

A Collective Case Study into the Use of Social Media as a Tool for Developing Sustainable Living Habits in Urban Families

Michel T. Léger & Shawn Martin, Université de Moncton, Canada

Abstract

Living sustainably is not easy for urban families. This mixed method collective case study looks to explore the development of habitual ecological action in families living in an urban setting, a context of socio-ecological transformation rarely examined in social science and environmental education. Given the ever-increasing popularity of social media today, this study seeks to understand the potential role of Facebook in promoting environmental action and to compare it to the use of e-mail as an Information and Communication Technology (ICTs) for the promotion of environmental action. In other words, for families already intent on living sustainably, we are interested in understanding how the use of social media could help bridge the gap between intent and action, as compared to using less network-oriented ICTs, such as e-mail. We recruited 45 families from two cities and divided them into two distinct groups. The first group of families attempted to lower their household electrical bill as part of a private Facebook group, while the other group aimed to do the same, but via e-mail instead, i.e., without the directed use of social media. For both groups, we compared the quantity of kilowatt-hours used during the project to those used for the same months in the previous year, adjusting for temperature variations from year to year. Our analysis of descriptive data shows that both groups experienced lower electricity consumption during the project months. Exit interviews help to explain these results and point to a better understanding of eco-citizenship development as a process in the context of family. Our qualitative results suggest that family engagement and child participation seem to be higher in families interested in living more sustainably when these families are part of a social network.

Résumé

Vivre des modes de vie durables n'est pas facile pour les familles de milieux urbains. Cette étude de cas multiples de méthodologie mixte cherche à explorer le développement de l'action écologique dans les familles vivant en milieu urbain, un contexte de transformation socio-écologique rarement examiné en sciences sociales et en éducation environnementale. Compte tenu de la popularité croissante des médias sociaux aujourd'hui, cette étude cherche à comprendre le rôle potentiel de Facebook dans la promotion de l'action environnementale, tout en le comparant à l'utilisation du courrier électronique en tant que technologie de l'information et de la communication (TIC) pour la promotion de l'action environnementale. En d'autres mots, pour les familles qui ont déjà l'intention de développer des modes de vie plus durables, nous souhaitons comprendre comment l'utilisation des médias sociaux pourrait aider à combler le fossé entre l'intention et l'action.

Nous avons recruté 45 familles de deux villes et nous les avons divisées en deux groupes distincts. Le premier groupe de familles tentait de réduire leur facture d'électricité domestique dans le cadre d'un groupe Facebook privé, tandis que l'autre groupe visait à faire de même, mais via le courrier électronique, c'est-à-dire sans l'utilisation dirigée des médias sociaux. Pour les deux groupes, nous avons comparé la quantité de kilowattheures utilisée pendant le projet à celles utilisées pour les mêmes mois de l'année précédente, en ajustant selon les variations de température d'une année à l'autre. Notre analyse des données descriptives montre que les deux groupes ont connu une consommation d'électricité réduite au cours des mois du projet. Les entretiens de sortie aident à expliquer ces résultats et permettent de mieux comprendre le développement de l'écocitoyenneté en tant que processus dans le contexte familial. Nos résultats qualitatifs suggèrent que l'engagement familial et la participation des enfants semblent être plus élevés dans les familles qui souhaitent vivre de manière plus écologique, lorsque ces familles font partie d'un groupe de réseau social.

Key Words: eco-citizenship, environmental action, social media, sustainable living, environmental education

Theoretical Perspective

In a recent report (2018), the UN Intergovernmental Panel on Climate Change (IPCC) said that the planet will likely reach the critical threshold of 1.5 degrees Celsius above pre-industrial levels as early as 2030, resulting in a much higher risk of extreme drought, wildfires, floods and food shortages for hundreds of millions of people throughout the world, including Canada. The IPCC is calling on governments to implement widespread initiatives in energy, industry and transportation. Climate change is already happening; reversing the tide will also require behavioural change at the grassroots level, with individuals and small groups (e.g., families). In fact, the IPCC's models emphasize the need for people to change their lifestyle and consumption patterns to more sustainable alternatives, specifically in areas they can control, such as modes of transportation, their dietary preferences, and the buildings they inhabit. For example, in terms of adopting more ecological household behaviours, the IPCC suggests that families use smart thermostats and more efficient temperature control strategies.

It is becoming increasingly apparent that the environmental problems we face today are, in large part, a consequence of human activity such as overconsumption (Haines, Kovats, Campbell-Lendum & Corvalan, 2006). This overconsumption includes the use of heated air in the winter and refrigerated air in the summer. Over the past two centuries, industrial growth has made for a world dependent mainly on the burning of fossil fuels. Consequently, climate change is shaping up to be one of the most serious environmental problems of

our time, threatening the stability of ecosystems worldwide (Bristow et al., 2004). According to Whitmarsh and O'Neill (2011), in Canada and in other countries, increasing concern towards the environment does not seem to translate into concrete environmental action. Attempting to better define environmental action, Marleau (2009) cites authors such as Emmons (1997), Clover (2002) and Garcia (2004) who suggest that deciding to act in a more environmentally sound manner is rooted in competencies such as good planning and reflective problem solving. Marleau (2009) adds that such action requires an already basic level of environmental consciousness and a pre-existing intention to adopt a greener lifestyle. Given the ongoing state of non-action towards the environment on the part of well-intentioned people, we are still trying to understand how to bridge the gap between environmental awareness and pro-environmental behavior (Kollmuss & Agyeman, 2002).

Our previous work on developing environmental competency (Léger, Kerry, Pruneau & Langis, 2014; Pruneau, Kerry, Langis & Léger, 2015; Pruneau, Kerry & Langis, 2013) has given us a better understanding of the processes behind the development of such competencies as prospective thinking and environmental problem solving. We also have a more comprehensive view of the role such competencies play in adopting environmental actions. Our more recent work on digital competency (Léger & Freiman, 2016, 2015; Freiman, LeBlanc & Léger, 2017) has revealed many similarities between the skills needed to adopt environmental action and those needed for developing digital literacy. These connections lead us to suspect a link between digital skills and developing environmental “action competency” (Jensen & Schnack, 1997). In other words, we wonder if the use of Information and Communication Technologies (ICTs) and other technologies could help one to go beyond intention and develop concrete environmental agency?

There is no doubt that environmental issues are front and center in the world today. Also at the forefront of development in today's world is the ever-increasing place of technology in daily life. Indeed, many countries are engaged in helping citizens find a place in the digital age by implementing various programs that aim to facilitate the development of digital competency. In Canada, the federal government's most recent strategy for boosting digital literacy, entitled *Digital Canada 150* (Industry Canada, 2014), emphasizes effective public policies that put forth the right conditions in order to encourage and help Canadians to take full advantage of the transformational possibilities offered in a digital future. In fact, one could argue that we are already living in the “digital future”, both in Canada and across the world. According to compilation websites such as *Internet World Stats* (www.internetworldstats.com) and *We Are Social* (www.wearesocial.com), about 50% of the world's population were users of the Internet in 2017. Equally impressive are the number of people worldwide using social media, estimated by these same sources at about 2.8 billion, which represents 37% of the world's current population.

Our literature review uncovered very few scholarly articles on the topic of the potential role ICT and other technologies play in environmental agency. In fact, there seems to be a need in the literature on ecological action for more studies about the potential impact of technologies on environmental agency. Of the few studies we did find, most point to a positive influence of social media users (e.g., Facebook and Twitter) to adopt eco-responsible life practices. For example, Bell, Toth, Little and Smith (2016) found that social media can contribute to high levels of environmental consciousness in adolescents and lead to a reduction in energy use at home. These authors also noted that social media may help support efforts to adopt more environmental action when one is already in what Prochaska, DiClemente and Norcross (1992) called the “preparation stage” of their Transtheoretical Model for behavioral change (when a person is intent or ready to act in the immediate future). In another study, Sweeney, Webb, Mazzarol and Soutar (2014) showed that using social media helps to develop a sense of self-determination when trying to adopt environmental actions. Regarding Facebook in particular, Kane, Chiru and Ciuchete (2012) state that social media can act as an efficient complementary tool when considering an ecologically friendly product or service online.

The present study of environmental agency in the context of families takes an innovative look at household eco-citizenship through the intersecting frameworks of environmental competency, environmental action, and digital skill development. In this paper, we examine what the effect would be on the development of environmental action if one’s Facebook newsfeed contained regular postings both on environmental issues and on ways to develop more sustainable habits at home. Would one be more inclined to develop and maintain concrete environmental actions with such virtual reinforcements? To help answer this general research question, our study compares Facebook users with similar participants (i.e. families living in an urban setting) who receive the same virtual reinforcements, only via the less network-oriented e-mail platform.

The Family as a Context of Socio-ecological Transformation

In most countries and cultures around the world, the family is widely considered as the basic unit of social organization, despite its evolving definition in these past few decades (Le Bourdais, Desrosiers & Gaulin, 1991). For Le Bourdais, Desrosiers and Gaulin (1991), Statistics Canada’s (2016) definition of a “census family” as a person or group of people “living in the same dwelling” is too unidimensional as it focusses on the place, rather than taking into account the inter-member relationships and social dynamics involved in living as a family. Other works in the fields of sociology and social psychology (Widmer, Kellerhals & Levy, 2004; Claffey & Mickelson, 2009; Neilson & Stanfors, 2014) have highlighted the place of social interaction in the healthy functioning of a family. In today’s digitally heightened world, such intra-family interactions are

also subject to influences from technology. Most notably, social media platforms have significantly changed the way in which people connect with one another, and this is no different in the context of family. Given the social place of the family as a common denominator of social structure and given the influence virtual social media platforms such as Facebook, Twitter and Instagram have on interactions in and beyond the family today, we consider the family to be a very relevant context of socioecological and psychological transformation in the struggle to implement societal change towards sustainable living. Though we agree with Le Bourdais, Desrosiers and Gaulin (1991) that the definition of “family” according to Statistics Canada (2016) would be more complete by including aspects of family dynamics, this paper is not focused on family interactions per se. Rather, as indicated by the specific research objective outlined in the next section, we are more interested in the broader “family experience” of using social media to become more sustainable collectively.

Though limited, there is some research on the role of family in deciding to adopt eco-responsible actions. In Australia, the Queensland Youth Environmental Council (2009) reports that being part of a pro-environmental family represents an important factor in influencing environmental agency in youth between the ages of 12 and 24. Payne (2005, 2010) found similar results, adding that children often imitate their parents’ ecological practices. Likewise, in an international study done by the Organization for Economic Cooperation and Development (OECD, 2008), it is reported that family members can influence a fellow member to adopt ecofriendly actions such as recycling. In Canada, our own work on family ecocitizenship points the importance of establishing common ecocentric family values and developing collective environmental competencies, such as prospective thinking, when trying to adopt collective environmental actions (Léger & Pruneau, 2014, 2013, 2012).

Research Objectives

Considering the place of technology in social change, our study aims to respond to the apparent dearth in the literature regarding the development of family-based environmental agency using technologies as a facilitating tool for collective behavioral change. More specifically, this is a study in the field of informal environmental education as defined by Sauvé (1997), where we endeavour to gain a better understanding of the role social media, namely Facebook, can play in a family’s efforts to adopt energy reduction actions at home. The following specific research question guided our investigation: How do social media such as Facebook influence the adoption of climate change mitigating actions in the context of families living in an urban setting? From this question, three specific research objectives were proposed:

- 1) Describe the daily Facebook usage of participating families living in an urban setting.
- 2) Measure the impact of social media on participating families' monthly electricity consumption, as compared to the impact of e-mail use on other participating families' monthly electricity consumption.
- 3) Understand the lived experience of families trying to adopt pro-environmental actions, using social media.

Modes of Inquiry, Data Sources, and Methods of Analysis

The methodological approach guiding the present study into technology-facilitated environmental agency in the context of family is rooted mainly in the qualitative research paradigm, though our methodology also calls for descriptive quantitative data collection and analysis. We chose the collective case study (Stake, 1995) as our approach to inquiry, applying purposeful sampling (Creswell, 2007) in order to select as many ordinary cases as possible of urban families aiming to adopt more sustainable lifestyles at home.

We decided on two cities as sampling pools for our study. Throughout the world, cities are now home to most of the planet's population (Buhaug & Urdal, 2013). We believe that it is not only relevant, but also important to investigating how families living in cities try to adopt more sustainable actions since increased urbanization can, itself, accentuate serious environmental problems, such as water scarcity and water contamination. Although smaller in numbers, it should be noted that the experiences of non-urban households (e.g. rural, remote) are also important; however, they are beyond the scope of the present study. Moncton, in Southeastern New Brunswick (population = 140 000 people), is the first of two cities involved in the study. The second sample city we chose is Montreal, in Quebec (population = 1.7 million people). In each city, a number of families were selected and represented our multiple study cases. In order to address the second research objective, which calls for a more quantitative approach, we devised a methodological strategy based on a quasi-experimental model, where an experimental group and a control group are required. All participating families included: two parents; an adolescent child identified by collaborating schools; and between two and three additional children. These families were of similar socioeconomic status, specifically middle to upper middle class, though further research is needed into the experiences of families of all socio-economic classes.

In the fall of 2017, after soliciting the help of local schools in the Moncton area, we sent out approximately 500 invitations via e-mails to parents of children aged 13 to 17, living in that city, who identified as interested in adopting more sustainable household habits. In total, 31 families responded asking for more information, of which 21 agreed to take part in our four-month study (November and December 2016; January and February 2017). We randomly divided the

families into two distinct groups, the first being the experimental group ($n = 12$), which used Facebook as a tool for environmental agency in the family, and the other being the control group ($n = 9$), which had access to the same supports for change, only via individual e-mail instead of through social media. Both groups received regular information and counsel on issues relating to climate change, specifically on how to reduce their dependence on electricity at home. This information came from a separate family that was not among the research participants, who already lived sustainably and was chosen by the researcher. This “expert family” would make regular postings in the private Facebook group to inform and stimulate network activity among its members. They would send the same information to individual participating families of the control group via e-mail. Again, these e-mail addresses were obtained with the permission of participating schools. The idea was to see if the social network aspect of the experimental group would contribute to the experience of adopting collective environmental actions as family. In the e-mail group, one parent was designated to receive all information. That parent would then be expected to share with his or her family. By contrast, all members of the social media group with a Facebook account would receive the same information at the same time.

One year later, the same methodology was applied to the larger participating city of Montreal, except for a slightly different sampling strategy. In the province of Quebec, access to schools for research purposes is somewhat more complicated, requiring permissions that need to be submitted well in advance. Given the time restriction of our funding and research plan, we decided to approach the Parents’ Committee from the *Commission scolaire de Montréal* (Montreal School Board). They agreed to advertise our call for participating families in their monthly news bulletin; families interested in a greener lifestyle were instructed to contact researchers for more information. In total, 39 families responded, asking for more information. Of these, 28 agreed to take part in our four-month study (November and December 2017; January and February 2018). Again, we collected consent forms from all families, randomly dividing them into two equal and distinct groups of 14 families. As with the Moncton cases, the first group was identified as the experimental group, that is, the one that would use Facebook as a tool for environmental agency. The other group was identified as the control group, which had access to the same supports for change via e-mail. Both groups of Montreal families also received regular information and support from the same “expert family” to help them adopt climate change mitigating behaviours. It should be noted that three families from the experimental group as well as seven families from the control group decided to retract their commitment to participate less than one month before beginning of the four-month experimental period, citing time concerns and an unwillingness to participate in an exit interview. Therefore, for the Montreal study site, we worked with an experimental group of eleven ($n = 11$) participating families, while our control group for this city contained seven participating families ($n = 7$).

Regarding the quantitative component of our work, we first relied on descriptive statistical analysis to get a better picture of social media usage by participating families in the experimental group in both cities. More specifically, for both experimental groups (i.e., in both cities), we kept a daily record of network activity, such as the number of “posts” and “comments” for each participating family. We then used graphs to reduce the raw numerical data and facilitate analysis. As for the control groups in both cities, we simply noted the frequency of responses from each participating family following every informative e-mail sent out by the expert family. Of course, as per our design, there were no exchanges between families in the e-mail group; rather, there were only potential exchanges with the expert family. This was deliberate in order to see the potential impact of social networking on the development of ecoresponsible behaviours. We also collected monthly electricity bills for all participating families during the four-month study periods, for the Moncton site and the Montreal site. These documents allowed us to compare kilowatt-hour consumption during the study months for control and experimental groups from both cities, with kilowatt-hour consumption for the same months of the previous year (a figure provided by both provincial electricity providers). It is also important to note that analysts from both power utilities adjusted kilowatt-hour figures from the previous year before we compared them to figures from the study months in order to account for average monthly temperature differences.

As for the qualitative aspect of our study, we conducted semi-structured exit interviews with participating families from both the experimental Facebook group and the control e-mail group (for both study cities). These interviews were conducted by the principle researcher and a research assistant. Most interviews took place in the homes of participating families, in person, but some were done via telephone due to availability and logistical considerations on the part of some participants. An inductive process of thematic analysis (Paillé & Mucchielli, 2012) was undertaken to identify, organize, and describe relevant categories (or themes) surrounding the discourse of participating family for both groups from both cities. During analysis, two researchers independently established codes to represent emerging themes within each case and compared their results. Similarities and differences across participating families, in each group and between groups, were the established in order to isolate common principle themes.

Results

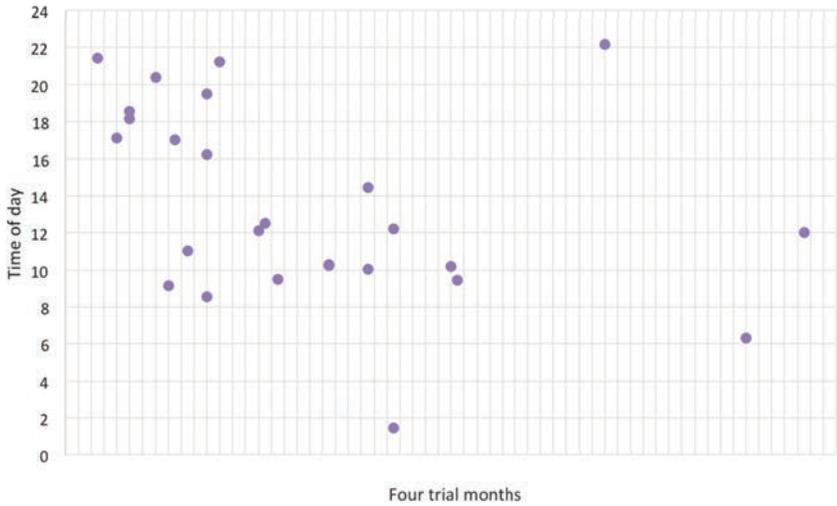
The following section presents results from both the qualitative and quantitative exploration of participating families’ experiences in adopting collective sustainable actions at home. These results offer insight into the research question guiding the present study: How do social media such as Facebook influence the adoption of climate change mitigating actions in the context of families living in an urban setting?

Quantitative Results

From quantitative data registered daily over the four months of experimentation, we were able to establish certain patterns in both the Facebook and e-mail groups for each study site (Moncton and Montreal). Thus, the following data are instrumental in addressing the first research objective. In the e-mail group, the only quantifiable information available was the number of corresponding e-mails sent from each participating family to the expert family in response to a particular shared piece of information. From the nine control group families in the Moncton site, the expert family received 49 e-mail messages in total over four months, mainly asking for more detail on a given subject. In the Montreal site, the expert family received 42 e-mail messages with a similar clarification intent. Very few of the control group families from both cities (only three families from the Moncton control group and two families from the Montreal control group) fostered an ongoing exchange with the expert family. Most sent no more than one or two e-mail messages during the entire project.

By contrast, we recorded much more activity in terms of response to the expert family's messages (Facebook posts) for the experimental private Facebook groups in both cities. These responses, in the form of a "like" and/or a "comment", serve to establish a certain level of participation and engagement in the group. Though based on a relatively small number of participants and exploratory in nature, we believe the higher response frequency in the Facebook group serves as evidence of a more involved level of engagement for those participants. Another sign of this improved level of participant engagement is the fact that 20 out of the 23 Facebook group families (10/12 from the Moncton site and 10/11 from the Montreal site) posted information on the social network during the four-month experimentation period. Such information included news articles on environmental issues as well as advice on how to conserve electricity. Contrary to "commenting on" or "liking" another person's posting, such activity is self-initiated and represents, in our view, a very high level of engagement, both to the object (developing climate change mitigation actions) and to the person (other families in the virtual network). Furthermore, an interesting time-related pattern emerged vis-a-vis participant activity in the combined experimental Facebook groups. As Graph 1 illustrates, postings dropped dramatically in the second half of the study, and participants (combined $n = 23$) seemed to be slightly more active during the day than in the evening. It was also interesting to see that participants' posting activity was as prevalent during daytime or evening (that is, in the first two months of experimentation).

To address the second research objective, we needed data from monthly electricity bills, which we were able to obtain by collecting all participants' power bills, from both provincial power utilities (*NB Power* and *Hydro Québec*). In terms of electricity saved during the four-month study period for both control groups,



Graph 1. Publications shared by member families from both Moncton and Montreal Facebook groups (n = 23)

we noted that five of the nine (5/9) participating families from the Moncton e-mail users managed to save an average of 8% on their electricity bill, while four of the seven (4/7) e-mail users from the Montreal group saved an average of 7% on their electricity bills over the same study months. These figures translate to an average kilowatt-hours savings of $\bar{x} = 175$ kWh for all control group participating families ($\bar{x} = 196$ kWh for the Moncton families; $\bar{x} = 148$ kWh for the Montreal families).

When we compared monthly electricity bills for both experimental Facebook groups over the same four-month study periods (Nov. 2016 to Feb. 2017 for the Moncton study; Nov. 2017 to Feb. 2018 for the Montreal study), we found that these participating families also managed to save electricity during the study. More specifically, we noted that seven of the twelve (7/12) participating families from the Moncton Facebook group saved an average of 10% on their household electricity bills, while seven of the eleven (7/11) families from the Montreal Facebook group saved an average of 11% on their electricity bills over the same study months. For the experimental Facebook groups combined, there was an average kilowatt-hours savings of $\bar{x} = 311$ kWh for participating families ($\bar{x} = 306$ kWh for the Moncton Facebook users; $\bar{x} = 317$ kWh for the Montreal Facebook user).

Finally, when we looked at the kilowatt-hours saved for families in both Facebook groups (Moncton and Montreal combined), we noticed an association between the amount of electricity saved and the level of activity in terms of

“comments” and “likes” posted by families. The following table (Table 1) shows that, in general, families with a higher participation rate in the private Facebook group seem to have saved more electricity over the study.

After compiling and analyzing descriptive data for both the experimental and control groups, we attempted to get a better understanding of the human experience of adopting environmental action as part of a virtual social network. At the end of the project, we conducted exit interviews with available consenting families of both groups (n = 32) in order to compare the experience of attempting household environmental action as part of an online network of like-minded families with that of attempting change without the support of a peer group.

Facebook Families (n = 23)	Level of Facebook Activity	KW/h saved
A	Not Active	0
B	Very Active	335
C	Not Active	0
D	Very Active	587
E	Very Active	633
F	Somewhat Active	276
G	Very Active	0
H	Very Active	597
I	Very Active	910
J	Not Active	0
K	Somewhat Active	340
L	Somewhat Active	0
M	Very Active	340
N	Not Active	0
O	Somewhat Active	250
P	Very Active	560
Q	Very Active	610
R	Not Active	0
S	Very Active	590
T	Not Active	0
U	Very Active	820
V	Not Active	0
W	Somewhat Active	320

Table 1. Facebook activity and electricity saved for all experimental group families

Qualitative Results

Here are some of the questions and prompts asked during these semi-structured interviews, which lasted approximately 30 minutes on average: What actions did your family adopt during the project? Describe your family's experience as it attempted to reduce household electricity use [as part a private Facebook group/having access to support via e-mail]. What are your thoughts on the support you received from the expert family? How was your experience affected by your [involvement with / isolation from] other families also attempting to adopt sustainable action at home? What challenges did your family encounter during the project?

After applying a process of thematic content analysis (Paillé & Mucchielli, 2012) to transcribed interview data, we found a number of emergent themes that seem to corroborate our quantitative results. They also provide a deeper understanding of what participating families in both groups experienced. This experience was, according to our qualitative data, similar in some ways, yet different on other levels. For example, families from both groups seemed to find it difficult to sacrifice certain comforts, such as taking long hot showers. For their part, only families from the Facebook group spoke of a higher level of collective engagement during the project months, especially from the children. The parents of these families shared how impressed they were to receive frequent reminders from their children to turn off the lights, for example. Such qualitative themes are identified in Table 2, along with supporting excerpts from qualitative data collected from consenting families (n = 32) in both cities.

Discussion and Conclusions

In light of increasing global environmental problems, such as climate change, millions of people throughout the world are looking for solutions. Though large-scale interventions are necessary if we are to meet Paris Agreement targets of limiting global temperature rise to under 2 degrees Celsius (United Nations, 2015), there is still a need for local action, such as reducing household electricity consumption. The most recent IPCC Report (October 2018) remarked on “shared socioeconomic pathways” (SSPs), which focus on adaptation to **and** mitigation of climate change. This relatively new point of view draws a new dimension to the IPCC's climate modeling, one that considers the impact of changes in human behavior. In the digital age, from the human behavior perspective, particularly relevant to incorporate the use of social media in the fight against climate change.

The present paper aimed to evaluate the use of virtual social networks to foster collective environmental action in the context of family. Our exploratory study offers descriptive and qualitative evidence that Information and Communication Technologies (ICTs), such as Facebook and e-mail can contribute to

efforts to reduce electricity use in urban families already intent on leading a more eco-responsible lifestyle. Though our study's research design did not allow for direct attribution of energy savings to the use of ICTs, descriptive data as well as qualitative results do seem to point to some degree of effect, justifying further research on the use of technology in adopting pro-environmental action in families.

Major themes	Groups	Supporting examples from focused coding	Supporting excerpts from participant interviews*
Relatively simple chosen actions	Both groups	- Reducing hot water usage. - Reducing ambient temperature.	<i>I take short showers now. (EMG-C)</i> <i>We've gotten used to lowering the thermostat a couple of degrees in the daytime. (FBG-P)</i>
Changing habits is difficult	Both groups	- Change takes time. - Sacrificing comfort is difficult.	<i>I sometimes forget to turn the heat down for the night, but I'm getting better at it. I just can't give up my long hot showers though. (EMG-P)</i>
Higher environmental awareness	Both groups	- Higher collective awareness of environmental problems. - Higher collective awareness of impact on the environment.	<i>Messages from the model family helped us to know more about nature and pushed us to talk about what we can do to help. (EMG-P)</i>
Higher family engagement	Facebook group	- All family members are involved in change efforts. - Families are encouraged by a sense of support from others.	<i>It felt good to do something as a family, all together. (FBG-P)</i> <i>We really felt that we were not alone in our efforts. (FBG-P)</i>
Higher participation from younger family members	Facebook group	- Children remind parents to stick with actions. - Children are active in simpler actions (e.g.: turning out lights).	<i>I liked it when I told daddy to turn off the TV. (FBG-C)</i> <i>It was great to see the kids running around turning off lights. (FBG-P)</i>
More family conversations about the environment	Facebook group	- More meaningful discussions on family environmental values.	<i>We found ourselves talking more about nature with the kids. (FBG-P)</i> <i>I liked talking to mommy about helping the polar bears. (FBG-C)</i>

* Abbreviation legend: EMG = e-mail group; FBG = Facebook group; P = parent; C = child

Table 2. Results from thematic content analysis of exit interviews from experimental and control groups

More specifically, families from the experimental Facebook groups and the control e-mail groups in both study cities were able to reduce their electricity consumption during the project in terms of monthly kilowatt-hours saved. This suggests that concrete pro-environmental actions can be adopted by families through both Facebook and e-mail use. Qualitative data served to identify the pro-environmental actions attempted during the project and helped to shed light on how participating families from both groups, in both the smaller city (Moncton) and the larger metropolis (Montreal), were able to reduce their electricity consumption during the project months. As for the nature of the actions attempted and seemingly adopted by all participating families (e.g., limiting hot water use, shutting off the lights when leaving a room in the house, reducing ambient temperature in the house during the nights), they were all relatively simple. These results are in line with our previous work on family-based environmental behavioural change (Léger & Pruneau, 2013, 2012, 2011). Finally, from a quantitative perspective, both the control e-mail and experimental Facebook groups showed similar effects in terms of energy savings, as evidenced by their electricity bills, with the Facebook group showing slightly higher savings.

Qualitative content analysis of the exit interviews conducted with participating families from both study sites revealed emergent qualitative themes, highlighting similarities as well as differences between the experimental and control groups, specifically as related to the experience of family-based change. For example, participating families from both Facebook and e-mail groups mentioned that changing energy intensive habits was difficult. As Maiteny (2002) suggests, it is hard to change comfort habits for more sustainable and often less practical actions. The mother of one participating family put it this way: "I know it's better for the environment if I simply put on a sweater when I'm home on a cold day, instead of raising the thermostat a couple of degrees ... but I'm so used to it just being toasty warm." During the exit interviews, families from both experimental and control groups also stated having higher levels of environmental awareness as a collective after having participated in the study. However, members of the experimental Facebook groups from both cities showed higher levels of collective engagement towards the environment. In contrast with the control e-mail groups from both cities, all participating members of the Facebook groups - adults and children - were involved in ensuring collective change efforts as a family. In fact, children seemed to play an important role in these families' success at adopting collective environmental action. For example, children would often remind adults to stick with the agreed upon actions. The Facebook families also mentioned being encouraged by a sense of support from other families in the social network, a potential motivating factor inherently not part of the family experience in the control group. Finally, another difference between experimental and control groups, which emerged from the thematic analysis of exit interviews, was the higher number of reported family conversations about environmental themes in the Facebook group.

In conclusion, although our results seem to point to some transferable benefits of social media use in adopting energy-conscious actions (i.e., family engagement boosted by a higher sense of collective support, more participation from younger family members, more meaningful family conversations on environmental values), they do not lend themselves to a more generalizable view. Moreover, our descriptive quantitative data do not seem to support the idea that using social media-type technology is any more efficient than less socially oriented, e-mail-type technology in enticing families to adopt lasting collective environmental action. In other words, social media did not prove to be substantially more effective in contributing energy reducing actions in urban families (Facebook participants showed only a slightly higher energy savings when compared to the e-mail group). However, Facebook does seem to contribute to enhancing family engagement in environmentally friendly practices, especially in younger family members. This finding was exclusive to the Facebook participants. Finally, we reiterate that more research is needed in order to better understand the possible contribution of ICTs (including but not restricted to social media) and other technologies to the adoption of collective pro-environmental action in the context of family. Specifically, further investigation is warranted on the household climate change mitigation experiences of families from all socio-economic strata as well as of families in more rural and remote areas.

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Notes on Contributors

Michel T. Léger is an associate professor in the Université de Moncton's Faculty of Education, in New Brunswick. With a PhD in education, he currently teaches environmental education and his research interests include eco-phenomenology and ecopsychology, focusing on the study of environmental behavior within families. Contact: michel.t.leger@umoncton.ca

Having completed a Master of Environmental Sciences degree with a focus on environmental education at the Université de Moncton, **Shawn Martin** currently teaches in the New Brunswick public school system. Contact: shawn.martin@nbed.nb.ca

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