

**Have Green Teens Become Blue?**  
Investigating changes and influences in  
adolescent attitudes towards electricity conservation

by  
Samra Amir

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## Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

## Abstract

Global energy consumption has been steadily rising since the 1990s, with projections estimating a 56% increase in consumption by 2040 (EIA, 2013). Although Canada's industrial sector accounts for the largest share of electricity consumption, the nation's residential sector is also a significant source of consumption (NRCAN, 2016). As such, numerous studies have explored the influences on adult attitudes and behaviour towards electricity consumption and conservation (Wallis et al., 2015).

Fewer studies, however, have investigated the attitudes and awarenesses of the electricity consumers of tomorrow; adolescents. Their role in the future of energy consumption warrants an investigation into the attitudes and awareness of this demographic with regards to electricity conservation. It is important to understand whether adolescents are in tune with current electricity conservation issues, if they are involved in any conservation practices, or if they are simply not interested.

A decade after Lynes and Robinson's initial 2007 investigation into Ontario adolescents' attitudes, awareness, and behaviour towards electricity conservation, this study aims to investigate the changes in these areas. The initial study surveying 500 Ontario teens was replicated in 2017, and statistical tests comparing both studies were conducted using Excel and SPSS software. The comparison between 2007 and 2017 adolescent attitudes towards electricity conservation indicated an overall decrease in the level of interest and engagement. However, it is important to note that this disconnect is likely not due to a lack of concern, but rather a lack of understanding between electricity consumption and the issues adolescents report being concerned with (i.e. climate change and creating a sustainable future).

In an attempt to comprehensively understand current attitudes towards electricity conservation, this study proposes a framework to investigate the *affective*, *cognitive* and *conative* (ACC) elements of adolescents' attitudes towards electricity conservation, as well as the influences on the development of these attitudes. The proposed framework contributes an additional dimension to Bronfenbrenner's Ecological System's model, which outlines variables affecting the development of attitudes such as age, gender, parents, schools, and media. This framework contextualizes the ACC components that generate adolescent attitudes towards electricity conservation, within the internal and external influences on these components.

Of the influences investigated, the level of parental education and sources of information were seen to have the most statistically significance influences in the 2017 survey. Teenagers of parents at either ends of the spectrum for levels of education (highest: second or graduate degree, lowest: some grade or high school) were seen to display higher levels of engagement and interest in electricity conservation. In addition, findings indicated that school remains an important influencer of these attitudes, whether EcoSchool certified or not.

Statistically significant positive correlations were observed between 2017 adolescents' *affects* towards electricity conservation ("I don't really care" to "I am really interested...") and their *conation* towards conservation behaviours ("doing very little" to "doing all [they] could possible do"). Weaker correlations were observed between teenagers' *cognition* and *conation*, and *cognition* and *affect*. However, it is acknowledged that this study did not extensively explore participants' cognition of electricity conservation.

This study provides valuable insight from this demographic with regards to electricity conservation initiatives that would resonate with adolescents. The observed influences of parents, media, and school as sources of information recognize these as a valuable resource for promoting electricity-conservation attitudes and behaviours among this demographic. In addition, this study provides direction for pro-conservation programs to focus on developing *affects* and *conations* of adolescents towards this issue, to create more favourable attitudes towards electricity conservation.

## Acknowledgements

Foremost, I would like to thank Allah SWT, without whom none of this would have been possible.

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## 1.0 Introduction

*“Young people have a unique relationship with the environment: they are often the first affected when something goes wrong, yet the least represented when decisions are made.”*  
*(Joi Officer, 15; Laura Cockman, 17; Rebekah Taft, 17, “The Clock is Ticking: Youth and Environmental Activism”, 2009)*

In 2007, Lynes and Robinson conducted research to explore adolescents’ awareness of, and attitudes towards, electricity use in Ontario. The research consisted of two focus groups along with 500 online surveys of Ontario adolescents. The purpose was to develop a baseline amongst young people that could be used to create effective conservation programs amongst this age group. A decade later, it is interesting to once again investigate this topic by conducting a similar survey with Ontario teens in 2017. In addition to exploring the internal and external factors influencing the development of these attitudes, this study aims to uncover the changes, if any, in these attitudes towards electricity conservation.

Today, more young people make up the world’s population than ever before, with some developing countries’ populations consisting of mainly children and adolescents (UNFPA, 2015). The potential of these young populations to achieve change is an important opportunity that is often overlooked. The fresh perspectives, innovation, and drive that this demographic provide can be used to support the transformation to a more sustainable society.

Research surrounding adolescents’ pro-environmental behaviour, including electricity conservation, is a relatively new and developing field. However, their role as the energy consumers of tomorrow provide an important motivation to study adolescents’ current attitudes about energy conservation. Adolescents’ attitudes about pro-environmental behaviour in general are developed as a result of a number of influences that have been identified through previous research. These influences consist of personality, cognitive, demographic, and external factors (Bronfenbrenner, 1975; Hines et al., 1986; Sivek and Hungerford, 1990; Hungerford and Volk, 1990). This study will focus specifically on the impact of factors identified in Bronfenbrenner’s Ecological Systems Theory (age, gender, parents,

school, media, and culture) on the development of adolescents' attitudes towards electricity conservation.

Given the large proportion of most adolescents' time spent in a school environment, this study additionally pays close attention to the relationship between education and sustainable behaviour and attitudes. This connection has been refined through the years, and has been established as a key piece of sustainable development.

### 1.1 Background on Education and Sustainability

In times of environmental unrest, youth hold a unique position. In addition to disproportionately more young people being affected by environmental events, they are also burdened with a deteriorating global environment that is a result of previous generations' actions – or lack thereof (UN World Youth Report, 2003). It is due to these very circumstances that this demographic is becoming more engaged in addressing environmental concerns such as climate change. One such initiative is Youth 4 Global Goals (Y4GG) by AIESEC, the world's largest student-led network, to encourage youth to contribute to the success of the UN's Sustainable Development Goals (SDGs) established in 2015 (Sustainable Development UN, 2016). In particular, Y4GG identifies Goal 4, quality education, as one of its targets:

*4.7 - By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development. (UN SDGs, 2015)*

However, the relationship between education and environmental stewardship is not unique to the UN's SDGs. Environmental education (EE) first gained international attention at the UN's Conference on the Human Environment in 1972, where recommendations called for the provision of EE programs to address international environmental issues (UN, 1972). Increasing awareness of the importance of EE programs contributed to further international conferences, in Belgrade and Tbilisi in 1975 and 1977 respectively, as well as advances in academia such as *The Journal for Environmental Education* (UN, 1975; UN, 1977; Stapp, 1997). The concept of EE was transformed once again after *The World*

Commission on Environment and Development published the Brundtland Report in 1987. The concepts of sustainability and sustainable development were garnering attention worldwide, and concepts of EE evolved to reflect this. Agenda 21, the product of the 1992 UN Conference on Environment and Development in Rio de Janeiro, was the first international document to identify education as a critical tool for promoting sustainable development (UN, 1992).

Agenda 21 described education for sustainable development (ESD) as being focused on interdisciplinary thinking, through the realization of complex relations between planetary and human sustainability. This understanding would improve the capacity of individuals to develop “environmental and ethical awareness, values and attitudes, skills, and behaviour consistent with sustainable development and for effective public participation in decision-making.” (UN, 1992)

In continuation of these efforts, the UN declared 2005-2014 as the Decade of Education for Sustainable Development (DESD), emphasizing that “education is an indispensable element for achieving sustainable development” (DESD, 2008). The international implementation of the DESD strategy initiated the exchange of views and dialogues about ESD across the world, raised awareness and understanding of ESD, and promoted the creation of ESD action plans (UNESCO, 2007).

Most recently, of the 17 SDGs identified by the UN in 2015, the separate nature of the education goal demonstrates its important role in sustainable development. The acquisition of quality education would subsequently determine the success of other goals regarding health, growth and employment, sustainable consumption and production, and climate change.

The relationship between education and sustainability has been refined through these global initiatives, with Canada also starting to contribute in the early 1990s.

#### 1.1.1 Ontario EcoSchools

Following the 1992 World Congress for Education and Communication on Environment and Development in Toronto, the *Canadian Network for Environmental Education and Communication*, and *Learning for a Sustainable Future* were the first in a series of organizations whose aim was to further EE and ESD development in Canada (EECOM, 2016; LSF, n.d.).

The goals of creating a culture of sustainability and environmental literacy in Canada are best perceived through these overarching programs at a national level. However, as constitutionally, the setting of curriculum in formal education systems falls under the jurisdiction of provinces and territories, more comprehensive programs – ones which are tailored to meet the needs of one province or territory - can also be valuable (CEGN, 2006).

Ontario EcoSchools is one such provincial environmental education program that uses a combination of curriculum-based education and ecological experiences to achieve pro-environmental values in students of the school. The organization provides voluntary certification, bronze, silver, gold, and platinum, based on the school's goals and student engagement (Ontario EcoSchools, 2016). The six sections of certification include:

- i. Teamwork and Leadership
- ii. Energy Conservation
- iii. Waste Minimization
- iv. School Ground Greening
- v. Curriculum
- vi. Environmental Stewardship

The organization's emphasis on student leadership and engagement provide the opportunity to influence and encourage pro-environmental attitudes and behaviour.

The progress in the field of EE and ESD has warranted investigation into its impacts on the program participants. Many studies have found that in-school EE and ESD experiences have enhanced adolescents' pro-environmental values, knowledge, and behaviours (Tung et al, 2002; Uitto et al, 2015). Evidence of the effectiveness of in-school programs in influencing attitudes and behaviour have also been documented, where participation in these programs significantly increased pro-environmental and conservation affects and behaviours (Cornelius et al, 2014).

While previous studies have explored the relationship between the EcoSchools program and adolescent environmental literacy (Igbokwe, 2016), they have not specifically investigated the program's influence on attitudes towards electricity conservation. Understanding this relationship

would provide insight into the influence of this program with regards to developing pro-environmental attitudes.

## 1.2 Problem Statement and Study-Based Contributions

Global energy consumption has been steadily rising since the 1990s, with projections estimating a 56% increase in consumption by 2040 (EIA, 2013). These energy needs stem from the increasing demand for fuel for transportation, production, and of course, electricity. As a country with a growing population, Canada is no exception to this trend (Young, 2017). On the global stage, Canada consistently ranks in the top 10 highest levels of electricity consumption, in addition to having the 4<sup>th</sup> highest electricity consumption per capita in the world (World Bank, 2014).

Although Canada's industrial sector accounts for the largest share of electricity consumption, the nation's residential sector also consumes large amounts of electricity (NRCAN, 2016). As such, numerous studies have explored the influences on homeowners (in this case defined as adults 20 years or older, living in a home or apartment, but not necessarily owning the property) with regards to electricity conservation and consumption (Wallis et al., 2015). Among others, sociodemographic variables such as age and income have been frequently correlated with household electricity use (Aydinalp et al., 2003; Wiesmann et al., 2011; Beckel et al., 2013; Brounen et al., 2012; Jones et al., 2015).

However, the presence and number of adolescents in households has also been found to have significant impact on overall electricity consumption (Jones and Lomas, 2015). This effect can be brought about through an increase in the purchasing of IT and entertainment appliances (Wallis et al., 2015), heavier use of electricity than average (Gram-Hanssen et. al, 2004), among other behaviours.

In addition to their role in current electricity consumption trends, adolescents must be recognized for their role as the electricity consumers of tomorrow. Pro-environmental attitudes and awareness instilled at these stages in development, along with other influences, have been observed to impact adult sensitivity to environmental issues (Lohr et al, 2000; Wells and Lekies, 2006; Thomspson et al., 2008). As such, investigating the awareness and attitudes of this demographic regarding electricity

conservation can provide valuable insight into policy and program development regarding electricity conservation, specifically aimed towards adolescent consumers.

In particular, this study will examine the changes in these attitudes that have taken place in the past decade. Exploring variations in these areas will provide insight into the current concerns of this demographic, and the factors attributing to these changes. Mapping these attitudes in conjunction with enrolment in a certified EcoSchool, as well as other variables, would further the debate regarding the effect of factors such as environmental education programs on students' pro-environmental attitudes. In order to achieve a holistic understanding of the attitudes of participants, this study will also investigate affective, conative, and cognitive influences that interact to create adolescents' overall attitude towards electricity conservation.

### 1.3 Research Objectives

This study aims to achieve the following four objectives in order to accomplish the above contributions

- i. To assess the changes, if any, in adolescent attitudes about electricity conservation that have taken place in the past decade
- ii. To evaluate the relationship between current attitudes about electricity conservation, and factors such as demographics, parents, enrolment in a certified EcoSchool, media, and culture
- iii. To understand the relationship between affect, conation and cognition in creating an overall attitude about electricity conservation
- iv. To provide insight for future electricity conservation research, policies, and initiatives aimed at adolescents.

### 1.4 Thesis Structure

This thesis is divided into seven sections designed to provide adequate background and understanding of the current literature surrounding adolescent pro-environmental attitudes, methodology employed, and the analysis of data to achieve the research objectives.

Chapter 2 covers the academic literature relating to the development of adolescent attitudes, including its components, as well as influences on these attitudes. This section also describes the proposed framework used by this study to achieve a holistic understanding of adolescents' perspectives towards electricity conservation.

Chapter 3 outlines the methodological approach used in 2007 iteration of this this study, as well as the approach used to collect and analyze data from the 2017 surveys.

Chapter 4 provides a comparative analysis of data from 2007 and 2017 studies in order to achieve Research Objective i: *To assess the changes, if any, in adolescent attitudes about electricity conservation that have taken place in the past decade.*

Chapter 5 analyzes influencing factors on the development of adolescents' attitudes towards electricity conservation in 2017, so as to address Research Objective ii: *To evaluate the relationship between current attitudes about electricity conservation, and factors such as demographics, parents, enrolment in a certified EcoSchool, media, and culture*

Chapter 6 investigates the relationship between the components of attitudes in adolescents. This section aims to achieve Research Objective iii: *To understand the relationship between affect, conation and cognition in creating an overall attitude about electricity conservation*

Chapter 7 concludes the thesis by providing a summary of major findings as well as recommendations for future initiatives and research to build on the study's findings, in order to achieve Research Objective iv: *To provide insight for future electricity conservation research, policies, and initiatives aimed at adolescents.*

## 2.0 Literature Review

The aim of the literature review for this study is to understand the influences contributing to the development of attitudes in adolescents. The theories and key findings from the literature informed the survey tool used in this research to bolster measurement validity, in addition to providing a context within which the relationship between influencing factors can be understood.

Before delving into the specific influencing factors of pro-environmental attitudes, it is useful to consider the parameters of the aspect of “attitudes”. This description can then be positioned within the influencing factors to gain a holistic understanding of the development of adolescent attitudes.

### 2.1 Defining Pro-Environmental Attitudes

“Many view environmental problems as resulting from maladaptive human behavior” (McIntyre, Milfont, pg 94, 2016). The anthropogenic root of this issue requires an understanding of human behaviour, and by extension, psychology. As such, it is constructive to understand the formation of these attitudes.

A widely-accepted model of attitudes is the ABC model, first introduced by Hovland and Rosenberg in 1960 (Solomon et al., 2010). This model defined attitudes as a function of three concepts: affect, behaviour, and cognition. The *affective* component denotes the individual’s feelings or emotions towards the attitude object. The *behavioural* element consists of the manner in which an individual acts or behaves in response to the attitude object. Lastly, the *cognitive* component involves the individual’s belief or knowledge about the attitude object (Mcelod, 2014). While empirical evidence supporting this tripartite model has been observed (Breckler, 1984), a debate in the current literature exists about the definition of these components, as well as the direction of influence.

Theories such as the Theory of Planned Behaviour challenge the ABC model’s notion that attitude is a product of behaviour, arguing instead that an individual’s behaviour is a result of their attitudes (LaMorte, 2016). To alleviate this disagreement, a modification of the ABC model (an “ACC” model depicted in Figure 2.1) has been suggested for use in this study, where the *behavioural* component is replaced by a *conative* element, where conation is defined as the intention or tendency to act or behave in a certain way towards the attitude object (Gifford and Sussman, 2012).

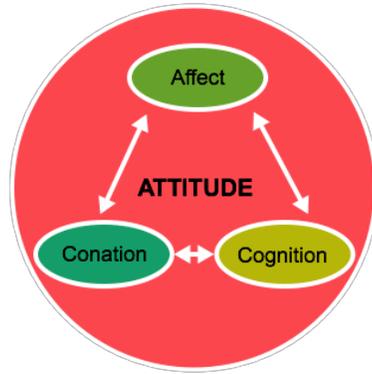


Figure 2.1: Proposed ACC model of attitudes used in this study, developed from the ABC (affect, behaviour, cognition) model

The interconnectedness of the three elements of this “ACC” model of attitudes has been recognized in the literature with regard to environmental attitudes, which has have been described as “the collection of beliefs, affect, and behavioral intentions a person holds regarding environmentally related activities or issues” (Schultz, Shriver, Tabanico and Khazian, 2004, pg 31). Studies such as Kaiser et al (1999) established that environmental attitudes were a powerful predictor of ecological behaviour, while others recognized that cognitive knowledge played an important role in supporting pro-environmental behaviour (Schumm and Bogner, 2014).

Rather than a unidirectional approach requiring an answer to the question “which is the horse and which is the cart?”, reciprocity between the components has been established through findings indicating environmental knowledge, described as an awareness of environmental issues as well as what actions can be taken to mitigate them, and values can be used to explain variance in ecological behaviour intention (Kaiser et al, 1999). The proposed “ACC” model of attitudes employed in this study aims to further understand the reciprocal nature of this model’s elements, from the perspective of adolescents.

#### Affect and Conation

Many studies have explored the relationship between overall environmental attitudes and behaviour. Often, these studies do not differentiate between an individual’s *affect* and attitude overall, preferring instead to include *affectation* within their definition of overall attitude. As such, this study aims to address this gap in the literature by making this distinction in the data analysis. A meta-analysis of 128

of these studies by Hines et al (1987) revealed low to moderate levels of correlation between attitudes and responsible environmental behaviour, reporting an average correlation of 0.35. Findings from Eckes and Six's study revealed similar findings (1994). It should be noted, however, that these studies described correlations between these variables in adults.

A study involving secondary students in Hong Kong investigating environmental attitudes and readiness to engage in pro-environmental behaviours revealed a stronger correlation, 0.52. Findings indicated that the students "expressed great concern about the environment and exhibited a strong willingness to participate in pro-environmental behaviour" (Chan, pg 297, 1996). The strong correlation between the adolescents' pro-environmental attitudes and *conation* indicate that there may be merit in investigating the components of attitudes as described in the proposed framework of this study.

#### Affect and Cognition

A study assessing high school students' environmental knowledge and attitudes, after completion of an environmental science course, revealed a statistically significant correlation between pre- and post-test knowledge and attitudes scores (Campbell et al., 1999). It was observed that students with higher levels of environmental knowledge had more favorable environmental attitudes. However, although environmental knowledge is generally seen to be positively correlated to environmental attitudes; the relationship is not especially strong (Arcury, 1990).

Other studies investigating environmental knowledge and attitudes have confirmed these findings, where little to no statistical relationship existed between these two factors, (Levine and Strube, 2012) even when investigating energy consumption (Paço and Lavrador 2017). Rather than discounting environmental knowledge as a factor contributing to overall environmental attitudes, researchers have found that environmental knowledge behaves as a moderator between environmental attitudes and behaviour (Schahn and Holzer, 1990; Meinhold and Malkus, 2005).

Acknowledging this relationship in adults, this study will seek to address the gap in the literature by investigating the relationship between adolescents' *affect* and *cognition* towards electricity conservation. Findings from this investigation would provide guidance on the effectiveness of environmental education and awareness initiatives.

## Cognition and Conation

The relationship between the *cognitive* and *conative* components of an individual's overall attitude was highlighted in a study that found that 60% of respondents felt that their level of pro-environmental behaviour was constrained by their lack of appropriate knowledge (Kennedy et al, 2009). Other studies have found that knowledge of environmental issues, and how to solve them, increases an individual's *conation* towards pro-environmental behaviours (Kaiser and Fuhrer, 2003; Mobley et al, 2010).

However, most studies agree that while environmental knowledge can be linked to pro-environmental behaviour, this relationship is not as strong as situational, or other internal influencing factors (Fliegenschnee and Schelakovsky, 1998; Kollmuss and Agyeman, 2002; Oguz, 2010). Hines et al. established an overall correlation of 0.30 between knowledge and environmentally responsible behaviour, (1987) further corroborating the understanding that *cognition* is a "necessary but not sufficient condition for pro-environmental behaviour" (Vicente-Molina et al, pg 132, 2013). As such, it is of value to investigate *affective*, *cognitive*, as well as *conative* elements of adolescents' attitudes in conjunction with each other, to achieve a more complete understanding of teenagers' attitudes towards electricity conservation.

Having established the parameters of the elements of adolescents' attitudes, it is now constructive to "zoom out" and identify internal and external factors influencing the development of these attitudes.

## 2.2 Bronfenbrenner's Ecological Systems Model

Through his paper, *Toward an Experimental Ecology of Human Development*, Bronfenbrenner attempted to marry two, up until then seemingly dichotomous, principles governing the study of human development. The principle of *rigor* lent itself to experiments in developmental psychology that were at best, "the science of the strange behavior of children in strange situations with strange adults for the briefest possible periods of time" (Bronfenbrenner, pg 513, 1977). Conversely, experiments rooted in notions of *relevance*, rejected observation in favour of "experience", and favoured an "understanding" through immersion in the field, rather than analysis (Bronfenbrenner, 1977).

Bronfenbrenner argued that in order to understand human development, a direct observation of one or two subjects in a defined setting is not sufficient. A thorough exploration of multiple actors in different settings, as well as their interactions, would provide a more comprehensive understanding of the environmental factors outside the immediate context of the individual. As such, Bronfenbrenner combined the principles of rigor and relevance to define the ecology of human development as

*“the scientific study of the progressive, mutual accommodation, throughout the life span, between a growing human organism and the changing immediate environments in which it lives...” (pg. 514, 1975)*

He goes on to clarify that the study is not limited to these immediate environments, but rather includes the relationships between them and larger social contexts, in which these environments are embedded.

Figure 2.2 conceptualizes the ecological systems model that arose from Bronfenbrenner’s work. It depicts the ecological environment as a nested arrangement with reciprocal tendencies.

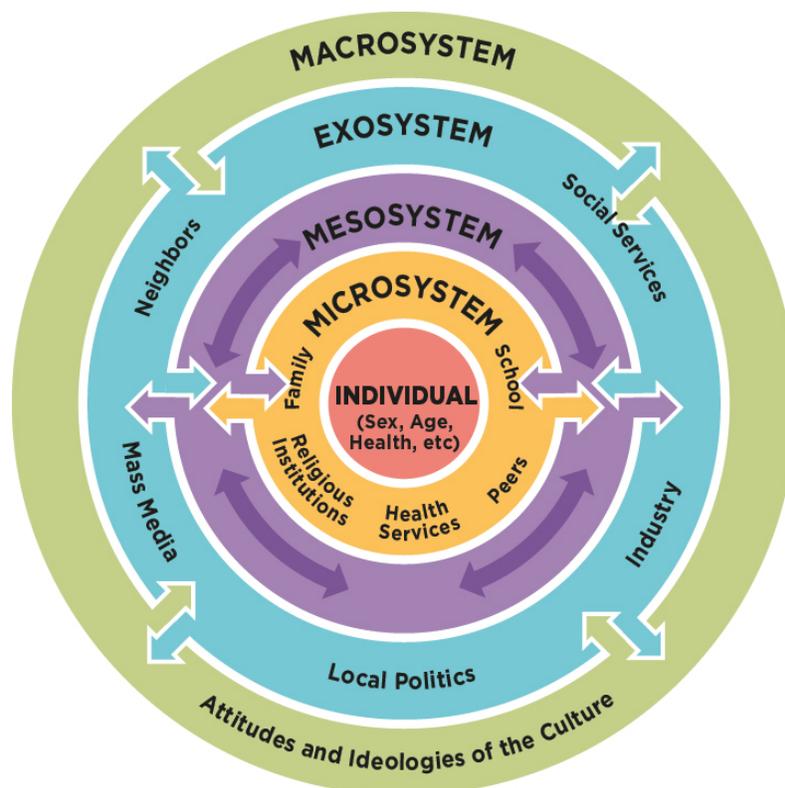


Figure 2.2 Adaptation of Bronfenbrenner’s Ecological Systems Model (Rivara and, Le Menestrel, pg 75, 2016)

At the individual level are the subject's characteristics unaffected by its environment. These include their age, gender, and health. The most proximal system to the individual is defined as the *microsystem*. It consists of the relationships between the developing individual and their immediate surroundings, such as family, school, peers, and religious institutions (Rivara and Le Menestrel, 2016).

The *microsystem* is nested within the *mesosystem*. The *mesosystem* consists of the interrelations between the components of the microsystem. These connections could include, but are not limited to, the interactions between the individual's peers and their teachers, or interactions between their parents and their religious institutions. In short, Bronfenbrenner describes the *mesosystem* as "a system of microsystems" (1975).

The next step outward is the *exosystem*. This level is distinct in its indirect influence on the development of the individual. The *exosystem* embraces both formal and informal social systems that interact with components of the *microsystem*, and so the *mesosystem*, to ultimately have an effect on the individual's development (Berk, 2000). Components of the *exosystem* include school systems, mass media, and communications facilities (Bronfenbrenner, 1975; Rivara and Le Menestrel, 2016).

The most external system influencing a growing individual's development, as defined by Bronfenbrenner, is the *macrosystem*. This level embraces the overarching institutional principles of cultural norms, values, and laws. The *macrosystem* has a cascading influence, both implicitly and explicitly, on systems that are the concrete manifestations of the micro-, meso-, and exosystems. Economic, social, legal, and political systems are all influenced by the institutional patterns of culture or subculture, of which the *macrosystem* consists.

### 2.3 Applications of Ecological Systems Model

Bronfenbrenner's Ecological Systems Model provides a rationale for examining specific variables affecting the development of attitudes. The study will use this model to assess influences at the individual (age, gender), micro- (parents, school), exo- (media), and macrosystem (culture) levels. Due to the nature of this study, an examination of the mesosystem is not possible, as it would require more in-depth interaction (i.e. through interviews and focus groups) with the participants.

A review of the literature revealed that these variables have been associated with pro-environmental attitudes and behaviour in adolescents. These findings lend an additional validation for assessing these variables in this study, in order to determine overall attitudes about electricity conservation.

### 2.3.1 Individual

#### *Age*

Of the literature investigating energy conservation behaviour in teens, few findings are categorized by an age breakdown within this demographic. For example, Cornelius et al's study in 2014 exploring the results of theory-driven, school-based intervention to promote energy-saving behaviours aggregated their participants' ages to a mean age of 15.5 years old. Similarly, de Vries and Knol's study in 2011, examining the use of educational games in changing adolescents' attitudes towards saving energy, also consolidated their participants' ages to provide an average of 16.4 years. This pattern is consistently seen in the literature (Worsley and Skrzypiec, 1998; Wray-Lake et al, 2010; Toth et al, 2013).

However, it is to be noted that data collected during the first iteration of this study in 2007 determined little age-dependent variation in responses (Lynes and Robinson, 2007). Whether similar findings will be produced in the second iteration of the study is yet to be determined.

#### *Gender*

In comparison to the relationship with age, a review of the literature provides considerably more insight into gender differences with regards to attitudes towards pro-environmental behaviour. Worsley and Skrzypiec's study of environmental attitudes of senior secondary students in South Australia revealed teenage girls to express greater levels of environmental concern, environmental pessimism (i.e. the belief that things can only get worse), and disagreement with environmental exploitation, than their male teenage counterparts (1998). Another investigation exploring gender patterns in environmental consciousness among adolescents produced similar claims, stating that girls were found to be more environmentally responsible and concerned about environmental degradation, than the boys involved in the study (Hampel et al, 1996).

However, more recent studies exploring adolescent attitudes towards energy conservation and the environment, found little statistical difference between genders (Toth et al, 2013; Saricam, 2014). This discrepancy was addressed by comparing results from studies using a classical analytical approach in studying youth's environmental values, to one employing measurement and structural invariance across genders. It was observed that the previously identified gender differences did not occur when using the invariance approach. These findings indicate that claimed gender differences may be a result of a statistical characteristic, differential item functioning, rather than genuine differences. The authors suggested that older studies, such as the ones from Worsely and Sprzywiec, and Hampel et al, may represent "methodological artifacts" (Boueve-de Pauw et al, 2014). As such, care should be taken to employ appropriate statistical analyses to determine authentic differences between genders.

### 2.3.2 Microsystem

#### *Parents*

The influence of parents on adolescents' environmental attitudes has been examined in greater detail in recent years. Studies have determined positive correlations between parents' and their adolescent offspring's environmental values (Grønhøj and Thøgersen, 2009; Grønhøj and Thøgersen, 2012; Lappänen et al, 2012). Grønhøj and Thøgersen observed a strong correlation for purchasing organic foods and environmentally friendly products, a medium correlation for the separation of waste, and a weak correlation for the conservation of electricity (2009). An extension of this study determined that an adolescents' inclination to adopt their parents' pro-environmental behaviour is greatly associated with the "visibility and unambiguity" of their parents' actions (Grønhøj and Thøgersen, 2012). That is to say, less discernible actions, such as conserving electricity, have a weaker influence than more visible behaviours, such as purchasing environmentally friendly products or separating waste.

The level of education of parents has also been identified as having an influence on environmental concern, indicating that there is a positive correlation between the two variables (i.e., the higher the level of education, the greater the concern) (Boeve-de Pauw, 2011; Meeusen, 2014).

Recently, some indicative evidence of a gender difference in the effects of parental influence on adolescent environmental attitudes have been observed. While girls were seen to be as positive in their environmental attitudes as their parents, boys were markedly more negative (Leppänen, 2012).

However, as this analysis was completed using one-way ANOVA, it is acknowledged that this study may be another example of a “methodological artifact”, resulting in an overestimation of its findings (Boueve-de Pauw et al, 2014).

The reciprocal nature of Bronfenbrenner’s Ecological Systems Model is observed through the exchange of environmental attitudes between parents and adolescents. It is no longer believed that this relationship is a one-way street, with evidence presenting the changes in parents’ environmental attitudes as a result of adolescent influence. The environmental attitudes of adolescents that occur as a result of environmental education programs, serves as a key factor for facilitating the parents’ receptiveness of environmental influence of adolescents (Damerall et al, 2013; Singh, 2016). These findings provide support for the validity of intergenerational transmission of environmental attitudes and awareness.

### *School*

Environmental education (EE) programs are no longer novel in the field of adolescent pro-environmental behaviour, with the earliest programs gathering support in the mid-19<sup>th</sup> century (McCrea, n.d.). As such, the relationship between EE programs and environmental attitudes and awareness has been examined through many studies. Most findings in the literature indicate a positive correlation between school-based EE programs and pro-environmental attitudes, behaviour, and knowledge. In particular, EE programs integrating the individuality of the students with school-wide involvement, achieved increased levels of environmental knowledge, self-efficacy, and pro-environmental behaviours such as recycling (Tung et al, 2002). Similar findings were produced in a more recent study through the use of a theory-driven school-based EE program, achieving a statistically significant increase in energy-saving behaviours in adolescent participants (Cornelius et al, 2014). In-school EE programs serve to strengthen pro-environmental attitudes outside of school, particularly through agency and prosocial experiences. These proficiencies lead to enhanced pro-environmental values, personal norms, and self-efficacy (Uitto et al, 2015).

Research into the development of adolescent worldviews provides insight into the dynamic nature of these perspectives, and their roots in interactions between the adolescent and their context. Accordingly, the worldviews produced by adolescents through participation in an EE program are likely

a result of genuine changes and differences, rather than simply based on pre-existing values and traits. (Boeve-de Pauw et al, 2011). These findings lend authenticity to the success of EE programs in changing the pro-environmental attitudes and awarenesses of adolescents.

### 2.3.3 Exosystem

#### *Media*

The growing presence of media, through the forms of television, movies, and the internet, present an important factor in influencing adolescent pro-environmental attitudes and behaviours. This relationship was recognized early on by Huckle, who described how

*“it is by watching television that many of the world’s people acquire an awareness and understanding of environments and environmental issues near and far. Images and sounds from television are increasingly significant in shaping their beliefs, attitudes, and identities.” (pg 291, 1995)*

Empirical studies of the effects of media have identified it as a key tool for reinforcing environmental attitudes and awareness gained through formal experiences, such as school (Eagles and Demare, 1999; Holbert et al., 2003; Blewitt, 2013). Acknowledging this correlation, an interesting investigation into message framing (dire vs not dire) in environmental documentaries indicated no significant influence of the message framing on participant behaviour or environmental concern (Diaz, 2012).

The vast reach and expanse of the internet led it to be identified in a study as the most important source of environmental knowledge for students, followed by newspapers, television, and school (Keinonen et al, 2014). Further inquiry is required in order to determine the effects of media on energy, in particular electricity, conservation.

### 2.3.4 Macrosystem

#### *Culture*

*“Culture is probably the broadest concept of all those used in the historical social sciences. It embraces a very large range of connotations, and thereby it is the cause perhaps of the most difficulty.” (Wallerstein, 1990, pg 31)*

The multifaceted effects of culture on adolescent development make it an important factor to investigate when analyzing the development of attitudes and awareness. Limited studies have been completed about the effects of different cultures on adolescents' pro-environmental attitudes. A few however, have explored the differences between Canadian francophone and anglophone cultures and the pro-environmental knowledge, attitudes, and behaviours of adults. The first iteration of this study demonstrated that Francophones exhibited lower levels of eco-literacy and concern for the local environment, when compared to Ontario anglophones (Laroche et al, 1996). These findings were contested however, after the second iteration of the study where it was found that Francophones were more knowledgeable and concerned about environmental issues than their Anglophone counterparts (Laroche et al, 2002). Whether this change is a result of a change in research methodologies, or reflects genuine changes in pro-environmental attitudes, is unclear.

Despite the limited investigations into the influence of culture on adolescent pro-environmental attitudes, Ontario's Ministry of Tourism, Culture and Sport has recognized younger consumers as one of the driving forces shaping the future of Ontario's culture sector. It is the preference for "socially and environmentally conscious products, produced sustainably", of this demographic that has been identified as the main influence for this change (Ontario, 2016).

Further inquiry is required to determine the relationship between Ontario's culture and its citizens' pro-environmental behaviour.

## 2.4 Proposed Framework

Based on concepts and theories identified in the literature review, a new framework is proposed in order to achieve a holistic understanding of adolescent attitudes towards electricity conservation (i.e. the attitudes themselves as well the influences on them). This framework aims to address the Ecological Systems Model's limitation of not providing a connection between these influencing factors and the individual's identity itself. This study proposes an integration of the ACC model of attitudes and Bronfenbrenner's Ecological Systems Model to establish this link, and further the model's contribution to the understanding of the individual themselves. The proposed framework is depicted in Figure 2.3:

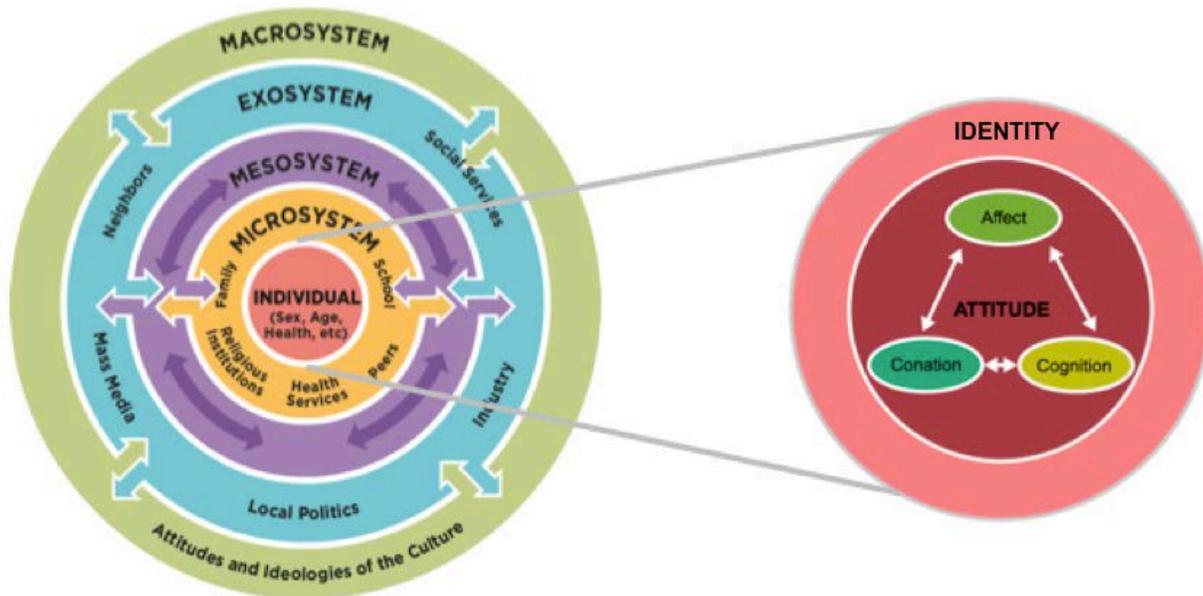


Figure 2.3: Proposed framework for this study combining Bronfenbrenner's Ecological Systems model and the ACC model of attitudes

This framework contextualizes the affect, conation, and cognition components that generate adolescent identities through attitudes, within the internal and external influences on these components. In addition to being able to use this all-inclusive understanding to achieve this study's research objectives, the proposed framework aims to contribute an additional dimension to Bronfenbrenner's existing Ecological Systems model. The ACC and the Ecological Systems models provide context for each other; by positioning the ACC model within the individual system, this framework allows for a comprehensive understanding of the factors influencing attitudes, from most proximate to least, and what the resulting attitudes are.

## 3.0 Methods

The nature of research is to systemically analyze a question to investigate hypotheses, suggest new interpretation of data, and/or to create new questions for investigation by future research (UC San Diego, 2017). This section outlines the methodological steps undertaken in this study to achieve all three of these directives.

This section will provide a brief overview of the 2007 study exploring an analogous topic by Lynes and Robinson, which provided the basis for this study. This will be followed by a discussion of the methodological considerations and processes, and the limitations, reliability and validity of this study.

### 3.1 Overview of 2007 Survey Methodology

The researchers of the 2007 iteration of this study also explored teenagers' awareness and attitudes about electricity conservation. The study was conducted for the Ontario Power Authority to understand how best to communicate conservation issues to this age group (Lynes and Robinson, 2007). The study used focus group discussions to inform the development of an online survey tool, which was completed by 500 teenagers across Ontario, between the ages of 13 and 17. Consequently, a parallel approach, an online survey, was used in this iteration of the study to allow for efficient comparisons between the sets of data.

### 3.2 Discussions of Methodological Considerations

A sound methodological design appropriate to a study's objectives is a major contributor to the study achieving its goals. Keppel and Zedeck recognized the significance of research design by stating that "sound inferences and generalizations from a piece of research are a function of design and not statistical analysis..." (pg. 1, 1991) As such, this section details the methodological considerations employed in this study to explore how teenagers' awareness and attitudes about electricity conservation have changed over the past decade.

#### 3.2.1 Quantitative Approach

Quantitative research focuses on the collection and analysis of numerical data (Bryman and Bell, 2016). As one of the primary aims of this research was to provide a comprehensive comparative analysis of data from a large number of participants, a quantitative approach was selected. In addition to being

able to establish clear links to the first data set, a quantitative approach was conducive to statistical analysis in order to determine the significance of relationships between variables identified in the survey. Furthermore, a quantitative analysis also allowed for clear comparisons between changes, if any, in adolescents' attitudes.

### 3.2.2 Basis for Survey Design

The survey tool from Lynes and Robinson's study in 2007 (Appendix 1) was adopted for use in this study. The survey was modified to ensure relevancy, and alignment with Bronfenbrenner's Ecological Systems model, resulting in the modification or removal of questions from the original survey. Appendix 2 outlines the changes made to the original survey, and the rationale for these changes. The final survey used in this study is included in Appendix 3.

The original survey was updated to reflect social and environmental issues relevant in 2017. This was achieved by including options such as climate refugees, civil unrest, and indigenous land rights. These topics were chosen after review of the UN's overview of global issues, as well as media representation of these issues (UN, 2017; Loudenback, 2016). Changes in electronic technology also required questions relating to electronics use to be updated. For example, Question 28 asking participants to "check the following items that you use on regular basis" was updated for relevancy by replacing the "digital video recorder" and "mp3" options with "laptop" and "tablet". Additionally, many electricity conservation programs referenced in the 2007 survey were no longer in effect, such as the *Flick Off* and *Every Kilowatt Counts* campaigns. As such, references to these programs were removed.

The variables being examined in this research largely stem from Bronfenbrenner's Ecological Systems model, which details influences on adolescents' values, attitudes, and behaviours (Bronfenbrenner, 1975). This model asserts that an adolescent's attitudes towards electricity conservation are a result of their interaction with, and interpretation of, the world.

The questions in the survey were evaluated to determine whether they corresponded to the systems identified in this study's proposed framework, in order to warrant their necessity. That is to say, it was established that the survey asked questions regarding variables, such as parental education, that had been identified by Bronfenbrenner as having an impact on the development of attitudes in

adolescents. Through this approach, survey questions were linked to *individual* (age, gender), *micro-* (parents, school), *exo-* (media), or *macro-* (culture) systems, or the *affective*, *cognitive*, or *conative* components as identified by this study's framework. This was done to bolster the measurement validity of this study's findings, as the correlation between these variables and adolescent attitudes is acknowledged and/or accepted, as established by this study's review of literature.

### 3.3 Research process

#### 3.3.1 Survey Development

The survey from Lynes and Robinson's iteration of this study was used as the scaffolding for this study's survey. This was done to maintain a connection between past and current data, allowing for a clearer analysis of any changes. After making the modifications described in section 3.2.2, the final survey consisted of 40 questions made up of a mixture of closed and open questions.

Bryman and Bell (2016) discuss the merits of including different types of questions in a survey, as each can present a unique advantage. Answers to closed questions are easier to process and compare, due to the standardized nature of the responses. Consequently, the challenges associated with this type of question, loss of unique responses and authenticity, can be addressed by incorporating open questions into the survey as well. With open questions, participants can answer in their own terms, allowing for more genuine responses. Considering that these questions can contribute to longer processing times, this study attempted to find a balance of both closed and open questions to allow authentic responses, while still allowing the researcher to process the data in a timely manner.

In addition to being connected to the ACC model of attitudes and Bronfenbrenner's ecological systems, the questions in the survey were sectioned together based on the topic addressed. The 7 sections of the final survey included:

##### *i. Demographics*

This section was designed to collect information related to the participants' gender and age. This data fell under the *individual* system as identified by Bronfenbrenner. This system exists independent of others, and so is not impacted by factors in the *micro-*, *exo-*, and *macrosystems*. However, *individual* aspects can exert influence over these other systems, and interrelations among them (Bronfenbrenner,

1961; Darling, 2007). As such, this information was necessitated in this study in order to examine relationships between *individual* factors and those in other systems.

#### ii. *The issues today*

In this section, participants were asked to identify social and environmental issues that they felt were most important to Ontario. This segment of the survey was updated to include more recent concerns such as climate migration and civil unrest. Additionally, participants were asked to evaluate Ontario's electrical power sources, in terms of their current and future supply. These questions were essential to address the "cognitive" aspect of this study's research objectives. They also allowed for an analysis of how adolescents perceive the priorities of Ontario to have changed, if at all, since 2007.

#### iii. *You've got the power*

This category collected data regarding the participants' use of electricity in their day to day lives. This provides valuable insight into adolescents' primary uses of electricity. In addition to allowing for a comparative analysis between how adolescents used electricity in 2007 versus 2017, this information is also useful for applications beyond this study, including designing conservation programs aimed towards teenagers.

#### iv. *Conservation*

In this portion of the survey, data is collected regarding participants' affects and conations regarding electricity conservation. Respondents are asked to identify their motivators and barriers towards electricity conservation, and what steps they have either already taken, or would take in the future, to reduce their electricity consumption. This section also investigates factors from the *microsystem*, such as the behaviour of participants' parents and friends. Bronfenbrenner identifies the reciprocal nature of the *microsystem*, explaining that "an ecological experiment must allow for reciprocal processes; that is, not only the effect of A on B, but also the effect of B on A" (1977). As such, this section investigates both the influence parents and friends may have on the participant, but also to what degree the participants feel they can influence their parents and friends.

#### v. *The players*

The focus of this section included aspects of the *micro-* and *exosystems* as identified by Bronfenbrenner. The questions emphasized the role of the participants' school, and government conservation initiatives in influencing adolescents' attitudes about electricity conservation. This section also investigated the role of media, also a component of the *exosystem*, in developing these attitudes. The impact of these external contexts on the development of adolescents was first discussed by Bronfenbrenner in 1977, but was further developed to include the reciprocity between the individual and this system, and the acknowledgement that these systems are responded to in different ways by different individuals (Darling, 2007). This section of the survey was necessary to achieve a preliminary understanding of which features of the *exosystem* play a role, and how, in the development of attitudes about electricity conservation. By comparing data from this study to that of 2007, the changes in attitudes with regard to school and government conservation initiatives can be mapped out and used to guide future research and conservation programs.

In addition, this section of the survey explored a combination of factors from the *exo-* and *macrosystems*, such as schools and media. The participants are asked about their attitudes towards information received regarding electricity conservation through others, media, and information campaigns. Similar to previous sections, this information is significant when developing conservation programs for adolescents, with regards to determining what works, and what doesn't.

#### vi. *Some last questions*

The final section of the survey included demographic questions, in addition to those asked in the *Demographics* section. These included details about the participants' households, cultural background, and employment. This was necessary for data analysis in order to determine patterns among this study's findings. This section also asked participants to provide details about the school they were enrolled in at the time of the study. This information was crucial in determining whether their school was EcoSchool certified. This data was then also used in analyzing findings for differences in attitudes between students in certified and non-certified schools.

### 3.3.2 Sample selection and survey distribution

The age range for adolescent participants in this study was determined as 13-17 years old. The adolescent phase of development has been categorized in the literature as between 12 or 13 years, to 19 years old (Costello et al, 2007; Psychology Today, 2017). In keeping with the previous iteration of this study, and also to limit the participants to those still enrolled in school, the age range classified as adolescence for this study was reduced to 13-17 years old.

Once developed, the final survey was programmed using Qualtrics. The use of an online survey, as opposed to a physical survey, increased the reach of the study - to across Ontario - which would otherwise have been limited geographically to locations available to the researcher. The survey was distributed using a third-party distributor, SSI, to allow for responses from all over Ontario, as well as quicker data collection. Additionally, the use of an online survey allowed for more straightforward data input and statistical analysis, further discussed in the *Data Analysis* section.

The participants of this study were limited to adolescents residing in Ontario, Canada. This was done for two main reasons: 1) to preserve a close connection with the 2007 study by Lynes and Robinson, which maintained the same parameters for participant recruitment, and 2) because Ontario EcoSchools only operates within the province of Ontario. Therefore, in order to objectively measure the impact of enrollment in a certified EcoSchool on attitudes towards electricity conservation, only participants in Ontario could be included.

### 3.3.3 Data analysis

Data were analyzed in three phases in order to achieve this study's research objectives through statistical analyses completed using a combination of Excel and SPSS software. The first phase employed descriptive statistics to investigate changes in adolescent attitudes towards electricity conservation between the 2007 and 2017 studies. Findings from this analysis are detailed in chapter 4.

As a chi-square test can be used to determine the likelihood of a relationship between two independent variables, this analysis was used for the second phase of analysis (Bryman and Bell, 2012). The chi-square tests determined relationships between factors identified in the literature as having an impact on attitudes, and the attitudes themselves. Chapter 5 details the results of these analyses.

The final stage of analysis utilized Pearson Correlation analyses to measure the strength of association between the components of attitude (University of the West of England, 2017). The results determining the relations between elements of attitude: affect, conation, and cognition are outlined in chapter 6.

The data from these statistical analyses are presented in Appendix 4.

### 3.4 Limitations of the study

This researcher acknowledges that every study has benefits and restrictions related to the methods and boundaries identified. The following section will address the limitations of this particular study.

#### 3.4.1 Method limitations

Critics of quantitative research claim that the measurement processes used can produce an artificial sense of precision and accuracy (Bryman and Bell, 2016). It is conceivable that different individuals could interpret this study's survey questions in different ways. This research attempted to solve this problem by taking care to use as straightforward and clear questions as possible. It is still recommended, however, that the findings of this study are corroborated through further investigations using a more varied (i.e. mixed methods approach) into the same topic.

The nature of an online survey as used in this study allowed for a broad scope of participants (i.e. varied location, age, etc.). However, it is acknowledged that this approach did generate limitations for the study. Participants were limited to those whose parents and/or guardians could be contacted by the third-party survey distributor (i.e. were registered clients of the distributor). This limitation was accepted as a trade-off for a diverse range of participants, and quicker data collection.

Additionally, participants were limited to those with access to both the internet and a device to access the survey (a computer, tablet, or mobile phone) in order to receive the invitation to, and complete, the survey. These limitations can be addressed through further investigations, as suggested earlier. Future research can engage a more comprehensive sample of the Ontario adolescent population through the use of both online and physical surveys.

### 3.4.2 Boundary limitations

This research has taken care to limit participants within the age category of “adolescents”, defined in this study as participants aged 13 to 17 years old. It is acknowledged, however, that young adults, aged 18 to 25 years old, may also play an important role in household electricity consumption. The attitudes and awareness levels of this separate population would be valuable to assess in a follow up study to examine differences from the adolescent age range. However, this study is limited only to participants who fall within the described “adolescent” age range due to the impactful nature of this school-attending development stage, in addition to maintaining consistency with data collected in the 2007 iteration of this study.

Similarly, limiting the geographical boundary of this survey to include only Ontario, was also justified as keeping the evaluation of certified and non-certified EcoSchools relative and fair. It was acknowledged, however, that this limitation may impact the study’s external validity, as discussed in the next section.

### 3.5 Reliability and Validity

A study’s reliability ensures that “the researcher’s approach is consistent across different researchers and different projects” (Creswell, 2014). Despite modifications made to the original survey tool developed by Lynes and Robinson, special care was taken to ensure consistency between the 2007 and 2017 survey tools. The use of the same 7 sections, as well as the same, or similar, questions allowed for a strong comparison of results, and in turn, bolstered the reliability of this study.

In addition, this researcher documented the procedures followed for survey development and data analysis as thoroughly as reasonably possible. This was done to ensure that future iterations of the study could be achieved with a high degree of replicability.

The theories and key findings from the literature were used to inform the development of survey tool used. This was done in order to bolster this research’s measurement validity. By gaining confidence that factors being examined, such as parental education, had been empirically correlated to the development of adolescent attitudes and awareness, this researcher believes that the study’s survey tool was able to effectively measure the changes in these attitudes.

It is acknowledged that this research's participant parameters (i.e. residing in Ontario) may contribute to a restriction on its external validity. The findings of this study may not be generalizable to other provinces, or other environmental education programs. It the hope of this researcher, however, that the methodological considerations and processes detailed in this study can contribute to the development of other investigations for these different contexts.

## 4.0 Comparative Analysis of 2007 and 2017 Studies

Data from this study was analyzed in three stages. The first, explored in this section, will address the first research objective:

- i. To assess the changes, if any, in adolescent attitudes about electricity conservation that have taken place in the past decade

Results from the 2007 and 2017 studies were compared in order to gain an appreciation of the changes, if any, in adolescent attitudes regarding electricity conservation.

### 4.1 Individual system and other demographics

At the centre of Bronfenbrenner's ecological systems model is the individual level. This system includes influencing factors such as age and gender. In addition to these aspects, further demographic information about participants was also collected in both iterations of the survey, including information about their type of household and the number of people residing in it. This was completed in order to gain a better understanding of the profiles of respondents from each survey.

#### 4.1.1 Individual System

The distribution with respect to participants' age and gender from the 2017 survey closely resembled 2016 census data. However, while the 2007 study's gender distribution was similar to the 2006 census, the age distribution was observed to have greater differences. Over 40% of the participants from the 2007 study were 17 years old, a major difference from the 2006 census data which identified 21% of this age range (13-17 years old) as 17 years old. This, among other differences, can be noted in Figure 4.1. These discrepancies were taken into account when analyzing the results of the 2007 survey.

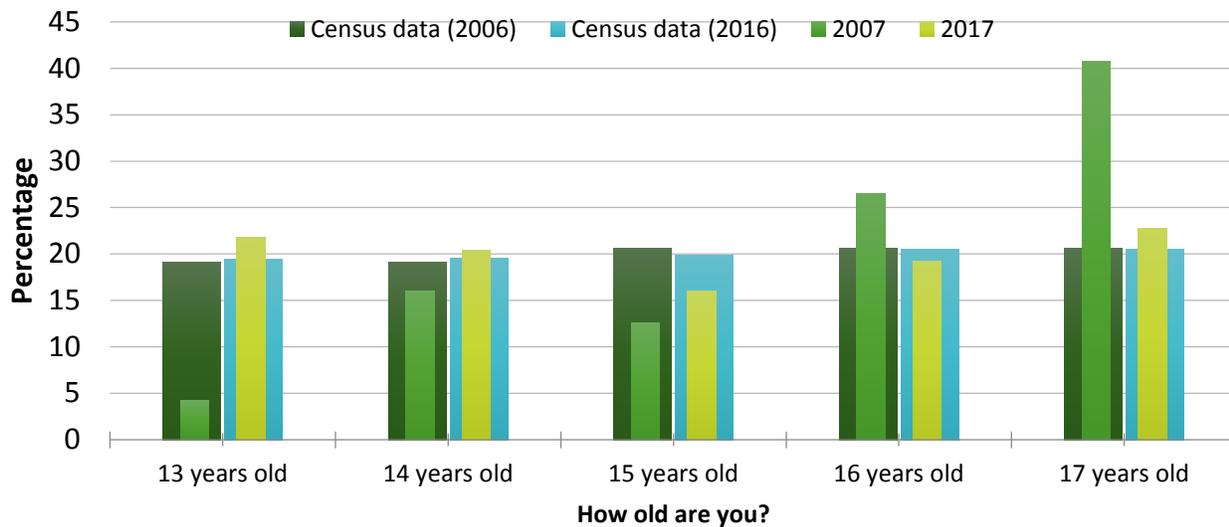


Figure 4.1: Age distribution of participants in 2007 and 2017 studies in comparison to census data from 2006 and 2016. Percentage is reflective of the proportion of participants at specified age within this demographic (i.e. of 13-17 year olds in the 2006 census, 19% were 13 years old)

#### 4.1.2 Additional Demographics

The majority of participants in both 2007 and 2017 surveys reported living in single family homes, with the second most common type of household being townhomes or duplexes. A small number of participants reported living in “other” types of households include mobile homes, basements, and triplexes.

Similar consistencies between the studies’ participants’ demographics were seen in the number of people reported living in the household; most participants (80-83%) reported 3-5 occupants in both 2007 and 2017 studies.

A slightly larger portion of participants of the 2017 study were born in Canada (92.8%), when compared to the 2007 data (84.6%). Of the 2007 participants born outside of Canada:

- 24.7% had been living in Canada for 3-5 years
- 42.9% had been living in Canada for 5-10 years
- 24.7% had been living in Canada for more than 10 years.

Interestingly, of the 2017 participants, 75.8% of those that had been born outside of Canada reported having lived in Canada for more than 10 years and therefore could likely have adopted some cultural norms.

## 4.2 Microsystem

Bronfenbrenner identified the microsystem as the influence in the closest proximity to an individual. Factors in this system include the parents and school environment of the individual.

### 4.2.1 Parents

In addition to the household information reported in 4.1.2, information was collected regarding the participants' parental education level. Similarities were seen between the number of parents with a, or some, post-secondary education at the university level. As seen in Figure 4.2, there were considerably more parents with college certificates or diplomas in 2017, and a decrease in the number of parents who had only completed some grade or high school. This is consistent with findings from the 2011 census (education information from the 2016 census was not available at the time of this study) that indicated an almost 4% increase in the number of Canadians with postsecondary qualifications (StatCan, 2011).

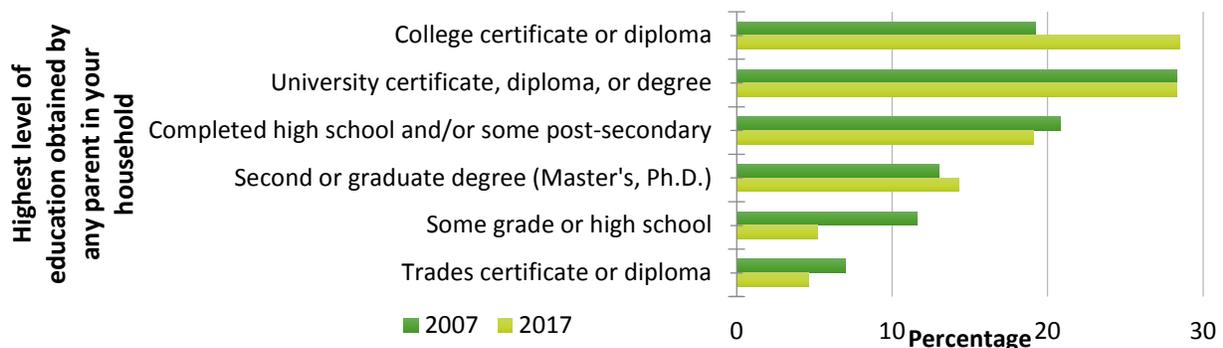


Figure 4.2: Highest level of education obtained by any parent in the household

Participants from both studies were also asked from where they learned about electricity conservation. As seen in Figure 4.3, a larger number of participants in 2017 reported that they gained their knowledge about electricity conservation from their parents (27.3%, as compared to 17.5% in 2007). A similar increase was seen in getting information from other family members, as 10.3% of respondents in 2017 reported, when compared to 5.8% in 2007. Although few recent studies have been completed regarding sources of information for teenagers about electricity conservation, many others have

identified parents as being the top source of information about other topics, such as health (Lindberg et al, 2016; Northwestern University, 2015; Bleakley et al, 2009;).

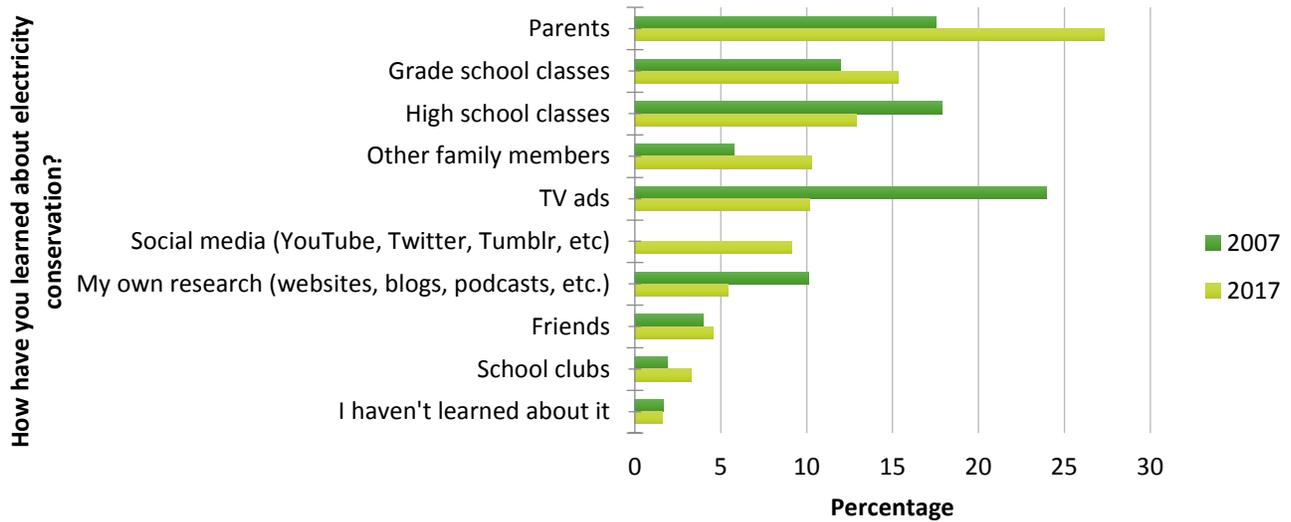


Figure 4.3: How participants learned about electricity conservation. Data for “Social media” responses from 2007 were unavailable as this question was added to the 2017 survey. See Appendix 2 for details.

In addition, the 2017 findings indicated that a much greater number of respondents felt that their parents were either “doing all they can possibly do...” or “doing most of what they can do...” with respect to efforts to conserve electricity in the past year. These findings are depicted in Figure 4.4 below:

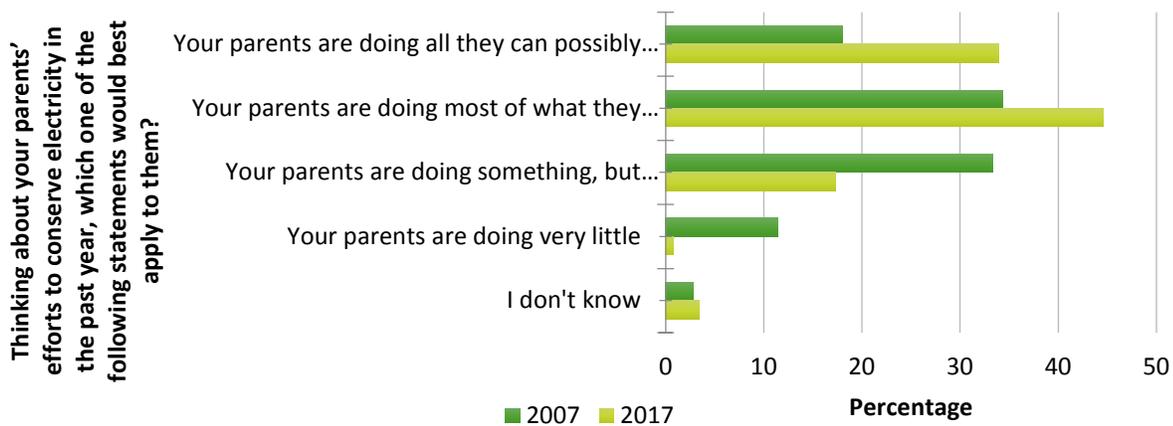


Figure 4.4: Respondents’ perspectives on their parents’ efforts to conserve electricity in the past year

For respondents who believed that their parents were “doing very little”, or “could do a lot more”, to conserve electricity, the top reasons for 2017 included:

- 1) A lack of time/too busy – 16%
- 2) Inconvenience – 12.8%
- 3) Their parents had not thought about it – 12%
- 4) Their parents did not know what to do – 11.2%

These options were consistent with findings from the 2007 survey, however it should be noted that the 2017 results showed a greater distribution between all 15 options when compared to 2007 results. The previous iteration of this study showed that the above-mentioned reasons counted for almost 70% of the responses. As mentioned in 4.1.1, it is possible that this skew in data was in response to unequal distribution of ages among the participants.

#### 4.2.2 School

It can be observed in Figure 4.4 that grade (elementary) and high school classes were the 2nd and 3rd most frequent responses to the question “How have you learned about electricity conservation?” for the 2017 study. This is different from the findings in 2007, where high school classes were the 2nd-highest option, and grade school classes were the 4th-highest. A possible reason for this increase in information from school can be attributed to a new Ontario-wide school curriculum that was introduced in 2009. This new curriculum incorporated environmental and sustainability concepts throughout subjects such as science, chemistry and biology. In addition, the reintroduction of the Environmental Science course in grade 11 and 12 in this curriculum may also have contributed to the increase in information gained from school sources (Ontario Ministry of Education, 2009).

More students in 2017 believed that their schools were somewhat careful users of electricity, as compared to 2007 findings (41.3% vs 28.6%). The previous iteration of the study had shown that most students had believed their schools to be somewhat wasteful users of electricity. This proportion of respondents has decreased from 35% in 2007 to 19.8% in 2017. This improvement can be attributed to the establishment of more comprehensive environmental policies and annual sustainability reports as practiced by school boards such as Toronto District School Board and York Region District School Board, in addition to the rise in the number of certified EcoSchools in Ontario (TDSB, 2015; YRDSB, 2016).

There also was an observed increase in the number of environmental awareness [or electricity conservation] programs that took place in the participants' schools. These programs included school clubs (Eco/Environment club, Green Team) as well as the EcoSchool program. As could be expected, a large percentage, 72.9% of 2017 respondents, reported that they had participated in an energy or electricity conservation activity at their school.

Participants from both studies indicated that they would place "some trust" on information provided by school teachers. Both studies showed that more participants (54% and 44% in 2007 and 2017 respectively) would place a "great deal of trust" in university-based scientists with regard to information related to energy conservation.

### 4.3 Exosystem

The next most proximate system to the individual is the exosystem. This level includes influencing factors such as mass media.

#### Media

As depicted in Figure 4.4, TV ads were the most popular source for learning about electricity conservation according to the 2007 survey. Additionally, using websites and magazines for independent research was the 5th most popular choice, and so 34% of respondents reported using a form of media to learn about electricity conservation.

This proportion was seen to decrease in the 2017 survey, as only 15.6% of participants named TV ads and personal research (using websites, blogs, and podcasts) as a source for learning about electricity conservation. Even with the addition of a new option (social media: Twitter, YouTube, Tumblr), the total percentage was still only 24.7%.

In addition, just over half of 2017 participants (53%) said that they would place "some trust" on the information provided by social media regarding energy conservation. This is in line with findings in the literature that identify 25-30% of teenagers trusting social media as a reliable and accurate source of information (FreshMinds, 2017).

#### 4.4 Macrosystem

The outermost system influencing the development of adolescents' attitudes is the macrosystem. This level includes influencing factors such as culture.

##### Culture

When asked what it would take for Ontario to adopt a “conservation culture”, a greater number of 2007 respondents recommended fining/penalizing businesses or others, (16.7% vs 10.9%) and stronger governmental leadership (15.4% vs 9.8%) than from the 2017 study.

Conversely, as seen in Figure 4.5, the top recommendations from the 2017 study were to 1) create more environmental awareness among consumers and 2) to make new standards/behaviours mandatory, closely followed by 3) experiencing serious energy shortages.

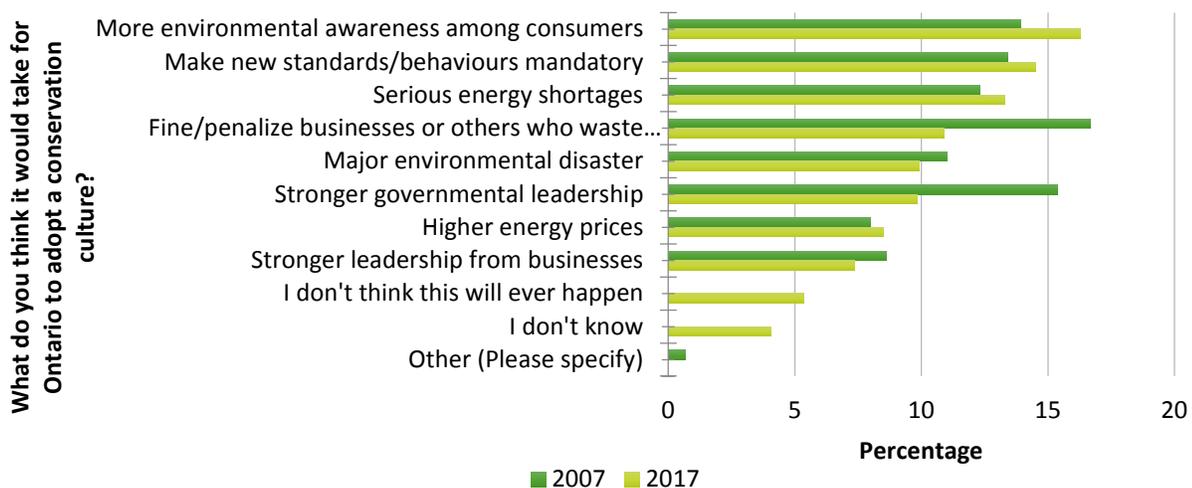


Figure 4.5: Recommendations by participants for Ontario to adopt a “conservation culture”

This change is reflective of participants' confidence in the “bottom-up” approach through consumers, rather than “top-down” from the government, that is often the aim of many EE programs, as well as the new Ontario curriculum.

#### 4.5 Affect

As observed in the proposed framework for this study, affect – how an individual feels about a subject – is a part of a person's overall attitude towards that topic. As such, a large portion of both 2007 and 2017 surveys explored the sentiments of the participants towards electricity conservation.

As seen in Figure 4.6, 48.8% of participants in the 2017 study reported that they were either “interested” or “really interested” in electricity conservation. This was a decrease from the 62.8% with the same responses from the 2007 study. In addition, the proportion of adolescents reporting that they “never really thought about [electricity conservation] before” more than doubled from 13.6% to 30.9%, from 2007 to 2017.

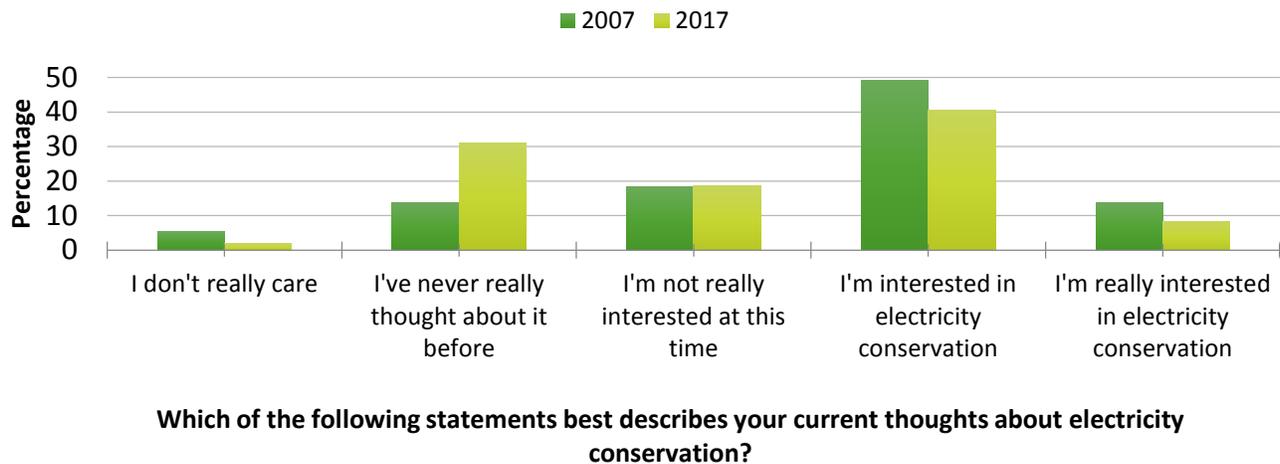


Figure 4.6: Participants’ current thoughts about electricity conservation

This overall decrease in interest in electricity conservation is interesting, as literature from both time periods indicated that adolescents were more concerned with social issues such as drug/alcohol use, mental health, and a shifting economy, than environmental issues such as energy conservation (Carroll, 2006; Demee-Benoit, 2007; Zur, 2016; Morin, 2017).

Despite a decrease in interest, the majority of participants in the 2017 survey, 87.6%, felt that they “definitely” or “likely” could make an important contribution to the overall reduction of electricity use in the province. This was a slight increase in the percentage of respondents with a similar attitude in 2007; 80.8%.

Fewer 2017 participants reported actually trying to influence someone to conserve electricity, 34%, as compared to 2007 participants, 42%. However, although the majority of adolescents from both studies did not actually try to influence others, over two thirds of participants from both studies believed they would have “some” or “significant” influence over their friends with regards to encouraging electricity conservation.

When asked on which specific actions the participants felt they would be able to have influence, the majority of respondents (80% or more) from the 2017 study believed that they would have “some” or “significant” influence on:

- 1) Turning the TV, computer, or lights off when not in use
- 2) Buying energy efficient compact fluorescent light bulbs
- 3) Listening to them talk about the environmental impact of electricity use
- 4) Adjusting the thermostat to save energy

Fewer respondents felt that they would have this level of influence in buying new energy efficient appliances and turning the car off when idling – which can be expected as these decisions are often made by parents.

Overall, this was a change from the 2007 study, where the majority of respondents believed that they would only have “some” or “significant” influence over 1) turning off the TV, computer and lights when not in use, and 2) buying compact fluorescent light bulbs.

The most popular strategy to promoting electricity conservation in the 2017 survey was to introduce financial rewards to encourage conservation actions. This was consistent with findings from the 2007 study. However, the next most popular option was to produce education and awareness programs to help people learn what they can do - this option was 3rd in the 2007 study. This is consistent with findings in the 2017 study that indicated one of the major reasons participants did not do more to conserve electricity was because they did not know what to do. Other responses suggested a combination of the suggestions listed in Figure 4.7.

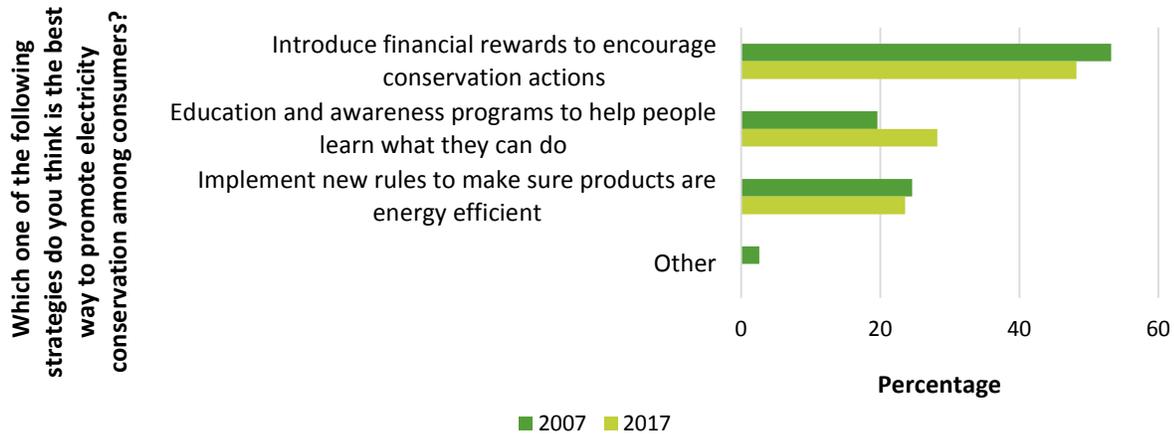


Figure 4.7: Suggestions for promoting electricity conservation among consumers

With respect to participant stances about the role of technology and today’s environmental problems, there was an exact split between respondents in the 2017 study, with half citing the overuse of technology as a cause of these issues. The other half believed that new technologies will allow us to reduce the environmental damage done to the planet. This was a change from the 2007 study where a slightly greater percentage, 54.8%, of participants believed that overuse of technology caused environmental problems, and only 45.2% believed that technology can be used to solve these problems.

The current widespread use of technology by teenagers, 92% of teens reportedly go online daily, including 24% report going online “almost constantly”, would explain this shift in sentiment in favour of technology (Lenhart, 2015).

#### 4.6 Conation

In addition to the sentiment of the participants regarding electricity conservation, both studies also examined their behavioural intention, conation, with regards to this topic as well. This information was valuable in understanding adolescents’ overall attitudes towards this topic.

When asked which activity from their daily routine uses the most electricity, adolescents from both studies identified using the computer and television as the top two activities. It can be observed in Figure 4.8 that nearly half of all responses from the 2007 study reported computer use as the activity using the most electricity, compared to only 20.6% of responses in 2017. The prevalence of

smartphones capable of most of a computer’s functions could explain this large decrease (Bonnington, 2015).

Other notable differences were the increase in reported use of game consoles, charging devices, and cell phones in 2017 when compared to the 2007 study. This increase is likely related to the increase in sales of these devices from 2007 to 2017 (Rayburn, 2013).

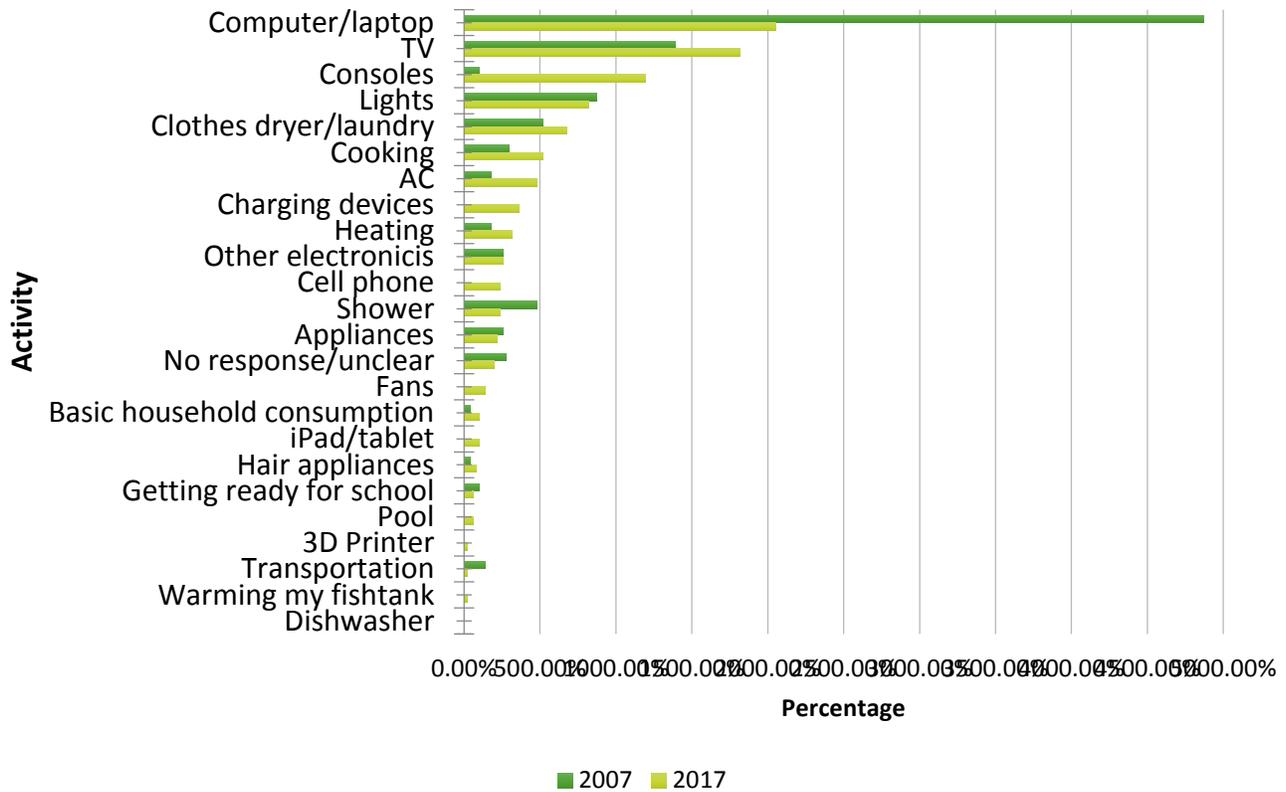


Figure 4.8: Activities from daily routines that use the most electricity

In the 2017 study, the most frequently reported electronics used on a regular basis were cell phones and the television. This is in contrast to the findings from the 2007 study which named the computer and iPod as the two most regularly used electronics. These electronics were the 3rd and 7th, respectively, in the 2017 survey. As discussed earlier, the increase in processing power of cell phones over the past decade would explain the decline in use of computers and iPods, both of which’s functions can be carried out by a smartphone in 2017.

Other notable observations from Figure 4.9 include that 10.2% of 2017 responses reported using a tablet regularly (this option was added to the 2017 survey to update its relevancy, see Appendix 2 for

details). A decrease was also observed in the reported use of stereos, electronic music equipment and digital cameras.

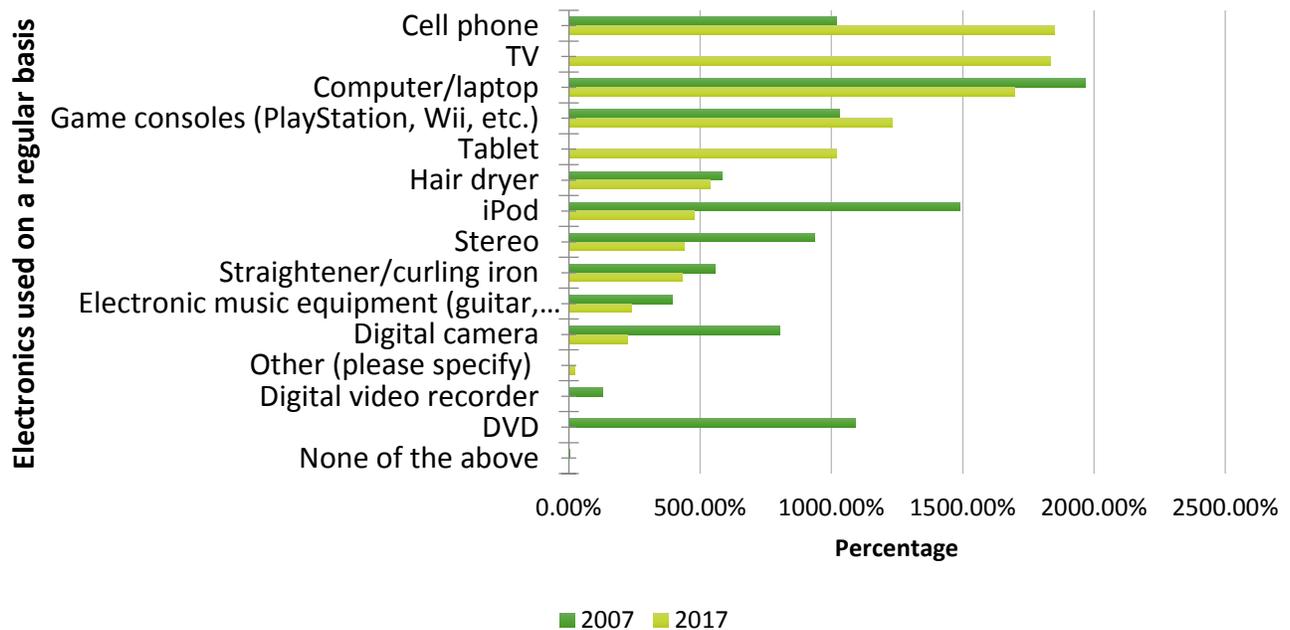


Figure 4.9: Electronics used on a regular basis.

When asked about participants’ own efforts to conserve electricity in the past year, there was a similarity observed between the two studies, in that most participants believed that they were “doing something, but could do a lot more”.

In addition, 2007 study respondents who reported that they were either “doing something but could do a lot more”, and those that reported that they were “doing very little”, identified the top three reasons as 1) being too lazy, 2) not having thought about it, and 3) a lack of time/being too busy.

This is a change from the reasons reported by participants in the 2017 survey, where the top 3 reasons were 1) a lack of information/not knowing what to do, 2) inconvenience, and 3) feeling that there was no reason to make a change.

Respondents from the 2007 survey also specified other reasons such as being forgetful, and not being responsible for purchasing energy-efficient appliances and products.

The difference between these barriers reported by 2007 and 2017 adolescents suggest that the 2007 adolescents were aware of the relevance of electricity conservation, but did not act on it as they were

too busy or lazy. However, the 2017 adolescents' uncertainty of what actions to take and feeling that there was no reason for a change indicate that these adolescents did not recognize the significance of electricity conservation, or its connection to issues such as climate change.

The top 3 motivations for 2007 respondents who believed that they were doing "all" or "most" of what they could do to conserve electricity included:

- 1) Wanting to reduce electricity-related emissions that cause smog and local air pollution
- 2) Believing it was a part of what must be done for a better tomorrow
- 3) Wanting to avoid a blackout

These findings were slightly different from the 2017 study where the top 3 motivators were:

- 1) Wanting to contribute to a better tomorrow
- 2) Believing it was just wrong to use electricity if you don't have to
- 3) Wanting reduce electricity-related emissions that cause GHG effects and climate change.

The findings from 2017 indicate that adolescents who believe they were doing "all" or "most" of what they could do, established the connection between electricity consumption and climate change – differing from the adolescents reporting they were doing "something" or "very little".

Respondents from both surveys were asked to name 3 things that adolescents like themselves would be likely to do to conserve electricity. The top two most common suggestions (by a large margin) for both studies were to turn off the lights, and unplug/turn off electronics were not in use. Additional suggestions included using electronics less in general, going outside more often, and taking shorter showers or using less water.

When asked what steps participants have actually taken in the last year to conserve electricity, both studies' findings showed that turning off the lights when not in use was the most commonly reported action, followed by turning off electronics when not in use. These were consistent with the participants' suggestions for conserving electricity. Figure 4.10 includes participants' additional suggestions, including unplugging chargers when not in use and washing clothes in cold water.

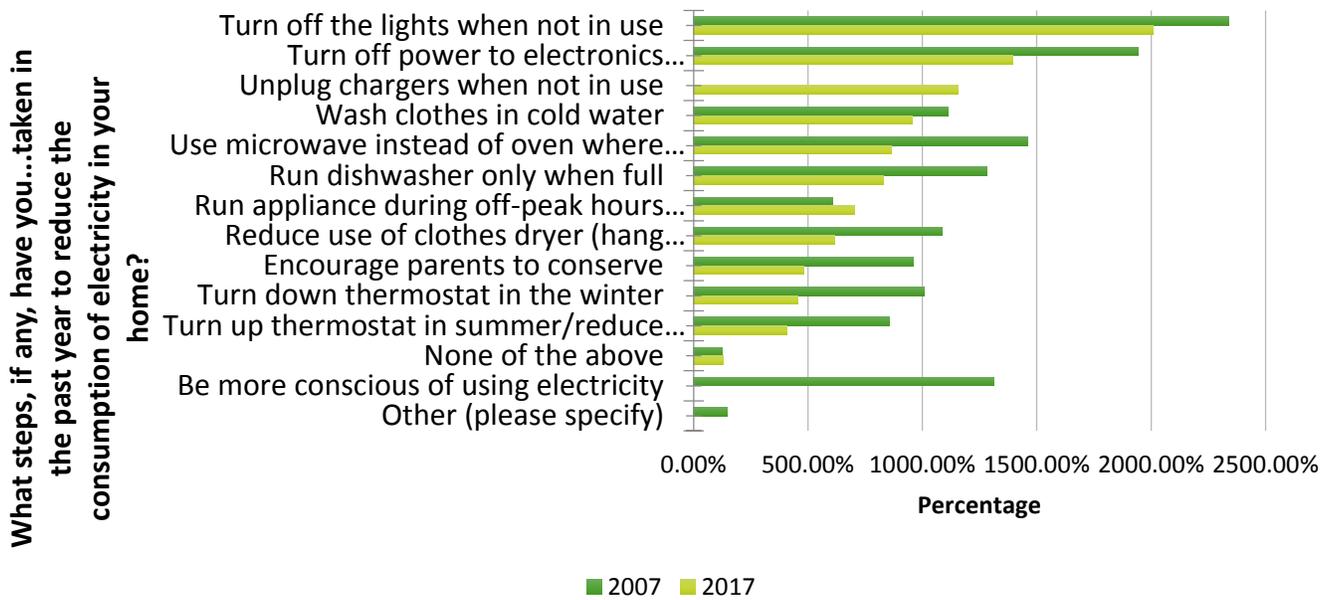


Figure 4.10: Actions participants have taken over the past year to conserve electricity

#### 4.7 Cognition

As a part of this study, participants were also asked questions to determine their understanding of electricity conservation. Participants' level of cognition has been identified as one of the pieces of their attitude towards electricity conservation overall.

The proportion of participants concerned about global warming and climate change was seen to decrease greatly (from 31.6% to 16%) from the 2007 to 2017 studies. However, this was still perceived to be the most important issue facing Ontario.

Where, in the 2007 study, the cost of gas/fuel and heating, and pollution were the next biggest concerns, the 2017 data indicated that poverty/homelessness and unemployment/jobs were the next most pressing concerns. There was an overall greater distribution among 2017 responses, when compared to 2007, as seen in Figure 4.11.

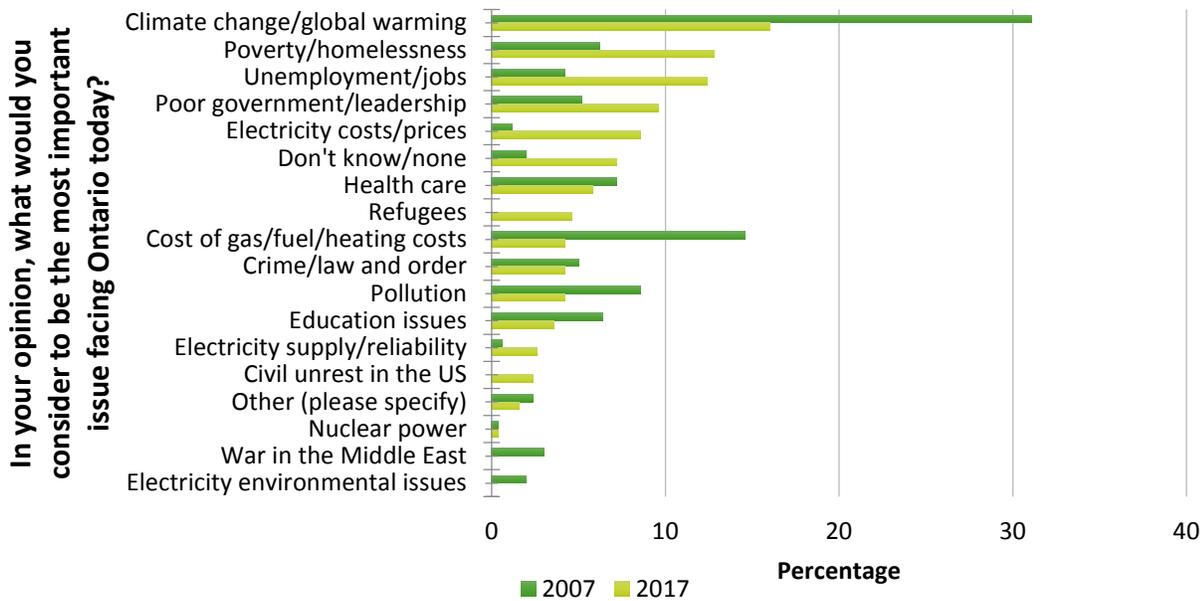


Figure 4.11: The most pressing concern Ontario is facing today

As discussed in section 4.5, literature from both time periods exploring issues teens were concerned about indicated that adolescents were more concerned with social issues such as drug/alcohol use, mental health, and a shifting economy, than environmental issues such as energy conservation (Carroll, 2006; Demee-Benoit, 2007; Zur 2016; Morin, 2017). As such, while the decrease in the number of adolescents concerned with climate change is an accurate reflection of findings from the literature, the 2007 data showing that over a third of teens considered climate change as the most pressing issue, is still unexpected.

When specifically focusing on sustainability issues, participants from both studies still ranked climate change as the issue they were most concerned with. It should be noted that 36% of 2007 participants ranked climate change as a priority, in comparison to the 23.8% from the 2017 study. The top 3 choices for both studies also included water pollution and smog/air pollution.

The decrease in the proportion of participants concerned with climate change is reflective of findings from a study conducted by the Environics Institute in 2015 exploring public opinion on climate change. A decrease in the degree of concern (20% of Canadians were “extremely concerned” in 2015, as compared to 39% in 2007) was observed in this study, with 9% more Canadians reporting that they were “not very/not concerned at all” in 2015 (Environics, 2015).

Further corroborating findings in the literature, a greater number of respondents in 2017, reported that they rarely thought about their electricity consumption, in comparison to the proportion who said so in 2007, as can be observed in Figure 4.12.

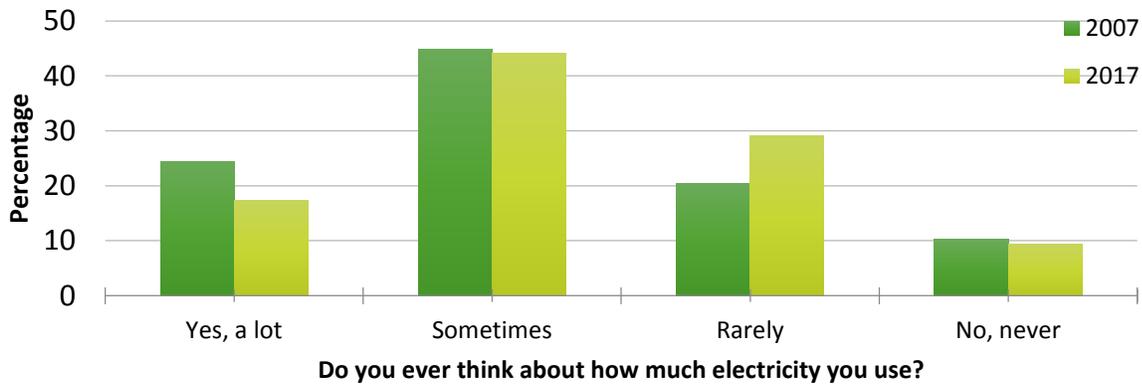


Figure 4.12: How often participants think about the amount of electricity they use

Electricity shortages was ranked as the issue 2007 participants were least concerned with. In the 2017 survey, electricity shortages were not ranked overall, but a trend was observed that more participants ranked the option as a lower concern (i.e. tendency to assign a higher value on the 1-8 scale).

In an effort to understand respondents’ understanding of the sources of electricity in Ontario, participants were asked about the amount of electricity produced by different sources such as coal, hydro, and natural gas. To facilitate comparisons, this study identifies a “small/minor” source as producing 0-10% of total electricity, “medium” source as 11-33%, and “major” source as 34-100%.

Table 1 summarizes the results from both studies, where both 2007 and 2017 adolescents identified hydro as a “major” source of electricity, however, according to data from the Canadian Nuclear Society (CNS) and the Canadian Electricity Associate (CEA), hydro was a “medium” source in both 2004 and 2017 (data regarding Ontario’s sources of electricity production in 2007 could not be found, the closest year, 2004, was used instead).

In addition, natural gas was identified as a “medium” source in both studies, when it was actually a “small” source in 2005 and 2017.

Solar and wind were also consistently identified as “small/minor” sources of electricity, in line with data from the CNS and CEA.

*Table 1: Percentage of participants reporting amount of electricity believed to be produced by different sources in Ontario – 2007 and 2017*

<b>2007</b>	<b>Coal</b>	<b>Hydro/water</b>	<b>Natural gas</b>	<b>Nuclear</b>	<b>Solar</b>	<b>Wind</b>
Major source of electricity	16.4	54	25.8	40.2	5.2	5.6
Medium source of electricity	29.2	33.4	44	37.8	18	22
Small source of electricity	39.4	10.8	24	16.2	64.8	63.4
No electricity from this source produced in Ontario	15	1.8	6.2	5.8	12	9
<b>2017</b>	<b>Coal</b>	<b>Hydro</b>	<b>Natural Gas</b>	<b>Nuclear</b>	<b>Solar</b>	<b>Wind</b>
Major source of electricity	8.3	59.1	28.7	28.7	9.8	10.2
Medium source of electricity	18	30.8	42.8	33.5	33.3	31.8
Minor source of electricity	36.6	8.3	20.7	22.4	52.4	53.3
No electricity from this source is produced in Ontario	37.1	1.8	7.8	15.4	4.5	4.7

Interestingly, nuclear, identified in the 2007 study as a “major” source, was named a “medium” source of electricity by 2017 participants. Producing over two thirds of electricity in Ontario in 2005 and 2017, nuclear can be considered a “major” source.

Also, where coal had been identified as a “small” source of electricity in 2007, which was accurate according to the CEA, there were an almost equal proportion of participants in 2017 that believed it was either a “small” source or that “no electricity was produced from this source” at all (36.6% and 37.1% respectively). However, data from the CNS shows that as of 2014, no electricity is produced from coal in Ontario.

These findings indicate that the participants from the 2007 survey had an overall greater understanding of sources of electricity produced in Ontario, when compared to participants from the 2017 survey.

## 4.8 Conclusions

Overall, adolescents' attitudes towards electricity conservation indicate a decrease in the level of interest. Although participants do seem to make the connection between electricity conservation and climate change, social issues such as poverty and unemployment are regarded with almost as much concern.

However, teenagers in 2017 display more self-efficacy in believing that they would be able to make an important contribution to reducing electricity use in the province, either through their own actions or by influencing others. They also believed that increasing education and awareness about electricity conservation would help contribute to this.

## 5.0 Analysis of Influencing Factors in 2017 Study

This section consists of the second stage of data analysis, and aims to address the second research objective:

- ii. To evaluate the relationship between current attitudes about electricity conservation, and factors such as demographics, parents, enrolment in a certified EcoSchool, media, and culture

In order to gain a deeper understanding of the influences of factors identified by Bronfenbrenner's Ecological Systems Model, chi-squared tests were performed on data collected from the 2017 study to determine if significant relationships existed between these factors and participants' attitudes (including affect, conation and cognition) towards electricity conservation.

### 5.1 Individual System

#### 5.1.1 Age

As discussed in the literature review, most studies investigating adolescents' pro-energy conservation attitudes fail to categorize their findings into age specific groups. Often these studies, such as Cornelius et al (2014) and de Vries and Knol (2011), opt to aggregate their participants' ages to a mean age.

The first iteration of this study conducted by Lynes and Robinson in 2007 did segregate findings into age categories, however the researchers did not find significant age-dependent variation in the participants' responses.

*"In your opinion, what would you consider to be the most important issue facing Ontario today?"*

Results from this study indicated a statistically significant relationship between age and which issue facing Ontario participants considered to be the most pressing (chi-square=36.258, df=24,  $p \leq 0.05$ ). The top three concerns overall included:

- 1) Climate change/global warming
- 2) Poverty/homelessness
- 3) Unemployment and jobs

It was observed that this ranking was consistent with responses from 13-16 year olds. However, as seen in Figure 5.1, the issue most concerning for 17 year olds was "unemployment and jobs", as

identified by 22% of participants of this age. “Climate change/global warming” was next most pressing, indicated by 12% of this population.

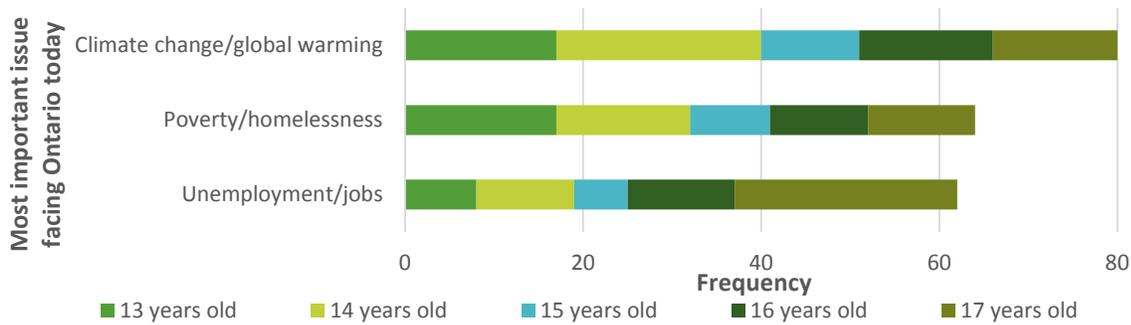


Figure 5.1: Age-dependent breakdown of top three concerns facing Ontario

A possible explanation for this discrepancy could include 17 year olds’ concerns of completing secondary school, and post-secondary options, such as employment, that are more immediate in comparison to this population’s younger counterparts.

*“Which one of the following do you think is the best way to meet Ontario's electricity needs over the next decade?”*

In addition, a statistically significant relationship was also observed between participants’ ages and what they considered to be the best method to meet Ontario’s future electricity needs (chi-square=28.174, df=16, p<0.05). Of respondents that suggested “developing new renewable sources” for electricity, most were aged 13-14 years old. In comparison, more 17 year olds were in favour of changing “building and appliance standards to make them more energy-efficient”, and changing “consumer behaviour and lifestyles to reduce overall demand for electricity”. An age-dependent breakdown of other suggestions can be observed in Figure 5.2.

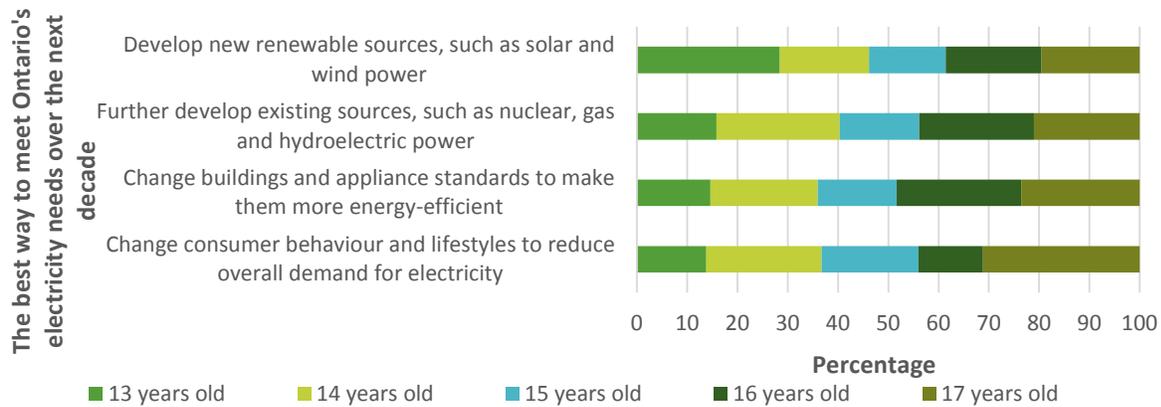


Figure 5.2: Age-dependent breakdown of recommendations for meeting Ontario’s future electricity needs

“Do you think you could have any influence over your friends with regard to encouraging electricity conservation?”

Although no statistical significance was observed between participant age and whether they had tried to influence anyone to conserve electricity, a significant relationship was determined between age and the level of influence participants felt they had over their friends with respect to encouraging electricity conservation, as seen in Figure 5.3 (chi-square=17.947, df=8, p<0.05). Of respondents that felt that they would have “significant influence”, the largest group were 16 year olds. For those that felt that they would have “no influence”, the largest percentage, 28%, were 14 years old.

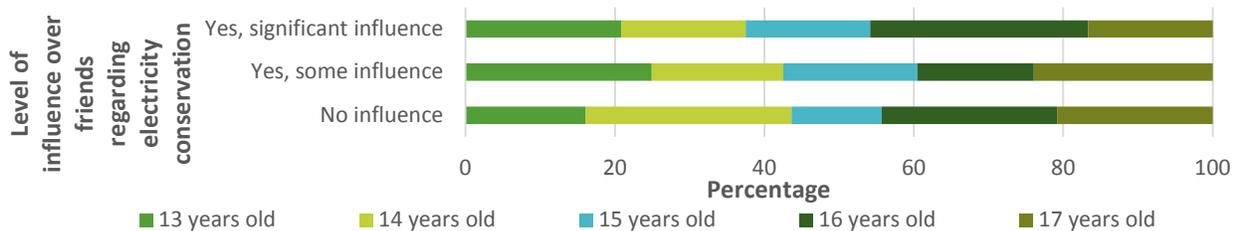


Figure 5.3: Age-dependent breakdown of level of influence over friends to encourage conservation of electricity

For additional comparative analyses between participant age and variables investigating affects, conation, and cognition (i.e. “Do you ever think about how much electricity you use?” and “Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you?”, among others), the null hypothesis that the two variables were independent could not be rejected.

### 5.1.2 Gender

The statistically significant differences between gender and pro-environmental attitudes and behaviour described by early studies have been called into question by more recent research. Findings from the latest studies have suggested flawed analysis, and that there are actually fewer differences between the genders (Toth et al, 2013; Saricam, 2014). This trend was observed in this study as well, where only two variables were found to have a statistically significant relationship to participants' gender.

*“From what you know or have heard, do you think the province has enough electrical power to meet its needs over the next 10 years?”*

One such relationship was observed when investigating the relationship between participant gender and their cognition of Ontario's future electricity needs. As depicted in Figure 5,4, although the majority of both males and females felt that the province had “as much [electrical power] as it needed”, a significantly larger proportion of females felt it had “less than needed” (chi-square=9.310, df=2,  $p \leq 0.01$ ).

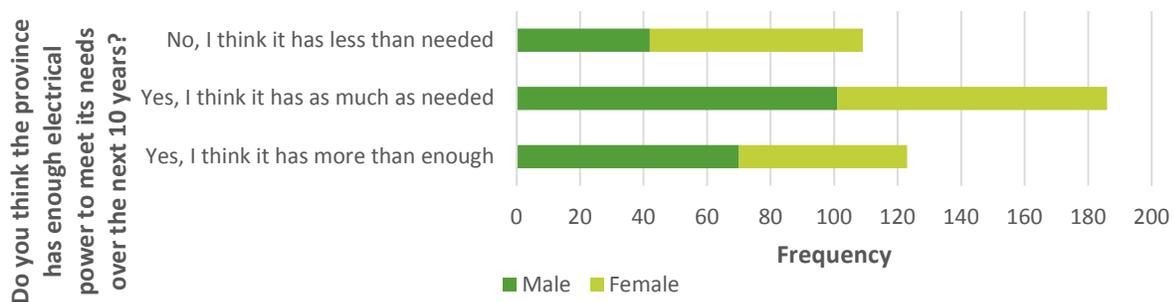


Figure 5.4: Gender-dependent breakdown on participant's awareness of Ontario's future electricity needs

These findings are in line with previous studies that found teenage girls to report higher levels of “environmental pessimism” (Worsely and Skrzypiec, 1998). However, as most female adolescents believed that the province had as much power as needed, this “pessimism” is not reflective of the majority of female participants.

*“Have you ever tried to influence anyone to conserve electricity?”*

An additional significant relationship was observed between participant gender and their conation towards influencing others to conserve electricity. Table 2 demonstrates that the majority of males and females both stated that they had not tried to influence anyone, however it was observed that a larger proportion of males (70%) reported so, as compared to females (61%).

*Table 2: Gender-dependent comparison on whether participants had tried to convince others to conserve electricity*

Have you ever tried to influence anyone to conserve electricity?	What gender do you identify as?	
	Male	Female
<b>Yes</b>	29.6%	38.9%
<b>No</b>	70.4%	61.1%
<b>Chi-square</b>	4.792	
<b>Df</b>	1	
<b>p-value</b>	<0.05	

Statistical analyses of the relationships between participants’ gender and how often they thought about “how much electricity [they] use”, their “efforts to conserve electricity in [their] daily routine in the past year”, their motivations and barriers for these efforts, among other variables, resulted in a failure to reject the null hypothesis that these variables were independent. As such, apart from the aforementioned findings, no other statistically significant differences between genders were determined.

## 5.2 Microsystem

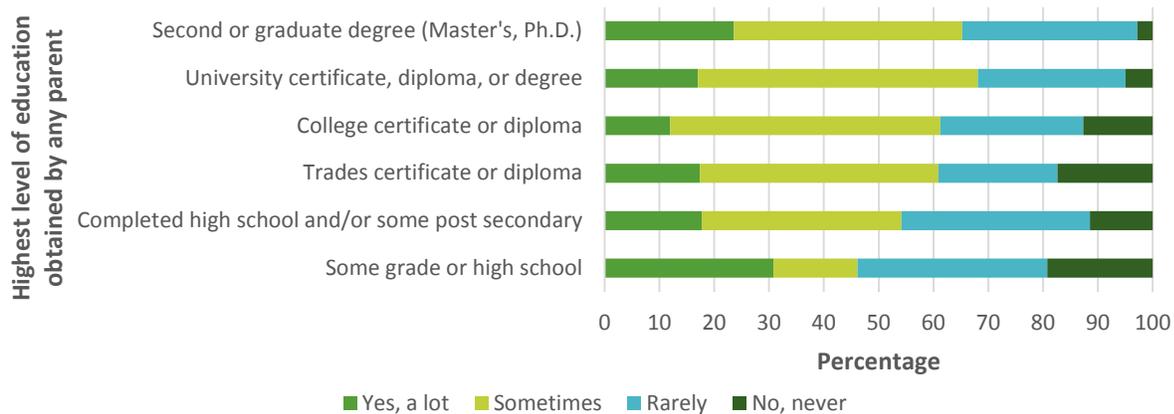
### 5.2.1 Parents

In line with Bronfenbrenner’s Ecological Systems Theory, previous studies had identified a relationship between the level of education of parents and level of environmental concern (Boeve-de Pauw, 2011; Meeusen, 2014). As such, statistical analyses were performed in order to determine significant relationships between parental education and participant attitudes towards electricity conservation.

*“Do you ever think about how much electricity you use?”*

A significance relationship was observed between parents’ level of education and how often participants thought about how much electricity they use (chi-square=30.420, df=15, p<0.01). As expected through a review of the literature, the proportion of participants who “never” thought about how much electricity they used decreased as the level of parental education increased.

Additionally, a significant portion of participants with parents who completed a second or graduate degree reported thinking about their electricity use “a lot” – 24%. Interestingly, however, an even greater proportion of participants with parents having completed “some grade or high school” reported thinking “a lot” about their electricity use – 31%. This trend is depicted in Figure 5.5, below.



*Figure 5.5: Relationship between level of parental education and how often participants’ think about how much electricity they use*

Ontario census data has identified a positive relationship between education and income, where the level of income increases with the level of education (StatCan, 2009). As such, it is conceivable that adolescents with parents having completed “some grade or high school” have a lower average income, and are thinking “a lot” about how much electricity they use as a cost-saving measure.

*“Which of the following statements best describes your current thoughts about electricity conservation?”*

A similar relationship was observed when investigating the effect of parental education on participants’ affect towards electricity conservation (chi-square=36.513, df=15, p<0.001). The

proportion of respondents who “[didn’t] really care” or had “never really thought about it before” decreased as the level of parental education increased as observed in Figure 5.6.

In addition, in line with the literature, the percentage of participants who reported that they were “interested in electricity conservation” increased as parental education increased. Similar to findings from the previous question, it should be noted that of those that reported being “really interested in electricity conservation”, the majority had parents who had completed “some grade or high school”.

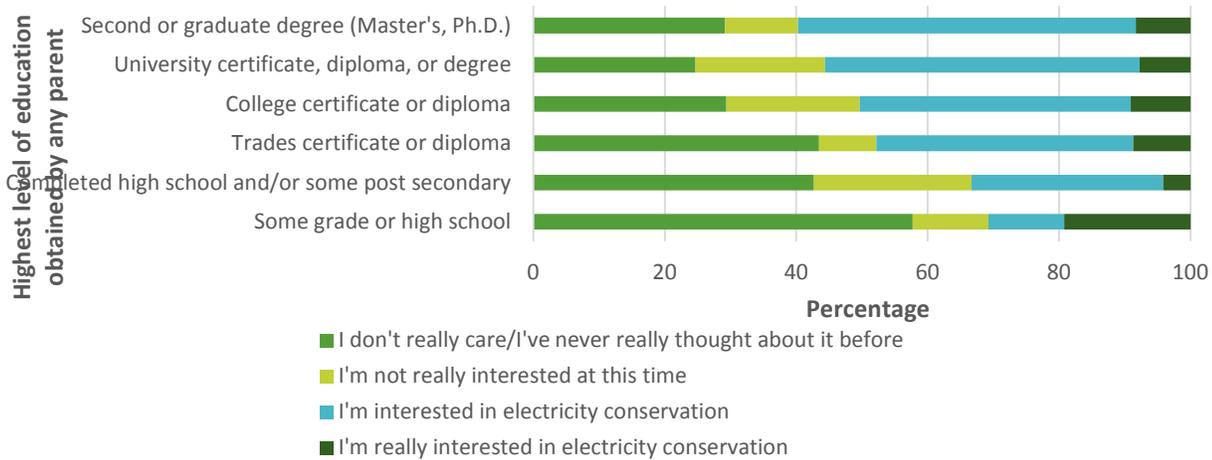


Figure 5.6: Relationship between level of parental education and participants’ current thoughts about electricity conservation

*“Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you?”*

When relating the participants’ conation towards conserving electricity to the level of parental education, a statistically significant relationship was observed (chi-square=27.697, df=15, p<0.05). These findings can be observed in Figure 5.7, where the majority of respondents from almost all parental education levels (with the exception of “some grade or high school) felt that they were doing “something, but could do a lot more”.

In line with findings from previous studies, a general trend was seen where the percentage of participants who reported doing “very little” decreased as the level of parental education increased. However, it should be noted that in contrast to what was expected after reviewing the literature, the

proportion of participants who felt that they were doing “all [they] could possibly do at this point in time” was also seen to decrease as the level of parental education increased.

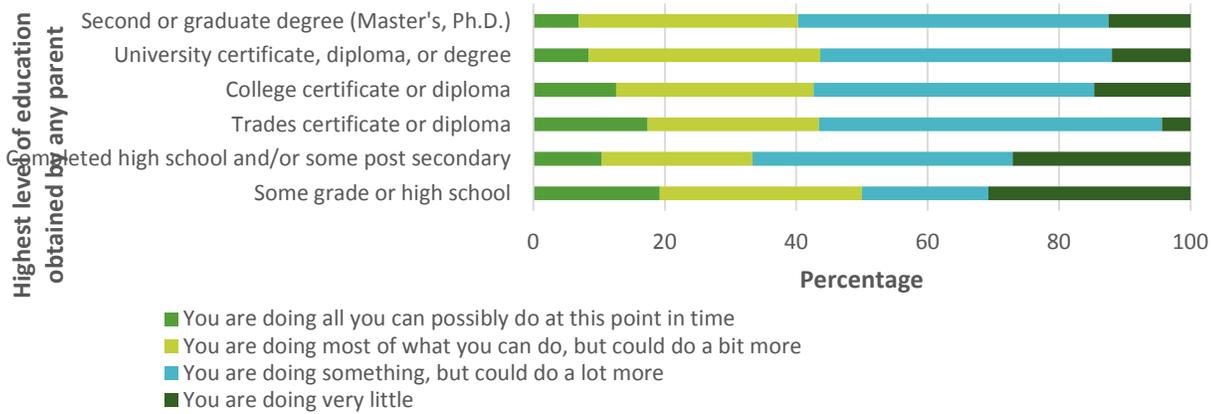


Figure 5.7: Relationship between level of parental education and participants’ behaviours in the past year to conserve electricity

“Thinking about your parents’ efforts to conserve electricity in the past year, which one of the following statements would best apply to them?”

A low level of statistical significance was observed when comparing how participants viewed their parents’ efforts towards electricity conservation and the level of their parents’ education (chi-square=30.031, df=20, p<0.1).

In general, the majority of participants with parents from all levels of education felt they their parents were doing “most of what they can do, but can do a bit more”. Two exceptions are those parents who completed a “trades certificate or diploma” and “some grade or high school”, where over 50% of their children believed that their parents were doing “all they can possibly do at this time”. A detailed breakdown of this relationship is depicted in Figure 5.8.



Figure 5.8: Relationship between level of parental education and participants' thoughts about their parents' efforts towards conserving electricity

Similar statistical tests were performed to determine significant relationships between parental education and other variables such as the most important issue facing Ontario, and participants' thoughts on how to meet Ontario's future electricity demands. No statistically significant findings were observed.

### 5.2.2 School

Numerous studies have explored the relationship between school-based environmental education (EE) programs and the development of pro-environmental attitudes and behaviour. Many findings indicated a positive relationship between participation in an EE program and pro-environmental attitudes and behaviours such as energy conservation (Cornelius et al, 2014).

This study explored the impact of enrollment in a certified Ontario EcoSchool, where students are exposed to curriculum-based integration of pro-environmental values, as well as ecological experiences.

#### *"Is your school a certified Ontario EcoSchool?"*

By corroborating responses using the school name and district responded by each participant's parent, the researcher determined that 30.3% of participants in the 2017 survey were confirmed to be enrolled in a certified EcoSchool. There was a fair distribution observed for the school districts in which

participants were enrolled, however, Toronto District School Board, Peel District School Board, and York Region District School Board had the largest number of participants.

There was a statistically significant discrepancy between the participants’ reporting of being enrolled in an EcoSchool, and whether they were actually enrolled in one (chi-square=12.594, df=1, p<0.01). As seen in Figure 5.9, of the parents with children in confirmed certified EcoSchools, only 28% correctly answered “Yes” to the question “Is your child enrolled in a certified EcoSchool?”. The remaining 72% of parents answered “No” or “I’m not sure”, indicating that they did not know their child’s school was an EcoSchool.

It should be noted that that most adolescent participants were still more knowledgeable about their school’s EcoSchool status, with 70% correctly identifying their school as a certified EcoSchool.

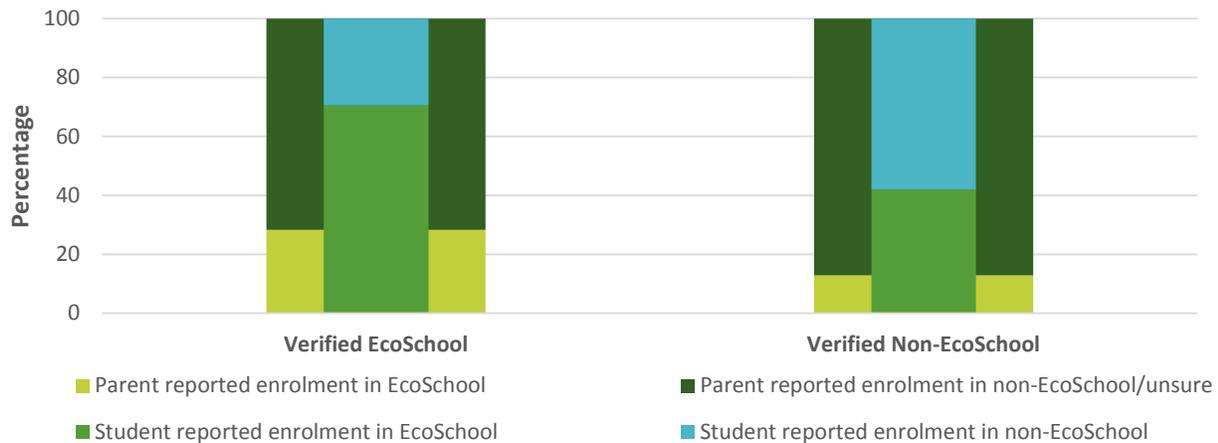


Figure 5.9: Comparing parent and student reports of enrollment vs actual enrollment in an EcoSchool

*“Would you say that your school is generally careful or wasteful users of electricity?”*

Although most students enrolled in both EcoSchools and non-EcoSchools felt that their schools were “somewhat careful” users of electricity, as seen in Figure 5.10, a greater proportion of students at an EcoSchool felt that their school was “very careful”. In addition, the percentage of students who believed that their school was “very wasteful” nearly doubled when comparing EcoSchool vs. non-EcoSchool enrolled participants (chi-square=8.957, df=5, p≤0.1).

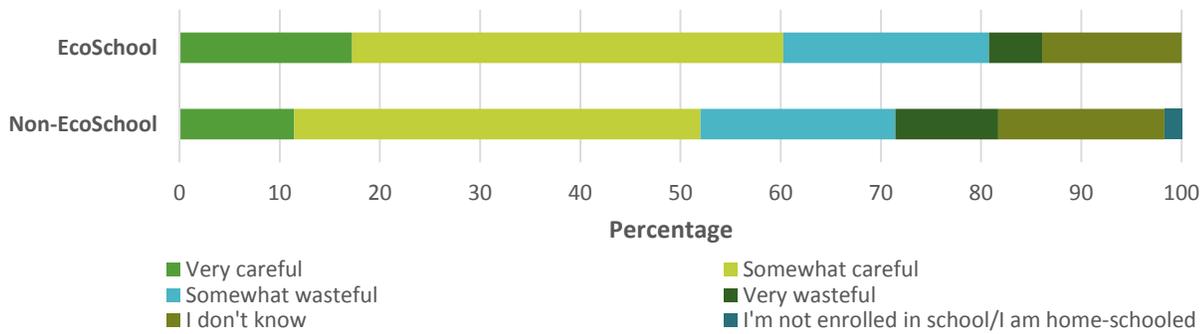


Figure 5.10: Comparing participant perspectives from EcoSchools and non-EcoSchools regarding their school's use of electricity

These findings are in line with a recent study by Enerlife Consulting exploring the energy performance of EcoSchool and non-EcoSchools. The study found that certified schools achieve slightly better energy efficiency than those not participating in the program (2016).

*“Are there any environmental awareness or electricity conservation programs at your school?”*

A low level of statistical significance was observed when comparing participants' schools' EcoSchool status and whether there were environmental awareness or electricity conservation programs at the school (chi-square=3.157, df=1, p<0.1) As exhibited in Figure 5.11, although the majority of both groups of students reported that the programs were present, a larger proportion of non-EcoSchool students reported that these programs were absent. These findings are evidence of the EcoSchool program's focus on student involvement and contribution through initiatives like school clubs and activities.

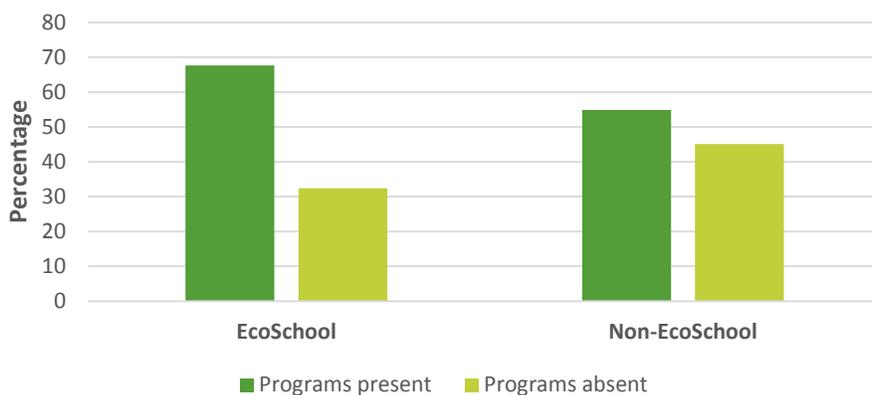


Figure 5.11: Comparing environmental awareness or electricity conservation programs at EcoSchools and non-EcoSchools

*“Have you participated in an energy or electricity conservation activity at school? These include ‘Lights off Lunches’, ‘Sweater Day’, ‘Earth Day’”*

As expected from the results of the previous question, a significantly larger proportion of participants enrolled in an EcoSchool reported having participated in an energy or electricity conservation activity at their school (chi-square=5.072, df=1, p<0.05). 80% of participants enrolled in an EcoSchool reported taking part in conservation activities, in comparison to the 70% from non-EcoSchools.

*“Which one of the following strategies do you think is the best way to promote electricity conservation among consumers?”*

Interestingly, a statistically significantly larger percentage of students from an EcoSchool (an education and awareness program) responded that “education and awareness programs to help people learn what they can do” was the best strategy to promote electricity conservation (chi-square=6.065, df=2, p<0.05). However, overall, as seen in Figure 5.12, the most popular suggestion from both groups of participants was to “introduce financial rewards to encourage conservation actions”.

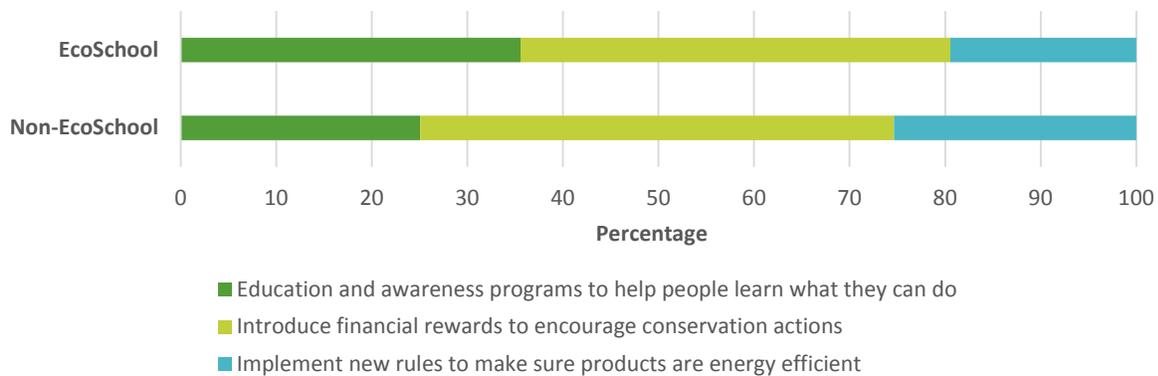


Figure 5.12: Strategies to promote electricity conservation among consumers, as selected by EcoSchool and non-EcoSchool enrolled participants

Additional statistical tests investigating the relationship between participants’ schools’ EcoSchool status, and their attitudes towards electricity conservation revealed further findings: interestingly, no

statistically significant relationship was observed between students enrolled/not enrolled in an EcoSchool and how often they thought about their electricity consumption.

Similar results were observed when considering participants' actions in the past year to conserve electricity (doing "all", "most", "something" or "very little").

In addition, enrollment in an EcoSchool did not have a significant impact on participants' self-efficacy. There was no noteworthy relationship between teenagers' school's EcoSchool status and whether or not they felt that could have an impact on the province's electricity consumption, or that they could influence others to conserve electricity.

### 5.3 Exosystem

#### *Media*

The influence of media on the development of pro-environmental attitudes has been recognized through a number of studies identifying sources such as the internet, newspapers, and television as key tools for the development of these attitudes (Eagles and Demare, 1999; Holbert et al., 2003; Blewitt, 2013; Keinonen et al, 2014). This study found a number of statistically significant relationships between participants who identified media (TV ads, social media, websites, blogs, and/or podcasts) as a source of information for electricity conservation, and their affects and conation towards electricity conservation.

As mentioned earlier, few studies have investigated teenagers' sources of information specifically regarding electricity conservation. Other studies have identified the internet (i.e. Google) as the biggest overall "go-to" for information. Specifically exploring concepts such as "news and current affairs", however, indicated that 35% of teenagers identified news websites as their preferred source for information (FreshMinds, 2017).

*"Do you ever think about how much electricity you use?"*

As seen in Figure 5.13, of the respondents who identified media as a source of information (compared to other sources such as school, parents, or friends), a larger proportion reported that they do, or "sometimes" do, think about how much electricity they use (chi-square=36.121, df=3, p<0.01).



Figure 5.13: How often participant's think about their electricity use, in comparison to their sources of information about electricity consumption

*“Which of the following statements best describes your current thoughts about electricity conservation?”*

A significant relationship was also observed between participants’ affect towards electricity conservation and their sources of information about the topic. Over 60% of participants learning about electricity conservation through media reported that they were either “interested” or “really interested” in electricity conservation. As shown in Figure 5.14, only 36% of participants that identified “other” sources reported feeling the same way (chi-square=46.687, df=4, p<0.01).

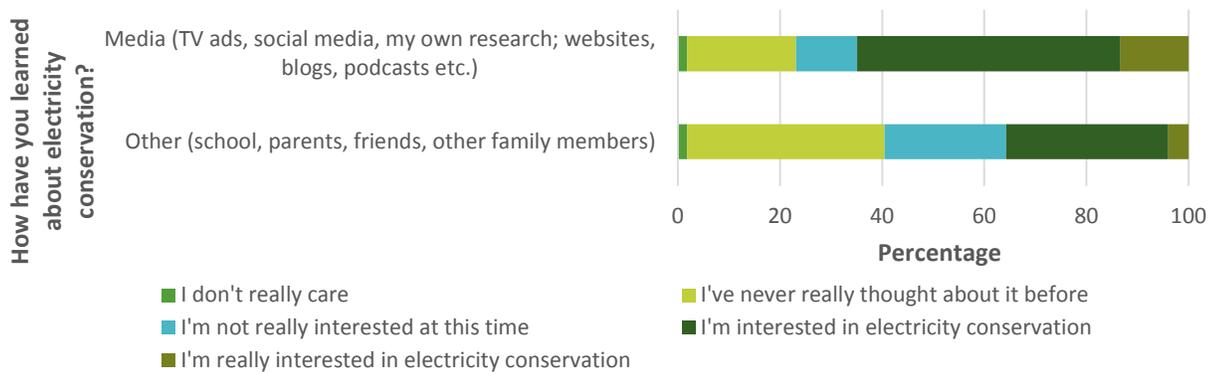


Figure 5.14: Participants’ level of interest in electricity conservation in relation to sources of information about electricity conservation

*“Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you?”*

Similar results were observed as a greater portion of participants who identified media as a source of information felt that they were doing “most” or “all” they could do to conserve electricity. This proportion was overall 20% higher than those that gained information from other sources (chi-square=25.279, df=3, p<0.01). A detailed depiction of these findings can be observed in Figure 5.15.

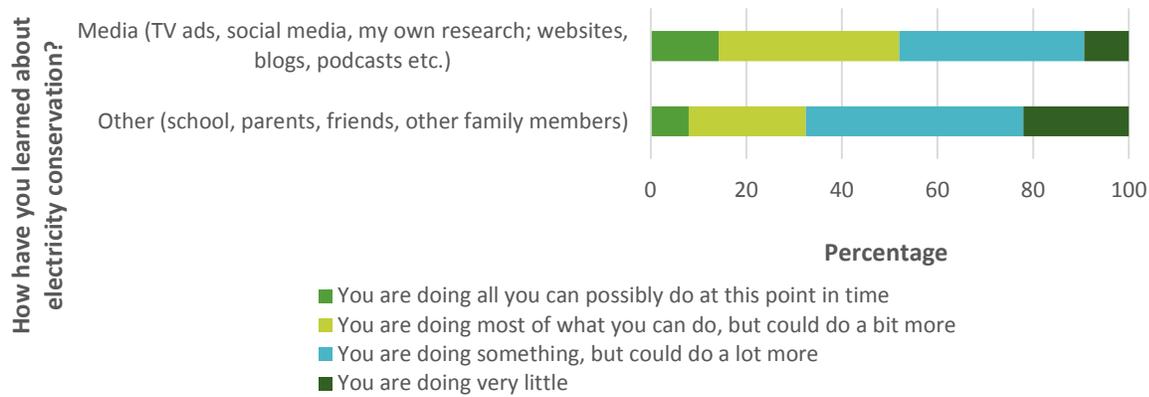


Figure 5.15: Participants' electricity conation towards conservation behaviour in relation to sources of information about electricity conservation

*“Do you think that individuals such as yourself can make an important contribution to the overall reduction of electricity use in the province?”*

Regardless of their source of information about electricity conservation, the vast majority of the participants of this study believed that they could “definitely” or “likely” make an important contribution to the overall reduction of electricity consumption, as seen in Figure 5.16 (chi-square=18.796, df=3, p<0.01). However, it should be noted that a somewhat larger proportion of participants that learned about electricity conservation through media believed that they could “definitely” make an impact on overall electricity use in the province.

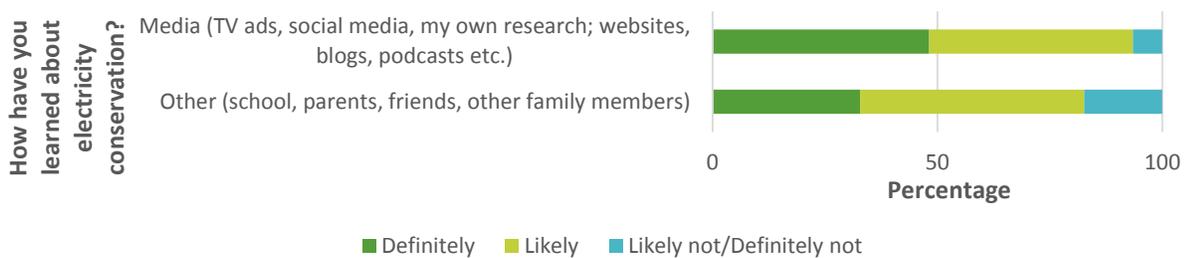


Figure 5.16: Participants' thoughts on whether they can make an important contribution in reducing overall electricity consumption, in comparison to sources of information about electricity conservation

*“Have you ever tried to influence anyone to conserve electricity?”*

An almost equal split was observed in participants who gained electricity conservation information from media, with 49% reporting that they have not tried to influence anyone to conserve electricity, and 51% reporting that they had. As seen in Figure 5.17, the difference between these two options was greater among participants who identified information sources other than media; 22% to 78% (chi-square=41.616, df=1, p<0.01).



*Figure 5.17: Participants’ efforts to convince others to conserve electricity, in relation to sources of information about electricity conservation*

Similar statistical tests comparing participants who identified media as opposed to other sources of information about electricity conservation revealed insightful findings. There was no significant relationship between sources of information and the motivations and barriers to electricity conservation behaviours.

In addition, when asked about their opinion on the use of technology (“a lot of our environmental problems are because of our over-use of technology” or “new technologies will allow us to reduce the environmental damage we do to the planet”), there was also no significant variance between those using media versus learning from other sources of information.

## 5.4 Macrosystem

### *Culture*

Of the factors influencing adolescent attitudes examined in this study, culture remains one of the broadest concepts in not only scope (global, social, popular, etc.), but also in its different connotations.

While some studies have examined the relationship between culture and pro-environmental attitudes of adults (Laroche et al, 1996), even fewer have studied the adolescent aspect of this notion.

The expansive nature of the concept of culture made it difficult for this study to gather sufficient data to analyze the influence of culture on adolescent attitudes towards electricity conservation.

## 5.5 Conclusions

Overall, although some significant relationships between 2017 teenagers' attitudes towards electricity conservation and their age or gender were observed, the level of parental education and sources of information were seen to have the most statistically significance influences. Teenagers of parents at either ends of the spectrum for levels of education (highest: second or graduate degree, lowest: some grade or high school) were seen to display higher levels of affectation and conation towards electricity conservation.

The enrolment in a certified EcoSchool did impact the adolescents' behaviour and perception of their school, with a greater number of EcoSchool teenagers feeling that their school were "careful users of electricity". While these students may have appreciated educational programs to promote electricity conservation, there were few other influences observed.

As high and grade school classes were in the top 3 sources for information about electricity conservation, it is possible that a greater influence may be from other school experiences, in science classes for example, rather than the EcoSchool program. As such, these findings indicate school remains an important influencer of these attitudes, whether EcoSchool certified or not.

In addition, although the overall number of teenagers identifying media as a source of information about electricity conservation was seen to decrease in 2017, those that reported so were observed to also be more interested in, and conatively more engaged with, electricity conservation.

The identification of the significant influences of factors such as parental education and sources of information, such as media and school, provide valuable insight into how best to promote electricity conservation behaviour in this population.

## 6.0 Analysis of Attitudes in 2017 Study

This section consists of the third stage of data analysis, and aims to achieve this study's third research objective:

- iii. To understand the relationship between affect, conation and cognition in creating an overall attitude about electricity conservation

Having investigated the influences on the development of attitudes, according to Bronfenbrenner's Ecological Systems Model, it is valuable to deconstruct these attitudes to better understand them. In order to do so, this study proposed an "ACC" model of attitudes framework, depicted in Figure 2.1, to investigate the relationships between an adolescent's affect, conation, and cognition towards electricity conservation.

### 6.1 Affect and Conation

As observed in this study's literature review, many studies have explored the relationship between overall environmental attitudes and behaviour, without differentiating between an individual's *affect*, *conation*, *cognition*, and attitude overall (Hines et al, 1987; Eckes and Six, 1994; Chan, 1996; Kaiser et al, 1999). To address this gap in the literature, this section investigates the relationship between the *affects* and *conation* of teenagers towards electricity conservation.

A significant, positive, correlation was observed between 2017 adolescents' feelings towards electricity conservation, and how they described their *conation* regarding this topic. As shown in Figure 6.1, as teenagers' level of interest increased (from "I don't really care" to "I'm really interested in electricity conservation"), it was observed that their level of action was also seen to increase (from "doing very little" to "doing all [they] could possible do"),  $r=0.39$ ,  $p<0.01$ .

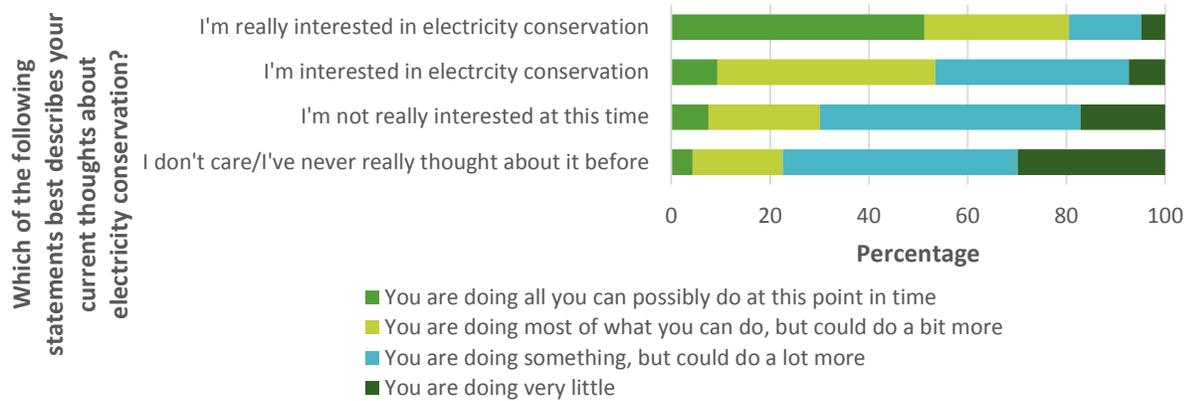


Figure 6.1: Comparing 2017 teenagers' affect and conation towards electricity conservation

Similar findings were observed when investigating if there was a correlation between teenagers' level of interest and whether they had tried to influence anyone to conserve electricity. Participants reporting higher levels of interest tended to also report having tried to influence others,  $r=0.39$ ,  $p<0.01$ .

Similar statistical tests comparing teenager's *affect* and *conation* regarding electricity conservation, such as whether they participated in energy conservation activities, revealed no other significant relationships.

These findings from this study corroborate those found in the literature regarding the relationship between environmental attitude and behaviour of adults; an average correspondence of 0.39 is only slightly higher than that reported by Hines et al. However, it should be noted that this correspondence is lower than what was established when investigating secondary students' attitudes and *conation* towards pro-environmental behaviour (Chan, 1996).

Nevertheless, the statistically significant correlations observed indicate that teenagers' *affect* have a positive effect on their *conation* towards electricity conservation.

## 6.2 Affect and Cognition

Previous studies have acknowledged a weak correlation between environmental attitudes and the level of environmental knowledge (Arcury, 1990; Schahn and Holzer, 1990; Meinhold and Malkus, 2005).

Findings from this study are in line with the literature; a low level of correlation was observed between adolescents' *affect* towards electricity conservation (from "I don't really care" to "I'm really interested in electricity conservation") and whether they believed the province had enough electrical power to meet its needs over the next decade. Similar observations were made when comparing participants' *affect* and their concern about sustainability issues (climate change, water/air pollution, among others), and strategies to meet Ontario's future electricity demands (developing renewable resources, changing consumer lifestyles, among others).

In view of this, however, it is acknowledged that this study did not comprehensively investigate participants' level of knowledge regarding electricity conservation, and so the observed low levels of correlation between participant *affect* and *cognition* may do due to a lack of appropriate information.

Of note, however is the strong positive correlation was observed when comparing adolescents' *affect* towards electricity conservation and how often they thought about how much electricity they consumed (ranging from "a lot" to "never"),  $r=0.42$ ,  $p<0.01$ . As seen in Figure 6.2, teenagers expressing more interest in electricity conservation (i.e. "I'm really interested...") tended to also report thinking more frequently about their electricity consumption.

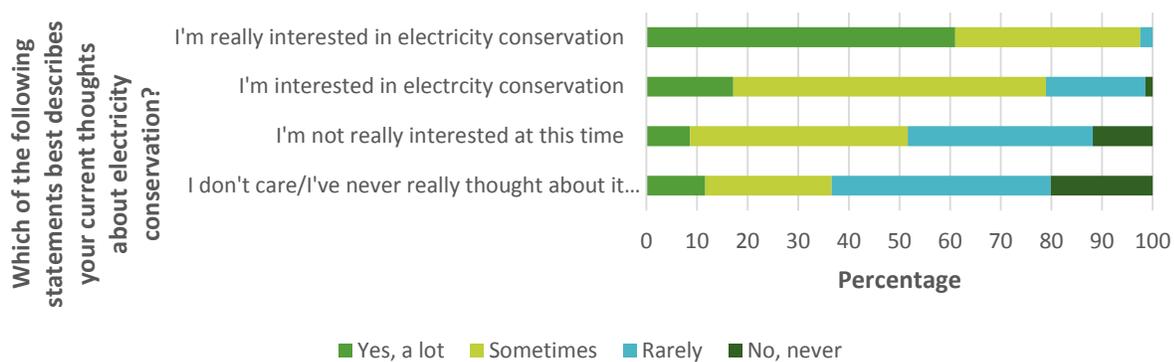


Figure 6.2: Comparing 2017 teenagers' affect towards electricity conservation and how often they think about their electricity consumption

These findings indicate a strong correlation between teenagers' conscientiousness of their electricity consumption and their *affect* towards electricity conservation. However, as this conscientiousness is not necessarily connected with the level of knowledge regarding electricity conservation, these

findings cannot establish a strong correlation between teenagers' *affect* and *cognition* of electricity conservation.

### 6.3 Cognition and Conation

There has been debate in the literature investigating the relationship between the level of environmental knowledge and pro-environmental behaviour. Although some researchers have maintained that environmental knowledge is a strong determinant of environmentally responsible behaviour (Kaiser, Fuhrer, 2003; Kennedy et al, 2009; Mobley et al, 2010), most studies have found that environmental knowledge is one of many other influencing factors, some of which produce a higher level of correlation (Hines et al., 1987; Fliegenschnee and Schelakovsky, 1998; Kollmuss and Agyeman, 2002; Oguz, 2010, Vicente-Molina et al, 2013).

Findings from this study were closely related to the latter, where no statistically significant correlations were observed when comparing adolescents' knowledge about how to meet Ontario's electricity needs, and their level of conservation behaviour. Similar observations were found when comparing teenagers' conservation *conation* and whether they believed Ontario had enough electrical power to meet its needs for the next decade.

As discussed in section 6.2, it is possible that the observed low levels of correlation between participant *conation* and *cognition* may do due to this study not extensively investigating participants' level of knowledge regarding electricity conservation.

Interestingly, however, a strong correlation was observed when comparing adolescents' level of conservation behaviour ("doing very little" to "doing all [they] could possible do") and how often they thought about how much electricity they consumed (ranging from "a lot" to "never"),  $r=0.48$ ,  $p<0.01$ . As demonstrated in Figure 6.3, teenagers reporting "doing" more to conserve electricity, were inclined to also report thinking more about their electricity consumption.

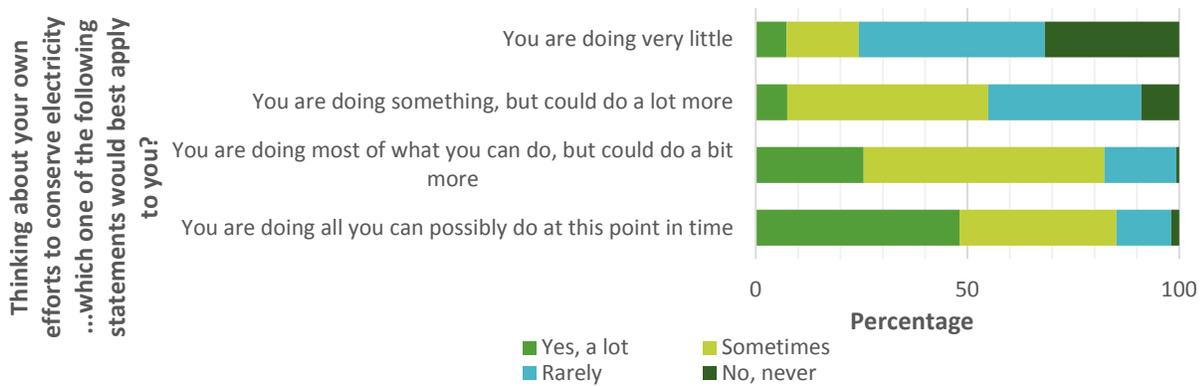


Figure 6.3: Comparing 2017 teenagers' conation towards electricity conservation and how often they think about their electricity consumption

These findings indicate a strong correlation between teenagers' awareness of their electricity consumption, in conjunction with their conservation behaviour, similar to observations discussed in section 6.2. However, as this conscientiousness is not connected with the level of knowledge regarding electricity conservation, these findings cannot establish a strong correlation between teenagers' *conation* and *cognition* of electricity conservation.

#### 6.4 Conclusions

The breakdown of adolescents' attitudes into the elements of *affect*, *cognition*, and *conation* has allowed for a better understanding of teenagers' overall attitudes towards electricity conservation. A moderate correlation was observed between their *affect* and *conation* towards this issue, however little no significant correlations were observed between their *cognition* of electricity conservation, and their *affects* and/or *conations* towards it.

A significant positive correlation was observed between adolescents' conscientiousness of their electricity consumption, and their level interest in electricity conservation. A similar correlation was observed between teenagers' awareness of their electricity consumption, and their level of involvement in conservation behaviours.

## 7.0 Conclusions

This chapter concludes this thesis by providing a summary of key findings from the three phases of data analysis. Implications for future initiatives and research for the promotion of electricity conservation among adolescents are also outlined in this chapter.

### Key findings addressing research objectives

*i. To assess the changes, if any, in adolescent attitudes about electricity conservation that have taken place in the past decade*

This study provided valuable insight into the changes over the past decade of teenagers' attitudes regarding electricity conservation. The number of teenagers interested in electricity conservation has decreased, with more teenagers reporting that they have "never really thought about [electricity conservation] before".

Nevertheless, consistent with findings in 2007, most adolescents in 2017 believed that they were "doing something [for electricity conservation], but could do a lot more". The motivations of these teens that reported taking action to conserve electricity remained largely the same between the two studies, with many participants wanting to mitigate electricity-related environmental effects, and wanting to contribute to a better future. Since climate change was still identified as the most pressing issue facing Ontario, this may indicate that the adolescents undertaking conservation behaviours have made the connection between electricity consumption and climate change.

Conversely, 2007 teens reporting limited action to conserve electricity reported different motives than 2017 teens. Adolescents in 2007 had reported being too lazy or not having enough time to make an effort to conserve electricity, whereas in 2017, the main reasons included a lack of information, or not feeling that there was a reason to change.

This discrepancy indicates that adolescents in 2007 had the information about and/or understood the relevance of conserving electricity, although they did not act on it. Whereas adolescents in 2017 did not have the same level of knowledge, and/or did not see the significance of conserving electricity. These findings are evidence of a decrease in awareness of the connection between electricity consumption the environmental issues such as climate change that adolescents report being concerned about.

The percentage of teenagers concerned about climate change decreased by almost half from 2007 to 2017, to 16%, with social issues such as poverty/homelessness and unemployment/jobs following close behind at 12.8% and 12.4% respectively. This is a change from 2007 where 2 out of the top 3 concerns were environmental issues (global warming and pollution). These findings are consistent with recent studies exploring Canadians' opinion on climate change. The proportion of the public "extremely concerned" about climate change was seen to decrease by 19%, whereas those "not very/not concerned at all" increased by 9% (Environics, 2015).

The increased prevalence of teen's concerns about social issues indicate that adolescents in 2017 regard issues of climate change, poverty, and unemployment with similar levels of concern.

This trend of decreasing concern regarding electricity conservation was observed again when fewer teenagers in 2017 reported thinking "a lot" about their electricity use, and a greater number reporting that they "rarely" thought about it at all. These findings were accompanied by observations that teenagers in 2017 were overall less knowledgeable about Ontario's sources of electricity.

The shift in adolescent attitudes toward the conservation of electricity indicates an overall decrease in the level of interest and engagement. However, it is important to note that this disconnect is likely not due to a lack of concern, but rather a lack of understanding between electricity consumption and the issues adolescents report being concerned with (i.e. climate change and creating a sustainable future).

*ii. To evaluate the relationship between current attitudes about electricity conservation, and factors such as demographics, parents, enrolment in a certified EcoSchool, media, and culture*

The use of Bronfenbrenner's Ecological Systems Model in the study's proposed framework provided this study with increased measurement validity when evaluating factors influencing teenagers' attitudes. As per the framework, this study investigated the relationship between factors such as age, gender, parental education, media, and teenagers' attitudes about electricity conservation.

While some statistical relationships were observed between gender and participant attitudes towards the future of Ontario's electrical power, a greater number of female teenagers reported that they had tried to influence someone else to adopt electricity conservation behaviours, few others were established between age and electricity conservation attitudes.

This is an important contribution to the literature surrounding age and energy conservation in teens, as most existing studies do not provide age-dependent findings, often choosing instead to aggregate participant ages to mean ages (Worsley and Skrzypiec, 1998; Wray-Lake et al, 2010; de Vries and Knol, 2011; Toth et al, 2013; Cornelius et al, 2014). Additionally, the limited gender-related influences found in this study are in line with recent findings which dispute earlier studies which claim significant differences between genders when considering energy conservation attitudes (Boueve-de Pauw et al, 2014). This study's findings address the gap in the literature around age-dependent pro-conservation attitudes, and confirm the findings of recent gender-focused studies. The findings suggest that developing age- or gender-differentiated energy conservation campaigns may not be as productive as other strategies.

Interesting relationships were observed between 2017 teenagers' attitudes about electricity conservation and level of parental education. As the level of parental education increased, the proportion of participants who "never" thought about how much electricity they used decreased. This was consistent with the literature identifying a positive correlation between parental education and the level of environmental concern in their children (Boeve-de Pauw, 2011; Meeusen, 2014). However, it was observed that a large percentage of adolescents with parents with "some grade or high school" education reported thinking "a lot" about the amount of electricity they use. Education/income information from census data may indicate that this may be as a cost-savings measure, in response to a lower income than those with parents with a higher level of education (StatCan, 2009).

Similar findings were observed when 2017 participants described their current thoughts about electricity conservation. Although the number of teenagers uninterested in electricity conservation increased as the level of parental education decreased, there was once again, a significant proportion of adolescents with parents who had completed "some grade or high school" that reported that they were "really interested in electricity conservation". These findings identify the significant influences of parental education, and correspondingly, level of income, and provide valuable insight for differentiating conservation campaigns according to this variable.

30% of teenagers from the 2017 study were confirmed to be enrolled in certified Ontario EcoSchools. Interestingly, when parents of these teenagers were asked about the EcoSchool status of their child's school, only 28% were able to answer correctly. The teenagers themselves fared a bit better, with just over 70% correctly identifying their school as a certified EcoSchool. As such, greater communication is

required between schools and parents about the environmental initiatives in which the students are participating.

More participants from EcoSchools felt that education and awareness programs would help to promote electricity conservation among consumers, when compared to their non-EcoSchool counterparts. This may indicate that these teenagers see value in environmental education programs, such as the EcoSchool program at their school.

Interestingly, no significant influences of their school's EcoSchool status were observed on how often the teenagers thought about their electricity use, their electricity conservation efforts over the past year, whether or not they felt that could have an impact on the province's electricity consumption, or if they could influence others to conserve electricity. Since very few studies have investigated the impact of the EcoSchool's program specifically, many others have established the influence of other in-school EE programs on developing pro-conservation attitude and behaviours (Tung et al, 2002; Cornelius et al, 2014; Uitto et al, 2015), this study addresses this gap in the literature. The findings indicate that, as high and grade school classes were the 2<sup>nd</sup> and 3<sup>rd</sup> most frequently reported source of information about electricity conservation, teens' in-school experiences remain an important influencer of these attitudes, whether EcoSchool certified or not.

There was a significant decrease from the 2007 study in the proportion of teenagers who identified media (TV ads, social media, websites, blogs, and podcasts) as a source of information about electricity conservation. This is in line with findings from a teen survey reporting that only 35% of teenagers used media for information about "news and current affairs" (FreshMinds, 2017).

However, the 2017 teens who did report using this source were observed to be statistically more engaged with electricity conservation. They reported thinking about their electricity use more often than those that reported other sources of information (school, parents, other family members, or friends), as well as being more interested in, and engaging in more behaviours towards, electricity conservation. A greater proportion of these teenagers also felt that they could make an important contribution to reducing province-wide electricity use, and had previously tried to influence others to conserve electricity. The findings from this study corroborate those found in the literature, confirming the use of media as a key tool for reinforcing environmental attitudes and awareness (Eagles and Demare, 1999; Holbert et al., 2003; Blewitt, 2013). This strong relationship between media and overall

attitudes towards electricity conservation warrants a continued, or increased, use of this medium to encourage pro-conservation attitudes and behaviours among this demographic.

*iii. To understand the relationship between affect, conation and cognition in creating an overall attitude about electricity conservation*

Numerous studies have explored the relationship between overall environmental attitudes and behaviour without differentiating between an individual's *affect*, *conation*, *cognition*, and attitude overall, preferring instead to include these elements within their definition of overall attitude. As such, this study addressed this gap in the literature by making this distinction in the data analysis.

A significant, positive, correlation was observed between 2017 adolescents' *affect* towards electricity conservation, and how they described their *conation* regarding this topic. As their level of interest increased (from "I don't really care" to "I'm really interested in electricity conservation"), it was observed that their level of action was also seen to increase (from "doing very little" to "doing all [they] could possible do"). These findings are consistent with the strong correlation observed between secondary students' *affect* and *conation* towards pro-environmental behaviour (Chan, 1996).

Strong positive correlations were also observed between teenagers' awareness of their electricity consumption, and their level of interest in the issue, as well as their adoption of conservation behaviours.

Weaker correlations were observed between teenagers' *cognition* and *conation*, and *cognition* and *affect*. A review of the literature revealed that correlations between environmental attitudes and behaviour are typically weak, and thus findings from this study are in line with the established literature (Arcury, 1990; Schahn and Holzer, 1990; Meinhold and Malkus, 2005). However, it is acknowledged that this study did not extensively explore participants' level of knowledge regarding electricity conservation, and this may have contributed to the low levels of correlation.

The findings from this research do not conclusively rule out the significance of the *cognitive* element of attitudes, but do indicate that developing *affects* and *conations* could contribute to greater overall pro-conservation attitudes within this demographic.

## Implications for future initiatives and research

### *Future Electricity Conservation Initiatives*

Through this study, an appreciation can be gained of the changes in adolescents' attitudes towards electricity conservation, as well as the influences on the development of these perspectives. This understanding can be used to produce efforts based on empirical evidence to help promote these pro-conservation attitudes.

As issues such as climate change were seen to share the spotlight with social and economic concerns, it may be of value to use initiatives and programs to establish connections between these issues. An understanding of the interconnectedness of these concerns may serve to increase awareness and promote attitudes in this demographic to mitigate climate change overall.

The identifying of parents as the main sources of information about electricity conservation recognizes them as a valuable resource for promoting electricity-conservation behaviours among adolescents. Although this study was aimed at understanding adolescents' attitudes towards electricity conservation, the findings indicate that initiatives aimed at promoting these values in adults can have a positive impact on this demographic as well.

In addition, although the use of media to learn about electricity conservation has decreased, the impact this resource has on teenagers was evident in this study. As such, it would be of value to create campaigns using these platforms to promote the conservation of electricity, as well as other pro-environmental attitudes and behaviours.

The establishment of the strong correlation between adolescents' *affect* and *conation* indicate that developing initiatives promoting these elements of attitudes could have a positive impact on overall attitudes towards electricity conservation. An approach appealing to teenagers' sense of competition may achieve these results. This strategy can take place through the use of media or other technologies in a community or school environment where teenagers are able to compare their own electricity use to those around them. Encouraging the reduction of electricity consumption through friendly competition could lead to greater pro-conservation *affects* and *conations* among this demographic.

Enrolment in a certified EcoSchool was also observed to have some effect on overall attitudes towards electricity conservation. As such, encouraging more schools to achieve certification could contribute to more pro-conservation attitudes and behaviour among teenagers.

However, the prevalence of school as a source of information about this topic indicates that a more extensive use of this resource may be one of the best methods to achieve pro-conservation attitudes among this demographic. As such, it is recommended that the province look to integrate environmental and sustainability values across the curriculum, rather than limiting these to science or geography classes. Doing so would involve a re-evaluation of the province's current educational curriculum to find ways to integrate these principles.

#### *Future Electricity Conservation Research*

A few aspects of Bronfenbrenner's Ecological Systems Model could not be investigated, due to the scope of this study. It would be of value to pursue further research into the *Mesosystem*, identified in the model as the interactions between systems, such as the relationship between parents and mass media. In addition, exploring the influences of other factors identified in the model, not investigated in this study, such as cultural norms, local politics, and peers, would add to the findings from this research to create a more complete understanding of the influences on adolescents' attitudes towards electricity conservation.

In addition, it is recommended that further inquiry be completed into the components of the proposed ACC model of attitudes. Specifically, the relationship between the level of knowledge of electricity conservation and the tendency of adolescents to undertake conservation behaviours. Such an investigation would provide a better understanding of the connection between *cognition* and *conation* and *affection* towards electricity conservation.

To bolster the external validity of the findings in this study, further investigations should be conducted to explore the effects of other EE programs, as well as teenagers' attitudes from different provinces or countries. Using a mixed methods approach similar to the 2007 iteration of this study may also reinforce the validity of these studies findings. The use of focus groups, along with physical and online surveys would provide a more comprehensive understanding of this populations attitudes towards electricity conservation.

In addition, conducting a study similar to this thesis to explore electricity conservation attitudes of young adults (aged 18-25 years old) is also recommended. Doing so would provide a truly complete understanding of the perspectives of the energy consumers of tomorrow.

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## Appendix 1: 2007 Survey

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### 2007 Ontario Teen Survey

#### FINAL Online Questionnaire

May 10, 2007

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We want to hear from you! We are conducting research with youth and young adults across the province on a range of issues, including your thoughts on what's going on in the world, environmental and energy issues, and advertising. We appreciate your participation!

Also, FYI, we often use the word "parents" throughout this questionnaire, but we want you to know that we intend this word to mean "parents", "parent", or "guardian(s)", depending on whatever is appropriate for you.

Thank you!

Before we get started, a couple of questions to find out what types of people participating:

1. Gender.

Female

Male

2. In what year were you born?

\_\_\_\_\_

#### A. The Issues Today

We want your opinion on some of the BIG issues affecting society today.

3. In your opinion, what would you consider to be the most important issue facing Ontario today? **Check only one.**

(Randomize)

Pollution

Global warming/climate change

Electricity environmental issues

Electricity supply/reliability

Electricity costs/prices

Nuclear power

Cost of gas/fuel/heating costs

Health care

War in the middle east

Unemployment/jobs

Education issues

Poor government/leadership

Crime/law and order

Poverty/homelessness

- Other (Please specify \_\_\_\_\_)
- Don't know/None

4. Now, focusing specifically on **environmental issues**, please **rank ALL** of the following based on how much you are concerned about each one, **with 1 being the issue you are most concerned about and 5 being the issue you are least concerned about.**

(Randomize)

- \_\_\_ Climate change
- \_\_\_ Water pollution
- \_\_\_ Smog/air pollution
- \_\_\_ Natural resource depletion
- \_\_\_ Electricity shortages/blackouts and brownouts

5. From what you know or have heard, do you think the province has enough electrical power to meet its needs over the next 10 years? **Check only one.**

- Yes, I think it has more than enough
- Yes, I think it has as much as needed
- No, I think it has less than needed
- I don't know

6. How much does each of the following sources of electricity currently produce in Ontario? Choose one for each **Choose one for each source**

(Randomize)

Electricity source	Major source of electricity	Medium source of electricity	Small source of electricity	No electricity from this source produced in Ontario
Coal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hydro/water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Natural gas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nuclear	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Solar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wind	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Who do you think has to be a part of the solution to address these environmental issues? **Rank ALL of the following choices from 1 (most necessary to be a part of the solution) to 5 (least necessary). Use each number only once.**

- \_\_\_ Business/corporations
- \_\_\_ Governments
- \_\_\_ My grandparents' generation
- \_\_\_ My parents' generation
- \_\_\_ My generation

8. Which one of the following do you think is the **best** way to meet Ontario's electricity needs over the next decade? **Check only one.**

- Develop new renewable sources, such as solar and wind power
- Further develop existing sources, such as nuclear, gas and hydroelectric power
- Change buildings and appliance standards to make them more energy-efficient
- Change consumer behaviour and lifestyles to reduce overall demand for electricity
- Other (Please specify \_\_\_\_\_)

### B.You've Got the Power

These questions are intended to get your opinion on how electricity plays a part in your everyday life.

9. Do you ever think about how much electricity you use? And please be brutally honest...!

- Yes, a lot
- Sometimes
- Rarely
- No, never

10. On average, what activity would you say uses the most electricity in your typical daily routine? **Name one thing.**

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11. Please check the following items that you use on regular basis. **Check all that apply.**

- |  |  |
|--|--|
| <input type="checkbox"/> iPod/MP3 player | <input type="checkbox"/> Digital video recorder (DVR)  |
| <input type="checkbox"/> Cell phone      | <input type="checkbox"/> Electronic music equipment (guitar, keyboard, mixing equipment, etc.) |
| <input type="checkbox"/> Digital camera  | <input type="checkbox"/> DVD   |
| <input type="checkbox"/> Video games     | <input type="checkbox"/> Hair dryer  |
| <input type="checkbox"/> Stereo          | <input type="checkbox"/> Straightening/curling iron  |
| <input type="checkbox"/> Computer        |  |

### C.Conservation

**You've got a lot going on in life: school, friends, parents, sometimes jobs. On top of that, advertisers are constantly trying to sell you their stuff, and other organizations are constantly trying to get their messages to "the youth" to try to get you on board to make the world a better place. Given that you're being hit**

from all angles, we want to know if the specific topic of electricity conservation has any place in it all. The following questions are intended to get your brutally honest opinion on the topic – there are no right or wrong answers!

12. When you think of electricity conservation, what is the first thing that comes to your mind?

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13. Which of the following statements best describes your current thoughts about electricity conservation?  
**Check only one.**

- I don't really care
- I've never really thought about it before
- I'm not really interested at this time
- I'm interested in electricity conservation
- I'm very interested in electricity conservation

14. a. Thinking about your own efforts to conserve electricity in your daily routine **in the past year**, which one of the following statements would best apply to you? **Check only one.**

- You are doing all you can possibly do at this point in time
- You are doing most of what you can do, but could do a bit more
- You are doing something, but could do a lot more
- You are doing very little

**If could “do a lot more”, or “doing very little”, ask 12b:**

14 b. what do you think is the main reason why you haven't done more to reduce electricity use over the past year? **Rank your top THREE reasons, with 1 being the strongest. Choose only THREE and use each number only once.**

(Randomize)

- |   |   |
|---|---|
| ___ Lack of time/too busy                     | ___ My actions will not make a difference |
| ___ Lack of information/don't know what to do | ___ Too lazy                              |
| ___ Have not thought about it                 | ___ Already energy efficient              |
| ___ Inconvenient                              | ___ No need to make change                |
| ___ Not worth the effort                      |   |
| ___ Other (Please specify _____)              |   |

**If “all you possibly can” or “most of what you can do”, ask 12c:**

14c. what would you say are your **main motivations** for trying to conserve? **Rank your top THREE motivations, with 1 being the strongest. Choose only THREE and use each number only once.**

(Randomize)

- \_\_\_ It stops my parents from nagging me about wasting money
- \_\_\_ I want to do my part to reduce electricity-related emissions that cause smog and local air pollution

- I just think it's wrong to use electricity if you don't have to
- I want to do my part to try to avoid another blackout
- I want to do my part to reduce electricity-related emissions that lead to the greenhouse effect and climate change
- I conserve to make a point to my parents (who are pretty bad at conserving!)
- I think it's cool to care about things like conservation
- It's just part of what we have to do for a better tomorrow
- Other (please specify \_\_\_\_\_)

15. Name **THREE things** that you think teens like you would and could **realistically** do to try to conserve electricity.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

16. What steps, if any, have you personally taken **in the past year** to reduce the consumption of electricity in your home? **Check all that apply.**

(Randomize)

- Turn off lights when not in use
- Turn off power to electronics (TV/computers) when not in use
- Turn down thermostat in winter
- Turn up thermostat in summer/reduce use of air conditioning
- Reduce use of clothes dryer/hang clothes to dry
- Run appliances during off-peak hours (i.e. evenings and weekends when electricity demand isn't as high)
- Run dishwasher only when full
- Use microwave instead of oven where possible
- Be more conscious of using electricity
- Wash clothes in cold water
- Encourage parents to conserve
- Other (please specify \_\_\_\_\_)

17. Do you think that individuals such as yourself can make an important contribution to the overall reduction of electricity use in the province? **Check only one.**

- Definitely
- Likely
- Likely not
- Definitely not
- I don't know

18. In a typical household, which group do you think generally uses the **most** electricity? **Check only one.**

- Grandparents
- Parents

- Teenagers
- Children (ages 8-12)
- Young children (ages 0-7)

19. Please **check** the groups that make up your household, **not including you**. **Check all that apply.**

Grandparent(s)	Parent(s)	Sibling(s) (13-18)	Sibling(s) (8-12)	Sibling(s) (0-7)
<input type="checkbox"/>				

20. Have you heard of any of the following programs or services to help Ontario consumers reduce electricity use in the home? **Check all you have heard of.**

(Randomize)

- PowerWise
- Every Kilowatt Counts
- Energy Star
- Energuide
- Flick off
- Power Smart
- Local utility program (Please specify \_\_\_\_\_)
- Peak Saver
- Lose it, Use it
- Summer Savings
- Obviously.ca
- Program to retire old beer fridges
- Energy rebates
- Other (Please specify \_\_\_\_\_)

21. Where is it that you've learned about electricity conservation? **Check all that apply.**

- High school classes
- Grade school classes
- School clubs
- Parents
- Other family members
- Friends
- TV ads
- My own research through web sites, magazines, etc.
- I haven't learned about it

22. a. Thinking about **your parents'** efforts to conserve electricity **in the past year**, which one of the following statements would best apply to them? **Check only one.**

- Your parents are doing all they can possibly do at this point in time
- Your parents are doing most of what they can do, but could do a bit more
- Your parents are doing something, but could do a lot more
- Your parents are doing very little
- I don't know

If “do a lot more”, or “doing very little”,ask 20b:

22 b. what do you think is the main reason they haven’t done more to reduce electricity use over the past year? **Rank your top THREE reasons, with 1 being the strongest. Choose only THREE and use each number only once.**

(Randomize)

- Lack of time/too busy
- Lack of information/don’t know what to do
- Have not thought about it
- Too expensive/cannot afford
- Inconvenient
- Not worth the effort
- Their actions will not make a difference
- Too lazy
- Do not own home/renter
- Cannot make changes to home
- Already energy efficient
- Too old/retired
- No need to make change
- Won’t save any money
- I don’t know

\_\_\_ Other (Please specify \_\_\_\_\_)

23. Have you ever tried to influence anyone to conserve electricity?

- Yes
- No

If yes, please specify **who** and **how** you tried to influence them

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

24. Do you think you could have any influence over your friends with regard to encouraging electricity conservation?

- Yes, a significant influence
- Yes, some influence
- No influence

25. Choose the degree of influence you think you could potentially have on **anyone in your family** to do the following:

Measure	Significant Influence	Some Influence	No Influence
Turn off the TV or stereo when they are done with it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Turn the computer off when they are done with it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buy new energy efficient appliances	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Turn off the lights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Listen to you talk about the environmental impact of electricity use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buy energy efficient compact fluorescent light bulbs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Turn off the car when idling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adjust the thermostat to save energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**D.The Players**

These questions are intended to find out your opinion on the role that different groups in society play with regard to electricity conservation.

26. a. In your view, how careful or wasteful are Ontario **consumers** with regard to electricity consumption? **Check only one.**

- Very careful
- Somewhat careful
- Somewhat wasteful

- Very wasteful
- I don't know

**If “somewhat wasteful” or “very wasteful”,ask 24b:**

24 b. what would you say is the main reason or reasons why Ontario consumers are wasteful users of electricity?

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27. What about Ontario **businesses and corporations**, how careful are they with regard to electricity consumption? **Check only one.**

- Very careful
- Somewhat careful
- Somewhat wasteful
- Very wasteful
- I don't know

28. What about your school, would you say they are generally careful or wasteful users of electricity?

- Very careful
- Somewhat careful
- Somewhat wasteful
- Very wasteful
- I don't know
- I'm not in school
- I'm home-schooled

29. Are there any electricity conservation programs at your school?

- Yes (please specify \_\_\_\_\_ )
- No
- I don't know
- I'm not in school
- I'm home-schooled

30. Is your school an "eco-school"?

- Yes
- No
- I don't know
- I'm not in school
- I'm home-schooled

31. Have you ever heard the term "conservation culture"?

- Yes
- No

32. A conservation culture means electricity and other forms of energy are used in a wise and efficient manner by all sectors of society. The government has made this a priority for the province. In your view, is this important?

- Yes
- No
- I don't know

33. What do you think it would take for Ontario to become a conservation culture? **Rank your top THREE reasons, with 1 being the strongest. Choose only THREE and use each number only once.**

(Randomize)

- Serious energy shortages
- Higher energy prices
- Major environmental disaster
- Stronger government leadership
- Stronger leadership from businesses
- More environmental awareness among consumers
- Make new standards/behaviours mandatory
- Fine/penalize businesses or others who waste electricity
- I don't think this will ever happen
- I don't know
- Other (Please specify \_\_\_\_\_)

34. How much confidence do you have that the government can succeed in getting consumers and businesses to reduce unnecessary electricity use? **Check only one.**

- A great deal of confidence
- Some confidence
- Little confidence
- No confidence at all

35. Which one of the following strategies do you think is the best way to promote electricity conservation among consumers? **Check only one.**

- Education and awareness programs to help people learn what they can do
- Introduce financial rewards to encourage conservation actions
- Implement new rules to make sure products are energy efficient
- Other (Please specify \_\_\_\_\_)

36. If you had to choose between the following two statements, which one comes closest to describing your opinion on the role of technology? **Check only one.**

- A lot of our environmental problems are because of our over-use of technology
- New technologies will allow us to reduce the environmental damage we do to the planet

37. On issues relating to energy conservation, please indicate the level of trust you would place on **information** provided by each of the following:

(Randomize)

a. The provincial government

- Great deal of trust
- Some trust
- Little trust

b. Your local power utility (the company that supplies your electricity)

- Great deal of trust
- Some trust
- Little trust

c. Environmental groups

- Great deal of trust
- Some trust
- Little trust

d. University-based scientists

- Great deal of trust
- Some trust
- Little trust

e. Business and industry leaders

- Great deal of trust
- Some trust
- Little trust

f. School teachers

- Great deal of trust
- Some trust
- Little trust

#### **D. Getting the Word Out**

**What works and what doesn't in terms of getting people's attention.**

38. Think of people your age you know who are interested in environmental issues including electricity conservation. What type of person would you say they are? **Check only one.**

- Nerdy
- Annoying
- They're just regular people
- Cool
- They're role models

39. If you wanted to get people like your friends to think more about electricity conservation, what idea would you suggest?

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40. If you had to choose between the following two statements about information campaigns, which of the following do you most agree with? **Check only one.**

- I see so many numbers and stats used to try to make me do the right thing that I shut off when I see them
- I need to see solid facts and numbers that I can relate to in order to get interested in something

**E. Some Last Questions...**

**To finish up, these are a few questions about you and your household for statistical purposes only. Again, your answers will remain completely confidential!**

41. Does your family currently own or rent your home?

- Own
- Rent
- I don't know

42. Which of the following best describes your home?

- Single family house
- Townhome or duplex
- Low-rise apartment building
- High-rise apartment building
- Farm
- Other (Please specify

\_\_\_\_\_ )

43. How many people make up your household, including you?

\_\_\_\_\_

44. Please indicate the highest level of education obtained by any parent in your household. **Check only one.**

- Some grade or high school
- Completed high school and/or some post-secondary
- Trades certificate or diploma
- College certificate or diploma
- University certificate, diploma, or degree
- Second or graduate degree (Master's, Ph.D.)

45. If you are in school, what grade are you in?

\_\_\_\_\_

46. In what country/region were you born?

- Canada
- US
- Europe
- Asia
- South/Central America
- Africa
- Australia/New Zealand
- Other (Please specify

\_\_\_\_\_ )

47. If you were born in a country other than Canada, how many years have you lived in Canada?

\_\_\_\_\_

48. Do you have a part-time job?

- Yes
- No

49. Do you have a driver's licence?

- Yes
- No

**If yes, how often do you drive? Check only one.**

- Everyday, I have my own car

- Everyday
- Once or twice a week
- Once or twice a month
- Less than once or twice a month

50. To better understand how results vary by region, please provide the first three digits of your postal code.

\_\_\_\_\_

**Thank you for your participation**

## Appendix 2: Changes to 2007 Survey

Changes appear in italics

Original (2007) Survey Question	Updated (2017) Survey Question	Rationale
<p>“In your opinion, what would you consider to be the most important issue facing Ontario today?”</p> <ul style="list-style-type: none"> <li>· Pollution</li> <li>· <b><i>Global warming/climate change</i></b></li> <li>· <b><i>Electricity environmental issues</i></b></li> <li>· Electricity supply/reliability</li> <li>· Electricity costs/prices</li> <li>· Nuclear power</li> <li>· Cost of gas/fuel/heating costs</li> <li>· Health care</li> <li>· <b><i>War in the middle east</i></b></li> <li>· Unemployment/jobs</li> <li>· Education issues</li> <li>· Poor government/leadership</li> <li>· Crime/law and order</li> <li>· Poverty/homelessness</li> <li>· Other (Please specify)</li> <li>· Don’t know/None</li> </ul>	<p>“In your opinion, what would you consider to be the most important issue facing Ontario today?”</p> <ul style="list-style-type: none"> <li>· Pollution</li> <li>· <b><i>Climate change/global warming</i></b></li> <li>· <b><i>Refugees</i></b></li> <li>· Electricity supply/reliability</li> <li>· Electricity costs/prices</li> <li>· Nuclear power</li> <li>· Cost of gas/fuel/heating costs</li> <li>· Health care</li> <li>· <b><i>Civil unrest in the US</i></b></li> <li>· Unemployment/jobs</li> <li>· Education issues</li> <li>· Poor government/leadership</li> <li>· Crime/law and order</li> <li>· Poverty/homelessness</li> <li>· Other (Please specify)</li> <li>· Don’t know/None</li> </ul>	<ul style="list-style-type: none"> <li>· Clearer description (more commonly used terms)</li> <li>· Changes in relevance 2017 vs. 2007</li> </ul>
<p>“Please check the following items that you use on regular basis. Check all that apply.”</p> <ul style="list-style-type: none"> <li>· <b><i>iPod/MP3 player</i></b></li> <li>· Cell phone</li> <li>· Digital camera</li> <li>· <b><i>Video games</i></b></li> <li>· Stereo</li> <li>· <b><i>Computer</i></b></li> <li>· <b><i>Digital video recorder (DVR)</i></b></li> <li>· Electronic music equipment (guitar, keyboard, mixing equipment, etc.)</li> <li>· <b><i>DVD</i></b></li> <li>· Hair dryer</li> <li>· Straightening/curling iron</li> </ul>	<p>“Please check the following items that you use on regular basis. Check all that apply.”</p> <ul style="list-style-type: none"> <li>· <b><i>iPod</i></b></li> <li>· Cell phone</li> <li>· Digital camera</li> <li>· <b><i>Game consoles (PlayStation, Wii, etc.)</i></b></li> <li>· Stereo</li> <li>· <b><i>Computer/laptop</i></b></li> <li>· <b><i>TV</i></b></li> <li>· Electronic music equipment (guitar, keyboard, mixing equipment, etc.)</li> <li>· <b><i>Tablet</i></b></li> <li>· Hair dryer</li> <li>· Straightening/curling iron</li> </ul>	<ul style="list-style-type: none"> <li>· Changes in relevance 2017 vs. 2007</li> </ul>
<p>“Have you heard of any of the following programs or services to help Ontario consumers reduce electricity use in the home? Check all you have heard of.”</p> <ul style="list-style-type: none"> <li>· PowerWise</li> <li>· Every Kilowatt Counts</li> <li>· Energy Star</li> <li>· Energuide</li> <li>· Flick off</li> </ul>	<p>Question was removed</p>	<ul style="list-style-type: none"> <li>· A number of the programs were no longer active</li> </ul>

<ul style="list-style-type: none"> <li>· Power Smart</li> <li>· Local utility program (Please specify)</li> <li>· Peak Saver</li> <li>· Lose it, Use it</li> <li>· Summer Savings</li> <li>· Obviously.ca</li> <li>· Program to retire old beer fridges</li> <li>· Energy rebates</li> <li>· Other (Please specify)</li> </ul>		
<p>“Are there any <b>electricity conservation</b> programs at your school?”</p> <ul style="list-style-type: none"> <li>· Yes (please specify)</li> <li>· No</li> <li>· I don’t know</li> <li>· I’m not in school</li> <li>· I’m home-schooled</li> </ul>	<p>“Are there any <b>environmental awareness</b> programs at your school?”</p> <ul style="list-style-type: none"> <li>· Yes (please specify)</li> <li>· No</li> <li>· I don’t know</li> <li>· I’m not in school</li> <li>· I’m home-schooled</li> </ul>	<ul style="list-style-type: none"> <li>· Changed to reflect study’s objectives</li> </ul>
<p>“Is your school an <b>“eco-school”</b>?”</p> <ul style="list-style-type: none"> <li>· Yes</li> <li>· No</li> <li>· I don’t know</li> <li>· I’m not in school</li> <li>· I’m home-schooled</li> </ul>	<p>“Is your school a certified <b>“EcoSchool”</b>?”</p> <ul style="list-style-type: none"> <li>· Yes</li> <li>· No</li> <li>· I don’t know</li> <li>· I’m not in school</li> <li>· I’m home-schooled</li> </ul>	<ul style="list-style-type: none"> <li>· Changed to establish direct relationship to Ontario EcoSchools</li> </ul>
<p>“On issues relating to energy conservation, please indicate the level of trust you would place on information provided by each of the following:”</p> <ul style="list-style-type: none"> <li>· The provincial government</li> <li>· Your local power utility</li> <li>· Environmental groups</li> <li>· University based scientists</li> <li>· Business and industry leaders</li> <li>· School teachers</li> </ul>	<p>“On issues relating to energy conservation, please indicate the level of trust you would place on information provided by each of the following:”</p> <ul style="list-style-type: none"> <li>· The provincial government</li> <li>· Your local power utility</li> <li>· Environmental groups</li> <li>· University based scientists</li> <li>· Business and industry leaders</li> <li>· School teachers</li> <li>· <b>Social Media</b></li> </ul>	<ul style="list-style-type: none"> <li>· Updated to reflect increased presence of social media in 2017 as compared to 2007</li> </ul>

## Appendix 3: 2017 Survey

### Ontario Teenagers and Electricity Conservation 2017

#### Q1 Introduction

This questionnaire looks at your child's, and other students', thoughts on what's going on in the world in terms of the environment and the use of energy. We want to know how they feel about how people use electricity in Ontario, in their home, and on their own! We know that not everyone feels the same way, or does the same things. We are interested in your child's answers to the questions in the questionnaire, and appreciate their participation! This study is partially funded by Ontario EcoSchools. The questionnaire is hosted on Qualtrics, however you will receive your standard remuneration as per your participation in SSI. The questionnaire is completely private. No one, except the researchers, will see your child's finished questionnaire, please ask them to be as honest as they can. If there is a question that they do not know how to answer, or do not want to answer, that's okay, they can just move to the next question. Also, we often use the word "parents" throughout this questionnaire, but we want your child to know that we intend this word to mean "parents", "parent", or "guardian(s)", depending on whatever is appropriate for them. This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE# 22193). If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or oreceo@uwaterloo.ca. If you have any questions about this study please contact my supervisor, Dr. Jennifer Lynes at 519-888-4567 ext. 35487 or jklynes@uwaterloo.ca. Thank you!

Q2 Are you the parent/legal guardian of a child aged 13-17 years?

Yes (1)

No (2)

Q3 Would you and your child be interested in participating in a study regarding electricity conservation?

Yes (1)

No (2)

#### Q5 Parent/Guardian Consent Form

To help you make an informed decision regarding your child's participation, this letter will explain what the study is about, the possible risks and benefits, and your child's rights as a research participant. If you do not understand something in the letter, please ask one of the investigators prior to consenting for your child to participate in the study. What is this study about? This study looks at adolescents' thoughts on what's going on in the world in terms of the environment and the use of energy. We want to know how they feel about how people use electricity in Ontario, in their home, and on their own. We know that not everyone feels the same way, or does the same things. This study is being undertaken as part of my (Samra Amir) Masters research. a. What does participation involve?- Participation in this study will involve

the completion of an online survey, expected to take 15-20 minutes to complete. The types of questions will include current electricity conservation behaviours your child is engaged in, their perspectives on electricity saving initiatives, and their awareness about the use of electricity in Ontario.

b. Who may participate in the study?- In order to participate in this study, your child must be between the ages of 13-17 years old.

c. Is participation in this study voluntary?- Your child's participation in this study is voluntary. You, or your child, may decide to leave the study at any time by closing the online survey. Any information provided up to that point will not be used. During the survey, your child may choose "prefer not to answer" for any question(s) they prefer not to answer.

d. Will your child receive anything for participating in this study?- You (the parents) will receive points from SSI, that will be added to your SSI account. To be rewarded points for the survey as well, the participant must go through to click "done" at the end of the survey. Please note that these points will be awarded to your account, and not your child's.

e. What are the risks associated with this study?- There are no known or anticipated risks associated with participation in this study. If a question, or the discussion, makes you uncomfortable, you can choose not to answer.

f. Will my or my child's identity be known to others?- You will be completing the study by an online survey operated by Survey Monkey. When information is transmitted over the internet privacy cannot be guaranteed. There is always a risk your responses may be intercepted by a third party. Survey Monkey temporarily collects your contributor ID and computer IP address to avoid duplicate responses in the dataset but will not collect information that could identify you personally.

g. Will my or my child's information be kept confidential?- The information you or your child shares will be kept confidential. The data collected will be retained for a minimum of 2 years, after which they will be destroyed. Data will be stored in an encrypted folder on my password protected laptop. Only the research team will have access to study data. No identifying information will be used in my thesis or any presentations or publications based on this research. In cases where researchers believe that a child may need protection from harm, researchers must by law report this information to authorities

Q6 Do you consent to you and your child participating in this study?

Yes (1)

No (2)

Q7 Household Demographics

In this survey we will be asking your child about how they feel about electricity conservation programs. To help gather a representative sample of Ontario's teenagers, we would like to ask you, the parents/guardians, some questions as well.

Q8 Which of the following best describes your household?

Single family house (detached home) (1)

Townhome or duplex (2)

Low-rise apartment building (3)

High-rise apartment building (4)

Farm (5)

Other (please specify) (6) \_\_\_\_\_

Q9 How many people make up your household, including you?

2 (1)

3 (2)

4 (3)

5 (4)

6 (5)

7 (6)

8+ (7)

Q10 Please indicate the highest level of education obtained by any parent in your household

Some grade or high school (1)

Completed high school and/or some post secondary (2)

Trades certificate or diploma (3)

College certificate or diploma (4)

University certificate, diploma, or degree (5)

Second or graduate degree (Master's, Ph.D.) (6)

Other (please specify) (7) \_\_\_\_\_

Q12 In which school is your child enrolled?

Q13 In which district is your child's school? (ex. Toronto District School Board)

Q11 Is your child enrolled in a certified Ontario EcoSchool?

Yes (1)

No (2)

I'm not sure (3)

Q60 The next portion of the survey is for your child. Please ask them to complete the remainder of the survey.

#### Q14 Participant Consent Form

Dear Potential Participant: Your parents have allowed you to participate in a project that I am working on with my advisor at the University of Waterloo. The project is trying to understand your feelings towards electricity conservation in Ontario. The following text will tell you about my project, and then I am going to ask you if you are interested in taking part in the project. Who am I? My name is Samra Amir and I am a student at the University of Waterloo. I work in the School of Environment, Enterprise and Development (SEED). Why are you reading this? I would like to tell you about a study that involves teenagers like yourself, and I want to see if you would like to be in this study too. Why am I doing this study? I want to find out how you feel about conserving electricity. I also want to know what you know about the electricity conservation programs that exist in Ontario. What will happen to you if you are in the study? If you decide to take part in this study, you will be asked to participate in an online survey. There are no right or wrong answers; it is what you think that matters. It will take you about 15 to 20 minutes to do this task. Could there be any problems for you if you take part? I hope you will enjoy taking this survey. If you are uncomfortable when answering the questions, you can stop the survey. Will you have to answer all questions and do everything you are asked to do? If I ask you questions that you do not want to answer, you can choose not to answer them. You can just choose "prefer not to answer" and move onto the next question. Who will know that you are in the study? The answers you give in the survey will not have your name on it, so no one will know they are your answers or how you feel about the things that the survey asks. I will not let anyone other than my teacher/advisor see your answers or any other information about you. The only time I might have to break this promise is if I think you or someone else might be at risk of being hurt. Do you have to be in the study? You do not have to be in the study. No one will get angry or upset with you if you don't want to do this. Just tell us if you don't want to be in the study. If you choose not to do the survey, or stop partway, your parents will still receive points from SSI. Do you have any questions? You can ask questions at any time. You can ask now or you can ask later. Here is the email address that you can reach me at: Samir@uwaterloo.ca Thanks for all your help, Samra Amir

Q15 Do you want to participate in the study?

Yes (1)

No (2)

Q16 Before we get started, here are a couple of questions to find out what types of people are participating in this survey

Q17 What gender do you identify as?

Male (1)

Female (2)

Other (3)

Prefer not to answer (4)

Q18 In what year were you born?

- 1999 (1)
- 2000 (2)
- 2001 (3)
- 2002 (4)
- 2003 (5)
- 2004 (6)
- 2005 (7)

Q19 Today's Issues We want your opinion on some of the big issues affecting society today.

Q20 In your opinion, what would you consider to be the most important issue facing Ontario today?

- Pollution (1)
- Climate change/global warming (2)
- Refugees (3)
- Electricity supply/reliability (4)
- Electricity costs/prices (5)
- Nuclear power (6)
- Cost of gas/fuel/heating costs (7)
- Health care (8)
- Civil unrest in the US (9)
- Unemployment/jobs (10)
- Education issues (11)
- Poor government/leadership (12)
- Crime/law and order (13)
- Poverty/homelessness (14)
- Don't know/none (15)
- Other (please specify) (16) \_\_\_\_\_

Q21 Now, focusing specifically on sustainability issues, of the choices below, rank the issues that you are concerned about. Put 1 for the issue you are most concerned about and then rank the next issues in terms of your level of concern.

- \_\_\_\_\_ Climate change (1)
- \_\_\_\_\_ Water pollution (2)
- \_\_\_\_\_ Smog/air pollution (3)
- \_\_\_\_\_ Species and natural resource depletion (4)
- \_\_\_\_\_ Electricity shortages/blackouts and brownouts (5)
- \_\_\_\_\_ Climate migration (people forced to leave their homes due to changes to their local environment) (6)
- \_\_\_\_\_ Extreme weather events (7)
- \_\_\_\_\_ Indigenous land rights (8)

Q22 From what you know or have heard, do you think the province has enough electrical power to meet its needs over the next 10 years?

Yes, I think it has more than enough (1)

Yes, I think it has as much as needed (2)

No, I think it has less than needed (3)

I don't know (4)

Q23 How much do each of the following sources of electricity currently produce in Ontario? Choose one for each.

	Major source of electricity (1)	Medium source of electricity (2)	Minor source of electricity (3)	No electricity from this source is produced in Ontario (4)

Q24 Which one of the following do you think is the best way to meet Ontario's electricity needs over the next decade?

Develop new renewable sources, such as solar and wind power (1)

Further develop existing sources, such as nuclear, gas and hydroelectric power (2)

Change buildings and appliance standards to make them more energy-efficient (3)

Change consumer behaviour and lifestyles to reduce overall demand for electricity (4)

Other (please specify) (5) \_\_\_\_\_

Q25 You've got the power! These questions are intended to get your opinion on how electricity plays a part in your everyday life.

Q26 Do you ever think about how much electricity you use? And please be brutally honest!

Yes, a lot (1)

Sometimes (2)

Rarely (3)

No, never (4)

Q27 On average, what activity would you say uses the most electricity in your typical daily routine? Name one activity.

Q28 Which of the following items do you use on a regular basis? Check all that apply.

iPod (1)

Cell phone (2)

Digital camera (3)

Game consoles (PlayStation, Wii, etc.) (4)

Stereo (5)

Computer/laptop (6)

TV (7)

Electronic music equipment (guitar, keyboard, mixing equipment etc.) (8)

Tablet (9)

Hair dryer (10)

Straightener/curling iron (11)

Other (please specify) (12) \_\_\_\_\_

Q29 Conservation

You've got a lot going on in life: school, friends, parents, sometimes jobs. On top of that, advertisers are constantly trying to sell you their stuff, and other organizations are constantly trying to get their messages to "the youth" to try to get you on board to make the world a better place. Given that you're being hit from all angles, we want to know if the specific topic of electricity conservation has any place in it all. The following questions are intended to get your brutally honest opinion on the topic – there are no right or wrong answers!

Q30 Which of the following statements best describes your current thoughts about electricity conservation?

I don't really care (1)

I've never really thought about it before (2)

I'm not really interested at this time (3)

I'm interested in electricity conservation (4)

I'm really interested in electricity conservation (5)

Q31 Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you?

You are doing all you can possibly do at this point in time (1)

You are doing most of what you can do, but could do a bit more (2)

You are doing something, but could do a lot more (3)

You are doing very little (4)

Display This Question:

If Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you? You are doing something, but could do a lot more Is Selected

Or Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you? You are doing very little Is Selected

Q32 What do you think is the main reason why you haven't done more to reduce electricity use over the past year? Choose your top THREE reasons.

Lack of time/too busy (1)

Lack of information/don't know what to do (2)

Have not thought about it (3)

Inconvenient (4)

Not worth the effort (5)

My actions will not make a difference (6)

Too lazy (7)

Already energy efficient (8)

No need to make change (9)

Display This Question:

If Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you? You are doing all you can possibly do at this point in time Is Selected

Or Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you? You are doing most of what you can do, but could do a bit more Is Selected

Q33 What would you say are your main motivations for trying to conserve? Choose your top THREE motivations.

It stops my parents from nagging me about wasting money (1)

I want to do my part to reduce electricity-related emissions that cause smog and local air pollution (2)

I just think it's wrong to use electricity if you don't have to (3)

I want to do my part to avoid a blackout (4)

I want to do my part to reduce electricity-related emissions that lead to the greenhouse effect and climate change (5)

I conserve to make a point to my parents (who are pretty bad at conserving!) (6)

I think it's cool to care about things like conservation (7)

It's just a part of what we have to do for a better tomorrow (8)

Q34 Conservation Cont'd

Q35 Name THREE things that you think teens like you would and could realistically do to try to conserve electricity

1 (1)

2 (2)

3 (3)

Q36 What steps, if any, have you personally (not your parents) taken in the past year to reduce the consumption of electricity in your home? Check all that apply.

Turn off the lights when not in use (1)

Turn off power to electronics (TV/computers) when not in use (2)

Turn down thermostat in the winter (3)

Turn up thermostat in summer/reduce use of air conditioning (4)

Reduce use of clothes dryer (hang clothes to dry) (5)

Run appliance during off-peak hours (i.e. evenings and weekends when electricity demand isn't as high) (6)

Run dishwasher only when full (7)

Use microwave instead of oven where possible (8)

Wash clothes in cold water (9)

Encourage parents to conserve (10)

None of the above (11)

Unplug chargers when not in use (12)

Q37 Do you think that individuals such as yourself can make an important contribution to the overall reduction of electricity use in the province?

Definitely (1)

Likely (2)

Likely not (3)

Definitely not (4)

I don't know (5)

Q38 How have you learned about electricity conservation? Check all that apply.

High school classes (1)

Grade school classes (2)

School clubs (3)

Parents (4)

Other family members (5)

Friends (6)

TV ads (7)

Social media (YouTube, Twitter, Tumblr, etc) (8)

My own research (websites, blogs, podcasts, etc.) (9)

I haven't learned about it (10)

Q39 Thinking about your parents' efforts to conserve electricity in the past year, which one of the following statements would best apply to them?

Your parents are doing all they can possibly do at this point in time (1)

Your parents are doing most of what they can do, but can do a bit more (2)

Your parents are doing something, but could do a lot more (3)

Your parents are doing very little (4)

I don't know (5)

Display This Question:

If Thinking about your parents' efforts to conserve electricity in the past year, which one of the f... Your parents are doing something, but could do a lot more Is Selected

Or Thinking about your parents' efforts to conserve electricity in the past year, which one of the f... Your parents are doing very little Is Selected

Q40 What do you think is the main reason they haven't done more to reduce electricity use over the past year? Choose your top THREE reasons.

Lack of time/too busy (1)

Lack of information/don't know what to do (2)

Have not thought about it (3)

Too expensive/cannot afford (4)

Inconvenient (5)

Not worth the effort (6)

Their actions will not make a difference (7)

Too lazy (8)

Do not own home/renter (9)

Cannot make changes to home (10)

Already energy efficient (11)

Too old/retired (12)

No need to make change (13)

Won't save any money (14)

I don't know (15)

Q41 Have you ever tried to influence anyone to conserve electricity?

Yes (1)

No (2)

Display This Question:

If Have you ever tried to influence anyone to conserve electricity? Yes Is Selected

Q42 Who did you try to influence to conserve electricity? How did you do this?

Q43 Do you think you could have any influence over your friends with regard to encouraging electricity conservation?

Yes, significant influence (1)

Yes, some influence (2)

No influence (3)

Q44 Choose the degree of influence you think you could potentially have on anyone in your family to do the following:

	Significant influence (1)	Some influence (2)	No influence (3)

Q45 The Players These questions are intended to find out your opinion on the role that different groups in society play with regard to electricity conservation.

Q46 Would you say that your school is generally careful or wasteful users of electricity?

Very careful (1)

Somewhat careful (2)

Somewhat wasteful (3)

Very wasteful (4)

I don't know (5)

I'm not enrolled in school (6)

I am home-schooled (7)

Condition: I'm not enrolled in school Is Selected. Skip To: What do you think it would take for

O....Condition: I am home-schooled Is Selected. Skip To: What do you think it would take for

O....

Q47 Are there any environmental awareness or electricity conservation programs at your school?

Yes (1)

No (2)

I don't know (3)

Display This Question:

If Are there any environmental awareness or electricity conservation programs at your school?

Yes Is Selected

Q48 Which environmental awareness or electricity conservations programs are at your school?

Q49 Is your school a certified Ontario EcoSchool?

Yes (1)

No (2)

I don't know (3)

Q50 Have you participated in an energy or electricity conservation activity at school? These include "Lights off Lunches", "Sweater Day", "Earth Day"

Yes (1)

No (2)

I don't know (3)

Q51 What do you think it would take for Ontario to adopt a conservation culture? Choose your top THREE choices.

Serious energy shortages (1)

Higher energy prices (2)

Major environmental disaster (3)

Stronger governmental leadership (4)

Stronger leadership from businesses (5)

More environmental awareness among consumers (6)

Make new standards/behaviours mandatory (7)

Fine/penalize businesses or others who waste electricity (8)

I don't think this will ever happen (9)

I don't know (10)

Q52 How much confidence do you have that the government can succeed in getting consumers and businesses to reduce unnecessary electricity use?

A great deal of confidence (1)

A lot of confidence (2)

A moderate amount of confidence (3)

A little confidence (4)

No confidence at all (5)

Q53 Which one of the following strategies do you think is the best way to promote electricity conservation among consumers?

Education and awareness programs to help people learn what they can do (1)

Introduce financial rewards to encourage conservation actions (2)

Implement new rules to make sure products are energy efficient (3)

Q54 If you had to choose between the following two statements, which one comes closest to describing your opinion on the role of technology?

A lot of our environmental problems are because of our over-use of technology (1)

New technologies will allow us to reduce the environmental damage we do to the planet (2)

Q55 On issues relating to energy conservation, please indicate the level of trust you would place on information provided by each of the following:

	Great deal of trust (1)	Some trust (2)	Little to no trust (3)

Q56 Some Last Questions

To finish up, these are a few questions about you for statistical purposes only. Again, your answers will remain completely confidential!

Q57 In what country/region were you born?

Canada (1)

USA (2)

Europe (3)

Asia (4)

South/Central America (5)

Africa (6)

Australia/New Zealand (7)

Q58 If you were born in a country other than Canada, how many years have you lived in Canada?

Less than 1 (1)

1 (2)

2 (3)

3 (4)

4 (5)

5 (6)

6 (7)

7 (8)

8 (9)

9 (10)

10+ (11)

Q59 Do you have a part-time job?

Yes (1)

No (2)

Q60 Thank you!

Thank you for participating in our teens and electricity conservation survey! Your feedback is extremely valuable! This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22193) If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca. For all other questions or if you have general comments or questions related to this study, please contact Dr. Jennifer Lynes, School of Environment, Enterprise, and Design, at jklynes@uwaterloo.ca or Samra Amir, School of Environment, Enterprise, and Design, at samir@uwaterloo.ca

## Appendix 4: Results of Statistical Analyses

The results of statistical tests used in this study are provided below

### Chi-square test results

The results of Chi-square tests performed for data analysis in section 5.0 are detailed below.

*In your opinion, what would you consider to be the most important issue facing Ontario today? - Selected Choice \* How old are you? Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	36.258a	24	0.052
Likelihood Ratio	36.603	24	0.048
Linear-by-Linear Association	0.008	1	0.93
N of Valid Cases	500		
a 5 cells (14.3%) have expected count less than 5. The minimum expected count is 2.08.			

*Which one of the following do you think is the best way to meet Ontario's electricity needs over the next decade? - Selected Choice \* How old are you? Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	28.174a	16	0.03
Likelihood Ratio	29.208	16	0.023
Linear-by-Linear Association	4.199	1	0.04
N of Valid Cases	501		
a 5 cells (20.0%) have expected count less than 5. The minimum expected count is 1.60.			

*Do you think you could have any influence over your friends with regard to encouraging electricity conservation? \* How old are you? Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	17.947a	8	0.022
Likelihood Ratio	17.754	8	0.023
Linear-by-Linear Association	0.107	1	0.743

N of Valid Cases	498		
a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.71.			

*From what you know or have heard, do you think the province has enough electrical power to meet its needs over the next 10 years? \* What gender do you identify as? Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.310a	2	0.01
Likelihood Ratio	9.367	2	0.009
Linear-by-Linear Association	7.507	1	0.006
N of Valid Cases	418		
a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 53.46.			

*Have you ever tried to influence anyone to conserve electricity? \* What gender do you identify as? Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.792a	1	0.029
Likelihood Ratio	4.794	1	0.029
Linear-by-Linear Association	4.782	1	0.029
N of Valid Cases	499		
a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 81.42.			

*Do you ever think about how much electricity you use? And please be brutally honest! \* Please indicate the highest level of education obtained by any parent in your household - Selected Choice Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	30.420a	15	0.01
Likelihood Ratio	32.463	15	0.006
Linear-by-Linear Association	5.697	1	0.017
N of Valid Cases	500		

a 4 cells (16.7%) have expected count less than 5. The minimum expected count is 2.16.

*Which of the following statements best describes your current thoughts about electricity conservation? \* Please indicate the highest level of education obtained by any parent in your household - Selected Choice Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	36.613a	15	0.001
Likelihood Ratio	37.818	15	0.001
Linear-by-Linear Association	15.422	1	0
N of Valid Cases	502		

a 4 cells (16.7%) have expected count less than 5. The minimum expected count is 1.88.

*Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you? \* Please indicate the highest level of education obtained by any parent in your household - Selected Choice Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	27.697a	15	0.024
Likelihood Ratio	27.602	15	0.024
Linear-by-Linear Association	1.308	1	0.253
N of Valid Cases	500		

a 4 cells (16.7%) have expected count less than 5. The minimum expected count is 2.44.

*Thinking about your parents' efforts to conserve electricity in the past year, which one of the following statements would best apply to them? \* Please indicate the highest level of education obtained by any parent in your household - Selected Choice Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	23.642a	15	0.071
Likelihood Ratio	24.237	15	0.061

Linear-by-Linear Association	0.421	1	0.517
N of Valid Cases	502		
a 6 cells (25.0%) have expected count less than 5. The minimum expected count is .96.			

*Would you say that your school is generally careful or wasteful users of electricity? \* Is your child enrolled in a certified Ontario EcoSchool? Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.957a	5	0.111
Likelihood Ratio	10.855	5	0.054
Linear-by-Linear Association	5.363	1	0.021
N of Valid Cases	501		
a 2 cells (16.7%) have expected count less than 5. The minimum expected count is 1.81.			

*Are there any environmental awareness or electricity conservation programs at your school? \* Is your child enrolled in a certified Ontario EcoSchool? Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.157a	1	0.076
Likelihood Ratio	3.21	1	0.073
Linear-by-Linear Association	3.143	1	0.076
N of Valid Cases	221		
a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 28.00.			

*Is your school a certified Ontario EcoSchool? \* Is your child enrolled in a certified Ontario EcoSchool? Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.594a	1	0
Likelihood Ratio	12.885	1	0

Linear-by-Linear Association	12.519	1	0
N of Valid Cases	168		
a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 29.05.			

*Have you participated in an energy or electricity conservation activity at school? These include "Lights off Lunches", "Sweater Day", "Earth Day" \* Is your child enrolled in a certified Ontario EcoSchool? Crosstabulation*

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.072a	1	0.024
Continuity Correctionb	4.576	1	0.032
Likelihood Ratio	5.258	1	0.022
Fisher's Exact Test			
Linear-by-Linear Association	5.061	1	0.024
N of Valid Cases	462		
a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 38.96.			

*Which one of the following strategies do you think is the best way to promote electricity conservation among consumers? \* Is your child enrolled in a certified Ontario EcoSchool? Crosstabulation*

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.065a	2	0.048
Likelihood Ratio	5.958	2	0.051
Linear-by-Linear Association	5.42	1	0.02
N of Valid Cases	496		
a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 35.15.			

*In your opinion, what would you consider to be the most important issue facing Ontario today? - Selected Choice \* How have you learned about electricity conservation? Check all that apply. My own research (websites, blogs, podcasts, etc.) Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	19.635a	15	0.186
Likelihood Ratio	20.964	15	0.138
Linear-by-Linear Association	1.922	1	0.166
N of Valid Cases	501		
a 4 cells (12.5%) have expected count less than 5. The minimum expected count is .90.			

*Do you ever think about how much electricity you use? And please be brutally honest! \* How have you learned about electricity conservation? Check all that apply. My own research (websites, blogs, podcasts, etc.) Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	36.121a	3	7.05856E-08
Likelihood Ratio	37.2	3	0
Linear-by-Linear Association	35.732	1	0
N of Valid Cases	502		
a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 21.07.			

*Which of the following statements best describes your current thoughts about electricity conservation? \* How have you learned about electricity conservation? Check all that apply. My own research (websites, blogs, podcasts, etc.) Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	46.687a	4	1.77227E-09
Likelihood Ratio	47.627	4	0
Linear-by-Linear Association	36.376	1	0
N of Valid Cases	502		
a 2 cells (20.0%) have expected count less than 5. The minimum expected count is 4.03.			

*Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you? \* How have you learned about electricity conservation? Check all that apply. My own research (websites, blogs, podcasts, etc.)*  
*Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	25.279a	3	1.35022E-05
Likelihood Ratio	25.911	3	0
Linear-by-Linear Association	23.785	1	0
N of Valid Cases	502		
a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 24.20.			

*Do you think that individuals such as yourself can make an important contribution to the overall reduction of electricity use in the province? \* How have you learned about electricity conservation? Check all that apply. My own research (websites, blogs, podcasts, etc.)*  
*Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.796a	3	0.000301282
Likelihood Ratio	20.099	3	0
Linear-by-Linear Association	18.185	1	0
N of Valid Cases	467		
a 2 cells (25.0%) have expected count less than 5. The minimum expected count is .92.			

*Have you ever tried to influence anyone to conserve electricity? \* How have you learned about electricity conservation? Check all that apply. My own research (websites, blogs, podcasts, etc.)*  
*Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	41.616a	1	1.1107E-10
Likelihood Ratio	41.898	1	0

Linear-by-Linear Association	41.533	1	0
N of Valid Cases	501		
a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 76.01.			

*Do you think you could have any influence over your friends with regard to encouraging electricity conservation? \* How have you learned about electricity conservation? Check all that apply. My own research (websites, blogs, podcasts, etc.) Crosstabulation*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	40.631a	2	0
Likelihood Ratio	42.21	2	0
Linear-by-Linear Association	39.765	1	0
N of Valid Cases	499		
a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 21.55.			

### Pearson Correlation test results

The results of Pearson Correlation tests performed for data analysis in section 6.0 are detailed below.

*Which of the following statements best describes your current thoughts about electricity conservation? \* Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you? Crosstabulation*

Correlations			
		Which of the following statements ...	Thinking about your own ...
Which of the following statements ...	Pearson Correlation	1	-.385**
	Sig. (2-tailed)		0
	N	502	502
Thinking about your own ...	Pearson Correlation	-.385**	1

	Sig. (2-tailed)	0	
	N	502	502
** Correlation is significant at the 0.01 level (2-tailed).			

*Which of the following statements best describes your current thoughts about electricity conservation? VS Have you ever tried to influence anyone to conserve electricity?*

Correlations			
		Which of the following statements ...	Have you ever tried ...
Which of the following statements ...	Pearson Correlation	1	-.392**
	Sig. (2-tailed)		0
	N	502	501
Have you ever tried to ...	Pearson Correlation	-.392**	1
	Sig. (2-tailed)	0	
	N	501	501
** Correlation is significant at the 0.01 level (2-tailed).			

*Which of the following statements best describes your current thoughts about electricity conservation? Vs Do you ever think about how much electricity you use? And please be brutally honest!*

Correlations			
		Which of the following statements ...	Do you ever think ...
Which of the following statements ...	Pearson Correlation	1	-.421**
	Sig. (2-tailed)		0
	N	502	502
Do you ever think ...	Pearson Correlation	-.421**	1
	Sig. (2-tailed)	0	
	N	502	502
** Correlation is significant at the 0.01 level (2-tailed).			

*Thinking about your own efforts to conserve electricity in your daily routine in the past year, which one of the following statements would best apply to you? \* Do you ever think about how much electricity you use? And please be brutally honest!*

Correlations			
		Thinking about your own efforts ...	Do you ever think ...
Thinking about your own efforts ...	Pearson Correlation	1	.477**
	Sig. (2-tailed)		0
	N	502	502
Do you ever think ...	Pearson Correlation	.477**	1
	Sig. (2-tailed)	0	
	N	502	502
** Correlation is significant at the 0.01 level (2-tailed).			