. More students completing the survey might have provided more external LOC scores and the opportunity to address the research question: what is the relationship between students' locus of control, their performance in earth/environmental science class, and their responsible environmental behavior?

A second limitation of the study is the lack of specific groups of students who did not take the survey, particularly in the lowest performing small schools as measured by percent at grade level in 2013 test scores and the highest percentage of free or reduced lunch (Bonner, 2013; NCDPI, 2013). The school SIT had the highest percentage of free or reduced lunch students and was the lowest preforming school as measured by percent of students at grade level

in 2013 test scores. The SIT student population is not represented because no students submitted surveys (n=0). The school STEM-ECHS was the highest performing school and lowest percentage of free or reduced lunch school submitted the highest number of surveys (n=52).

A third limitation of the study was the fall semester scheduling of student classes by the schools. This study targeted students in their 10th grade year after having just competed their earth/environmental science in the 9th grade year. Schools on the block schedule (Arts, SES, SHS, SIT, EWA) tended to schedule fewer 10th graders in a fall science course and therefore some earth/environmental students were not strongly encouraged by their science teacher to take the survey. Only STEM-ECHS science courses are year-long courses, which ensured every student was in a science course and was given information on taking the survey.

A fourth limitation of the study is the lack of standardized testing data from the charter school. EWA students did not take the North Carolina standardized final exam in earth/environmental science. As a charter school, it was not required to administer the exam. EWA also does not report percentage of students with free or reduced lunch data. EWA students did answer socioeconomic status demographic questions when taking the survey.

Multiple regression analysis determined grade in course accounted for only 13% of the REB. A fifth limitation of the study is not considering, measuring or adding other variables to the model to account for the remaining 87% of the REB.

Recommendations for Further Research

This study found the final grade in course was the only independent variable that made a significant contribution to the prediction of responsible environmental behavior (REB). It is

possible that this is due to the positive impact of knowledge on responsibility as reported by Hines et al. (1987) and Sia et al. (1985), but future research is needed

The sample of this study is skewed due to the fact that only six students showed an external LOC. An important area for future research would be to replicate the study using a different group of small schools with a larger student population that has more students that might show external LOC orientation to examine the relationship between REB and performance.

The majority of the students for this study come from only one of the six schools represented. Of the 83 students in the survey, 53 came from one school, STEM-ECHS. To further examine the impact of small school environment, a larger sample yielding more student data is needed in each of the small schools. An important area for future research would be to secure student survey information for each of the small schools.

In order to secure student survey information for each of the small schools, barriers and facilitators to survey completion should be researched and addressed. What external reward prompted the six externally motivated students to take the survey and why did they choose to take the survey? The three schools who assigned the survey as a homework assignment had different homework policies and yielded different return rates. The schools with the stricter homework policies (Appendix H) had more students complete the homework assigned survey and the schools with the most flexible homework policies (Appendix H) did not have any students complete the survey. Further research into why some students took the survey and some did not take the survey is warranted.

This study used the 21-question modified Nowicki-Strickland Locus of Control Scale to measure internal or external orientation. It is possible that using a different instrument, such as the 40-question Nowicki-Strickland Locus of Control Scale, Rotter's Internal-External Scale, or Trice's Academic Locus of Control Scale, might provide more information in assessing orientation. For example, Janssen & Carton (1999) separated scores at the median into internal and external groups. Further analysis with more external students in the sample is needed.

Recommendations for Practice

This study found a significant correlation between LOC and course grade and also between LOC and standardized exam grade. Schools' practices aimed at helping students shift their LOC more internally could also help students increase course grade and increase standardized exam grade according to the results of this study. Flowers et al. (2003), Grimes et al. (2004), Lynch et al. (2002) and Miller et al. (2003) recommend that educators help youth focus on consequences that they can control and reinforce consistent behavior patterns that will lead to academic success in order to shift LOC more internally. Educators are encouraged to help students recognize areas of their life where they do and do not have control, and focus on consequences of specific actions (Miller et. al., 2003) to reinforce internally oriented LOC. Howerton et al. (1992) recommends inducing more internal locus of control to increase school achievement specifically for at-risk black males. Students may change their behavior and improve their academic performance when they believe they have more personal control of their environment (Howerton et al., 1992).

This study found that the final grade in the earth/environmental science course was the only independent variable that made a significant contribution to the prediction of REB.

According to the results of this study, schools' practices aimed at increasing science content knowledge and helping students be successful in the science course could also increase students' REB (Berube, 2004; Scot et al., 2009). To this end, teacher placement, preparation and pedagogy take on new levels of importance. Master's degree programs and EE certification could be seen a ways to promote science content knowledge. For students, Erb (1996) recommends that students work together in groups to hold each other accountable. Small learning communities, also called cooperative learning groups, can be used to show social support, increase 21st century collaboration skills, and engage students in relevant projects (Edmunds, 2011; Erb, 1996; Le & Frankfort, 2011; Steese et. al., 2006). Another recommendation for group work suggests only homogenous LOC groups of like-oriented students be allowed. Grimes et al. (2004) found that heterogeneous groups of internally and externally oriented students were not as effective. Externally oriented students are less likely to benefit from group work and less likely to report a satisfying leaning experience when in a mixed group of internal and external locus of control (Grimes et. al., 2004).

Conclusion

This study began to address the question of how students' locus of control impacts their performance in earth/environmental science class and their responsible environmental behavior. The small number of external LOC subjects prevented independent analysis of internal and external LOC groups and independent analysis of the six schools in the study.

This study found significant correlations in five areas and a marginal correlation in one area. A significant correlation was found between the course grade and LOC and between the standardized exam grade and LOC. The relationship between the course grade and REB was

found to have a significant correlation. A significant correlation was found between the standardized exam grade and REB. As expected, a significant correlation was found between course grade and standardized exam grade, the highest degree of correlation in the study.

This study found a marginal correlation between LOC and REB. This study did not find a significant correlation between attendance and any of the tested variables.

This study did find that the final course grade was the only independent variable that made a significant contribution to the prediction of REB. Schools working to increase environmental literacy, or REB, should target strategies to increase the earth/environmental science course grade.

In terms of demographics, this study found a significant effect of gender on the prediction of REB. A strong relationship between course grade and LOC was seen in males but not in females. This study also found a significant effect of type of small school, age, ethnicity, socioeconomic status, father's education level and mother's education level on the prediction of REB.

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APPENDIX A

SURVEY QUESTIONS FOR TEACHERS AND PRINCIPALS

Survey Questions, for teachers and principals:

Information about school

- Student population
- Percent free/reduced lunch
- Percent male/female
- Percent minority (Socioeconomic status)
- Average parent income
- Composite score from last year
- Number absences last year
- Tardy data
- Drop out rate
- Percent graduation
- Number of students in the school

Information from teacher

- License designation
- EE certified (yes or no)
- Number of years teaching
- Number of years teaching earth/environmental science
- Number of years teaching earth/environmental science at this school
- What percentage of earth/environmental science classes do you teach for the school?
- Number of students you will be teaching earth/environmental science spring 2014.

- Attendance policy (is this a school policy?)
- Tardy Policy (is this a school policy?)
- Homework policy (is this a school policy?)
- Late work policy (is this a school policy?)

Information from Principal

- Number of years you have served as a high school principal
- Number of years you have served as a high school principal of this school

APPENDIX B

PARENTAL CONSENT LETTER

July 1, 2014

Dear Parents and Students:
You are among a group of students invited to participate in a study exploring the relationship between student perceptions and performance in the small school setting. The study is being conducted by Dorothy Holley, a native of eastern Wake County who has taught at East Wake High School and East Wake School of Integrated Technology for 13 years and is currently a graduate student in Environmental Education at Montreat College.

Procedures:
Students will be asked to complete an online survey to provide input about their sense of control, performance and environmental responsibility. It will take approximately 20 minutes to complete the survey. Students will be asked to complete basic demographic information (given on the back of this letter). Their attendance record, class grade and standardized test score will be provided by their classroom teacher.

Risks and Benefits of the Study:
The risk in completing the survey is that it will take time. The benefit to students as a result of their participation is the opportunity for personal reflection. The benefit to our community is a better understanding of student perception, performance and environmental responsibility in small school settings.

Confidentiality:
The information that is obtained during this research project will be kept private and will not become a part of any student's school record. All data will be kept in a locked cabinet and will be destroyed when it is no longer needed. Any sharing or publication of the research results will not identify any of the participants by name.

Voluntary Nature of the Study:
Only information from students for whom parental consent has been given will be used in the research. The use of student information is completely voluntary. Your decision will have no effect on your future relationship with the school or your student's status or grades there. The results of the study will be available to you if you would like.

Contacts and Questions:
This study has been approved by Wake County Public School System Data and Accountability Department and Montreat College Internal Review Board. If you have any questions about this research, please contact Dorothy Holley, (dorothy.holley@montreat.edu).

Statement of Consent:
In the space below, please indicate whether you **do** or **do not** want your student's information to be used and return this letter to your student's science teacher. Please make a copy of this form for your records.

****

I do / do not (circle one) give permission for my student's information to be used in the research project described above.

_____	_____	_____
(Print) Student's name	Student's signature	Date
_____	_____	_____
(Print) Parent's name	Parent's signature	Date

Optional: You may / may not (circle one) contact me in case follow up research is needed.

I would like for you to be aware of the Demographic Questions that will be asked during the survey. Please do not fill them out now.

1. What is your first name? Last name? (Your name will be permanently removed from your survey responses once parental consent or dissent is verified)
2. What is the name of your school? (SIT, SHS, Arts, SES, STEM, EWA)
3. What is your address? (Street, City, State, Zip code)
4. What is your gender? (male, female)
5. What grade are you in? (9,10,11,12)
6. What is your birthdate? (Month, date, year)
7. Do you get either free or reduced lunch? (yes, no)
8. What ethnic group do you consider yourself?
   (White, Black, Hispanic, Asian, multi, other)
9. What is the highest level your parent's education? Mom, Dad
   (Attended) high school, college, graduate school
10. What grade did you make in your last science class before taking earth/environmental science? (A,B,C,D,F, don't know)
11. What final grade did you make in earth/environmental science? (A,B,C,D,F, don't know)
12. What was your GPA last semester?
    (4.0 or above, 3.0-3.9, 2.0-2.9, 1.0-1.9, 0.0-0.9, don't know)
13. How many times were you tardy to earth/environmental science class?
    (never, 1-3, 4-6, 7-9, 10-12, more than 12 times)
14. How many times were you absent from earth/environmental science class?
    (never, 1-3, 4-6, 7-9, 10-12, more than 12 times)
15. Did you do anything this summer that was related to topics from your earth/environmental science class? If so, what types of things did you do?
16. Did you spend time doing outside activities this summer? If so, what types of things did you do?
17. Would you like to give any more information to any question above?

APPENDIX C

DEMOGRAPHIC QUESTIONS

Demographic Questions

1. What is your first name? Last name? (Your name will be permanently removed from your survey responses once parental consent or dissent is verified)
2. What is the name of your school? (SIT, SHS, Arts, SES, STEM, EWA)
3. What is the code number given to you by your teacher for the purpose of this survey?
4. What is your address? (Street, City, State, Zip code)
5. What is your gender? (male, female)
6. What grade are you in now? (9,10,11,12)
7. What is your birthdate? (Month, date, year)
8. Do you get either free or reduced lunch? (yes, no)
9. What ethnic group do you consider yourself? (White, Black, Hispanic, Asian, multi, other)
10. What is the highest level your parent's education? Mom, Dad
    (Attended) high school, college, graduate school
11. What grade did you make in your last science class before taking earth/environmental science? (A,B,C,D,F, don't know)
12. What final grade did you make in earth/environmental science? (A,B,C,D,F, don't know)
13. What is your GPA? (4.0 or above, 3.0-3.9, 2.0-2.9, 1.0-1.9, 0.0-0.9, don't know)
14. How many times were you tardy to earth/environmental science class? (never, 1-3, 4-6, 7-9, 10-12, more than 12 times)
15. How many times were you absent to earth/environmental science class? (never, 1-3, 4-6, 7-9, 10-12, more than 12 times)
16. Did you do anything this summer that was related to topics from your earth/environmental science class? If so, what types of things did you do?
17. Did you spend time doing outside activities this summer? If so, what types of things did you do?
18. Would you like to give any more information to any question above?

APPENDIX D

NOWICKI-STRICKLAND LOCUS OF CONTROL SCALE FOR CHILDREN

Nowicki-Strickland locus of control scale for Children

For each question, students respond either yes or no. Each external response (indicated in parenthesis after the statement below) receives one point and each internal response receives zero points; scores range from 0 to 21. Scores of 13 or less are considered internal; scores above 13 are considered external. A higher score indicates a more externally oriented locus of control.

1. Do you believe that most problems will solve themselves if you just don't fool with them? (yes)
2. Are you often blamed for things that aren't your fault? (yes)
3. Do you feel that most of the time it doesn't pay to try hard because things never turn out right anyways? (yes)
4. Do you feel that most of the time parents listen to what their children have to say? (no)
5. When you get punished does it usually seem it's for no good reason at all? (yes)
6. Most of the time do you find it hard to change a friend's (mind) opinion? (yes)
7. Do you feel that it's nearly impossible to change your parent's mind about anything? (yes)
8. Do you feel that when you do something wrong there's very little you can do to make it right? (yes)
9. Do you believe that most kids are just born good at sports? (yes)
10. Do you feel that one of the best ways to handle most problems is just not to think about them? (yes)
11. Do you feel that when a kid your age decides to hit you, there's little you can do to stop him or her? (yes)
12. Have you felt that when people were mean to you it was usually for no reason at all? (yes)
13. Most of the time, do you feel that you can change what might happen tomorrow by what you do today? (no)
14. Do you believe that when bad things are going to happen they just are going to happen no matter what you to do to stop them? (yes)
15. Most of the time do you find it useless to try to get your own way at home? (yes)
16. Do you feel that when somebody your age wants to be your enemy there's little you can do to change matters? (yes)
17. Do you usually feel that you have little to say about what you get to eat at home? (yes)
18. Do you feel that when someone doesn't like you there's little you can do about it? (yes)
19. Do you usually feel that it's almost useless to try in school because most other children are just plain smarter then you? (yes)
20. Are you the kind of person who believes that planning ahead makes things turn out better? (yes)
21. Most of the time, do you feel that you have little to say about what your family decides to do? (yes)

APPENDIX E

ENVIRONMENTAL STEWARDSHIP SCALE

Environmental Stewardship Scale

Please circle the answer that best describes how you feel about the following statements. There is no right or wrong answer.

Strongly disagree,	*Somewhat disagree,*	*Neutral,*	*Somewhat agree,*	*Strongly agree*
1	*2*	*3*	*4*	*5*

1. It's important to take good care of the environment. 1…2…3…4…5
2. I might someday like to volunteer in a park or natural place. 1…2…3…4…5
3. I might someday like to work in a park or natural place. 1…2…3…4…5
4. I know how to take care of and protect nature. 1…2…3…4…5
5. It's important to pick up your trash. 1…2…3…4…5
6. It's important to leave plants, animals, and rocks where you find them. 1…2…3…4…5
7. I would help to clean up nature in my neighborhood. 1…2…3…4…5
8. I would give some of my own money to help save plants and animals. 1…2…3…4…5
9. Plants and animals are important to people. 1…2…3…4…5
10. Nature is easily harmed or hurt by people. 1…2…3…4…5

APPENDIX F

ATTENDANCE POLICIES OF THE SMALL SCHOOLS

School	Attendance Policy	Who determines this policy?	Is policy consistently enforced?
Arts	Students should turn in to the main office a note from home when they are absent. 2 consecutive absences or accumulate 4 total-teacher calls parent 5 absences- letter sent home to parents 7 absences- teacher/counselor/administrator call home and offer invitation for conference 10 or more absences- student fails course Student may attend a teacher/counselor/administrator appeals panel at the end of each semester to seek a waiver. If a waiver is granted, only 1 waiver is allowed for each school year	School level policy	Yes
SES	Students should turn in to the main office a note from home when they are absent. Wake County Board Policy: > 10 days absent student must retake course, handled by administration	School level policy	No
SHS	Students should turn in to the main office a note from home when they are absent, handled by administration	School level policy	No
SIT	Students should turn in to the small school office a note from home when they are absent; no action from school if a note is not received. Intervention Coordinator will have a conference with students with excessive absences and organize a plan to "make up" absences so that students will not fail.	School level policy	No
STEM -ECHS	Wake County Board Policy: > 10 days absent student fails course, handled by administration	School level policy	Yes
EWA	Same as Wake County Board Policy	School level policy	Yes

APPENDIX G

TARDY POLICIES OF THE SMALL SCHOOLS

School	Tardy Policy	Who determines the policy?	Is policy consistently enforced?
Arts	Teacher sends any student who is tardy to the office for a note. 3 tardies results in lunch detention with administrator. Successive tardies will result in more lunch detentions leading up to Alternative Learning Center (ALC)	School level policy	Yes
SES	yes	School level policy	No
SHS	1ST tardy, Warning 2nd tardy, lunch detention 3rd tardy, office referral	School level policy	No
SIT	On time defined as anywhere in the classroom when the bell rings. Students who are tardy must go to the office for a note. Every 3 tardies results in lunch detention with a teacher for a part of the lunch period. Students may attend a teacher remediation during lunch detentions. After 3 lunch detentions (9 tardies), 1 day of in school suspension (ISS) assigned. Tardy count starts over at the beginning of each quarter.	School level policy	No
STEM-ECHS	Students sign in at the front desk to receive a pass to class. Consequences for unexcused tardies include lunch detention and then after school detention.	School level policy	Yes
EWA	1ST tardy, First Warning 2nd tardy, Final Warning 3rd tardy, Parent Notification 4th tardy, Disciplinary Action, parent conference lunch detention 5th tardy, Out of school suspension 6th tardy, Out of school suspension, 3 days mandatory 7th tardy, Out of school suspension, 5 days mandatory; headmaster review	School level policy	Yes

APPENDIX H

HOMEWORK AND LATE WORK POLICIES OF THE SMALL SCHOOLS

School	Homework Policy	Is Homework policy supported and consistently enforced?	Late Work Policy	Is Late Work Policy supported and consistently enforced?
Arts	Homework given infrequently but collected and graded when given.	Yes	Grade dropped one letter grade when turned in late.	Yes
SES	Homework is either done - 100 or not - 0	Yes	Flexible policy, student specific	Flexible
SHS	Homework is given 3 times each week.	Teacher determined and supported	Students can make up assignments at lunch, in advisory, or study hall for partial credit.	Most teachers in the school follow this; yes.
SIT	Students can turn in homework at any time for full credit.	Yes, Policy determined by administration	Students can turn in any assignment late for full credit.	Yes, Policy determined by administration
STEM-ECHS	Homework is required. 0 is recorded in gradebook for students who do not turn in Homework.	Yes; teachers in each department set the policy	10% deduction for turning in assignment late. Students have until the end of the grading period to turn in work.	Yes; each teacher sets on policy and consistently enforces
EWA	Late homework is not accepted.	Yes	Only projects are accepted late; 20 point deduction for each day late	Yes