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# The Role of Youth Environmental Stewardship in Generating Awareness of Energy Efficiency

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Team 5: Energy Transformation  
Consulting

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## **1.0 Executive Summary**

This project focused on developing and implementing an educational program for students and staff at Dunsmuir Middle School about energy efficiency and renewable technologies by exploring ways to encourage Colwood families to participate in the Solar Colwood program. Solar Colwood is the first municipal leadership program in Canada providing a demonstration of a whole community attempting to move towards renewable energy technologies and energy conservation. The purpose of this study was to investigate the effect of youth environmental education together with an increased knowledge about the Solar Colwood program in energy awareness in the parents, or guardians of the students. The Royal Roads University research team (Energy Transformation Consulting) was involved in three classes within a Grade 7 Environmental Stewardship class, consisting of a field trip to a local solar home, and two classroom sessions. A parent survey developed by the Royal Roads University and Pacific Institute of Climate Solutions research team was delivered to the parents of students that had taken the Environmental Stewardship class and was used to assess the level of influence the students had on their parents regarding home energy efficiency. This project also involved an evaluation of the existing curriculum and delivery methods being completed by our sponsor Susan Kerr and included recommendations for restructuring of the program. This was accomplished by utilizing a mixed methods approach to collect quantitative and qualitative data on the original curriculum delivery, in order to revise and re-implement the delivery to an Environmental Stewardship class.

Due to the poor return rate of the parent/guardian surveys and the low sample size, interpretations of the data were limited. Certain aspects of the revised curriculum delivery appeared to be successful, such as the restructuring of media, which included a summary of the topics covered, an added focus on the local environment, and an increase in hands-on activities. Upon completion of the study it is recommended that:

- More parental participation be incorporated into the take-home assignment and action challenge;
- The observation form and quiz format be consistent through numerous classroom sessions to ensure the validity of results;

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- The amount of educational materials and Solar Colwood promotional materials the students are given is increased to help with uptake of knowledge;
- More time is allotted for on hands-on activities, such as the field trip; and
- Further research regarding the effectiveness of transgenerational learning with different age groups needs to be conducted and evaluated for its applicability to this program.

## 2.0 Acknowledgements

Energy Transformation Consulting would like to acknowledge: Dr. Chris Ling and Susan Kerr, the project sponsors; Dr. Charles Krusekopf and Dr. Ingrid Kazjer Mitchell, the project co-sponsors; Dr. Alison Moran, the academic advisor; Heather Wanke, the program administrator; Mickie Noble; the Solar Colwood Team; and the staff and students at Dunsmuir Middle School.

## 3.0 Glossary of Terms

**Action Research:** A participatory process concerned with developing practical knowledge in the pursuit of worthwhile human purposes. This definition is a work in progress, as it is an underlying objective of the project to develop an understanding of the concept.

**Data Saturation:** Occurs when new information is no longer heard or seen in interviews or surveys. Data is analysed throughout the project, rather than at the end of collection, to examine common themes.

**Transgenerational Learning:** The transfer of knowledge from one generation to another.

**Data Triangulation:** The use of different sources of information in order to increase the validity of a study.

**Mixed Methods:** Research method that incorporates both quantitative and qualitative research methods (Denzin & Lincoln, 2011).

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**Acronyms and Abbreviations:**

**SCT:** Solar Colwood Team

**PICS:** Pacific Institute for Climate Solutions

**ETC:** Energy Transformation Consulting

**RRU:** Royal Roads University

**PV:** Photo Volatic Cells

**SHW:** Solar Hot Water

**DSHP:** Ductless Split Heat Pumps

**NRC:** Natural Resources Canada

**SC:** Solar Colwood

## **4.0 Introduction**

### **4.1 Scope of the Project**

The sponsors have appointed the major project team Energy Transformation Consulting (ETC) to continue the environmental education and outreach action research project. This project is currently focused on: developing and implementing an educational program for students and staff at Dunsmuir Middle School about energy efficiency and renewable technologies by exploring ways to encourage Colwood families to participate in the Solar Colwood program. The project will further evaluate the effect of youth environmental education together with an increased knowledge and awareness about the Solar Colwood program in the parents or guardians. The time frame for the project is from January to August, 2013. A review of the previously collected data from Solar Colwood and the Pacific Institute for Climate Solutions Research team will be performed. In addition, the major project team will evaluate current practices in the classroom setting and develop changes to the current curriculum delivery, with the intention of increasing uptake.

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## **4.2 Research Questions**

The team has developed the following two research questions to be answered through the course of the project:

a) Does an environmental education and outreach program conducted by the RRU PICS research team encourage youth in talking with their parents or guardians about the Solar Colwood program?

b) How does increased environmental education in middle school children affect parent's level of education and awareness, specifically with participation in projects relating to renewable energy practices in the home (Solar Colwood)?

### **4.2.1 Supporting Objectives**

The team has identified the following supporting objectives of the project:

- Develop recommendations, make a presentation and report the results to RRU executive, staff and Solar Colwood partners.
- Gain experience assisting in workshop facilitation in a Middle School classroom, field trips, and small student groups and at a community event.
- Gain an understanding of environmental education and outreach learning theory and community engagement.
- Develop an understanding and practice of Action Research.

## **4.3 Background Information on Solar Colwood**

Solar Colwood is the first municipal leadership program in Canada that encourages a whole community to move towards renewable energy technologies and energy conservation. The aim is to have 1,000 Colwood residents and businesses take energy saving actions at home, at work and on the road. Energy saving actions include retrofits such as solar hot water systems, ductless heat pumps, energy efficient heating systems, insulation, air sealing, energy efficient windows and doors, and water and energy saving plumbing fixtures. Solar Colwood highlights Colwood as a

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leader in sustainability, taking concrete actions to reduce their community footprint. Natural Resources Canada has provided \$3.9 million in funding over three years (2011 - March 2014). This funding is to be used to transform the City of Colwood. Its goals will be met through various outputs, including:

- Creating jobs and training people to improve the local economy;
- Creating leading-edge demonstration projects; and
- Providing measurable progress towards energy conservation and climate action goals.

The City of Colwood received a Climate and Energy Action Award from the Community Energy Association for their innovative Solar Colwood partnerships. These partnerships include Royal Roads University, BC Hydro, the T'Sou-ke Nation, WestShore Chamber of Commerce and the LiveSmart BC program.

By the end of June 2013, over 400 energy saving actions and nearly 1,900 education activities have taken place through the Solar Colwood Initiative. In addition, 33 solar hot water systems and 88 ductless heat pumps have been installed (City of Colwood, 2013).

#### **4.4 Background Information on Pacific Institute for Climate Solutions**

A research grant was awarded to three Royal Roads University staff members by the Pacific Institute of Climate Solutions for the project: “Understanding the public uptake and acceptance of municipal green energy incentives program”. This project is financially independent of the Solar Colwood funding from NRC, but serves to further its goals by way of research and recommendations. (Ling 2013).

The main objectives of this research were to broaden the depth of knowledge available on energy technologies through homeowners in the city; to gather information on the economic impacts of energy efficiency improvements; to develop a more effective social marketing approach than what was currently in effect; and to break barriers to the community. In addition, an action researcher was hired to coordinate an educational and marketing program that promotes energy saving actions in the home, and encourage participation in the Solar Colwood Program. As part of this program, ETC was given the opportunity to evaluate the educational program and deliver it to students at Dunsmuir Middle School. (Ling, 2013).

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#### **4.5 Background Information on Original Education Program**

One of the sponsors of this project is the original developer and facilitator of the Solar Colwood environmental education and outreach action research program that is continued for this report. The program is integrated into the Grade 7 Environmental Stewardship class at Dunsmuir Middle School in Colwood, British Columbia. The Environmental Stewardship class is offered as an elective, with a focus on accountability and responsibility for the environment. With the class objectives in mind, the Solar Colwood educational program was developed with an accompanying goal of increasing uptake into the Solar Colwood program.

The Solar Colwood educational program consisted of three 1 hour and 10 minute sessions, with the first session being comprised of a field trip to a Solar Colwood home located within walking distance from the school. At this home, three stations were set-up: an electric car station with a home energy consumption tablet; solar panel identification and hot water heating; and, home energy assessment requirements with insulation and thermal imagery. The following sessions were based on a review of the concepts presented on the field trip as well as actions that the students can take to improve energy efficiency.

#### **4.6 Limitations**

This project has the potential to be wide in scope, so to manage the project effectively and present specific results, it has been limited to qualitative and quantitative observations, revision and implementation of in-class activities. The sponsor and the participating school suggested including extra-curricular activities, but due to time constraints and scheduling conflicts it was not feasible. Team ETC did manage to volunteer at a Youth Climate Action conference and aided one of our sponsors with the facilitation of a short educational session regarding energy efficiency and Solar Colwood, but this did not contribute to the body of data needed for this report.

#### **5.0 Materials and Methods**

Materials for the classroom sessions can be found in Appendix D. The greenhouse gas game used in the revised curriculum delivery for Group 2 Session 2 (Appendix B) was modified slightly from an environmental education in action resource at WildBC.

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## **5.1 Program Development**

The team decided that division of the project into phases would assist in maintaining organization and adhering to the established timeline. This section will describe each of the phases.

### **5.1.1 Phase 1: Observation of Classroom Sessions**

- Observations of the existing program were made by all four team members to develop an understanding of the topics covered. These observations provided basics for revisions to the delivery of the curriculum and were performed using a standardized evaluation sheet that was developed by ETC.
- Evaluation accomplished through mixed methods approach using curriculum based quizzes, surveys and qualitative notes completed via classroom observation with the use of standardized evaluation sheets.

### **5.1.2 Phase 2: Revision of the Curriculum Delivery and Re-implementation**

- Using data collected from observations made in Phase 1 and quiz responses, revisions to the delivery of the curriculum were developed.
- Implementation of curriculum delivery revisions by the major project team was evaluated in the same manner as Phase 1.

### **5.1.3 Phase 3: Development and Implementation of an Extracurricular Activity**

This phase was time-dependent and was not completed throughout the course of the project due to scheduling conflicts. This phase had been developed to support one of the underlying objectives but was not required for data collection or analysis. Had this phase been undertaken, it would have consisted of the:

- Development of an activity for Dunsmuir Middle School in collaboration with the principal to incorporate environmental stewardship in the school and/or community.
- Facilitation of the proposed activity.

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#### **5.1.4 Ethical Reviews**

In order to use the information collected, an extensive ethical review was conducted.

- Approval from Sooke School Board District 62 was obtained under the ethical review conducted by Solar Colwood for Action Research, which included research assistants (major project team).
- An ethical review was completed for Royal Roads University, and was approved.

#### **5.1.5 Standardized Classroom Evaluation Sheet**

In an initial literature search, specific evaluation methods were not found. However, a document entitled *Classroom Observation Tools* proved to be useful; this component is summarized 7.1. The team was interested in gathering quantitative and qualitative data regarding the student's participation, engagement and attention span during each of the classroom sessions. Student participation was measured by counting the number of questions, comments as well as the number of individual students participating. Qualitative data is based off of student behaviour to identify barriers and differences within the set of students.

#### **5.1.6 Classroom Quiz Development**

The team was interested in gathering data reflecting the level of uptake during the classroom sessions. Two quizzes were created for in-class lesson plans one and two, containing four and five questions, respectively (Appendix J). The questions were generated from the lesson plans and reflected the key points. The majority of the questions were open ended, allowing the students to write down multiple answers. The same quizzes were used in Group 1 and Group 2 facilitations.

#### **5.1.7 Parent/Guardian Surveys**

As part of the PICS project and Solar Colwood, a survey was developed to assess the understanding of energy efficiency in Colwood homes as portrayed through resident's opinions. The survey consists of 13 questions, including one for general comments, and is available online. PICS established baseline data of the survey results of Colwood residents at the beginning of the project and launch of Solar Colwood.

An invitation to complete the survey was extended to parents and guardians of students involved in the Solar Colwood educational program. Through the results of this survey, comparisons will be made with data collected in the classroom, to assess if transgenerational learning was accomplished.

## **5.2 Program Materials**

Lesson 1, the field trip to a Solar Colwood home, did not require any materials from ETC, as the Solar Colwood Team (SCT) provided and facilitated the session. The SCT did, however, require various materials involved in an energy audit, such as a thermal camera, solar pathfinder and ventilation fan.

Lesson 2 involved the use of three short video clips, which were presented to increase understanding of the material. The greenhouse gas game required each student to be given one of nine energy sources represented on a piece of paper, i.e., natural gas, coal, oil, nuclear, solar, wind, geothermal, biomass, and hydro (Appendix C).

The take-home assignment required each student to be given a plastic flow rate bag provided by the Capital Regional District, as well as sheets on which they could record answers to the questions posed by Solar Colwood (Appendix K). Home Energy Savings Kits were also presented to the class and these required a parent or guardian to complete a form (Appendix L). Lesson three required very few materials, with the exception of notepads and calculators (Appendix D).

## **6.0 Literature Review/Case Studies**

This section summarizes the literature reviewed to assist in the development of changes to the delivery of the educational program at Dunsmuir Middle School. It was utilized to help ETC with observation techniques and tools, as well as providing background information on the importance of transgenerational learning and critical factors to the success of environmental education programs in promoting this behavior. All reviews were made in relation to the components of the project that ETC used for consideration or incorporation to the varying aspects of the research.

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## **6.1 Classroom Observation Tools**

This document was developed from materials obtained through a Google search of observation tools. It was used to develop the standardized observation forms for use during the classroom sessions. The document primarily discusses examples and suggestions of what to consider while developing a research program in a classroom setting. A variety of methods are mentioned, including: measures of academic performance, interviews, and direct observation of classroom behaviors. (Chesterfield, n.d.)

An example of the development of textbooks for use in a school in Ghana demonstrated that the students benefitted from having materials in their possession, rather than using shared resources that an instructor monitored. The importance of observational data was discussed with regards to improving performance in the classroom and to determine areas in which further research needs to be conducted (Chesterfield, n.d.). This was a consideration in evaluating the Solar Colwood education program already in place, and efforts were made to increase materials that students had possession of.

ETC was able to use several of the observational strategies suggested in this document, including: preparing how to introduce the role and objectives to the students and ensuring that comments are positive and encouraging rather than insensitive or negative. There were two specific strategies that ETC incorporated into delivery of the curriculum: “observation point” where the researcher finds a point where the classroom is fully visible but not contained within the main parts of the classroom; and “teacher’s helper”, where the researcher acts more like a teacher’s assistant, responding to student questions (Chesterfield, n.d.)

In developing a successful instrument for observation, several suggestions are made. A heavy emphasis on the training of the researchers will ensure success of the research itself. Training activities include developing common definitions and procedures, as well as simulation exercises (Chesterfield, n.d.). It is important to note that ETC did not receive any training related to observational data collection in the classroom and was, therefore, not adequately prepared or trained in lesson plan development and facilitation.

From this document, ETC decided to use a form of a “Checklist” as an instrument for observation. This entails measuring the presence or absence of an event or action (Chesterfield, n.d.). Specifically, ETC used a “frequency count”, tallying the actions of students that we were most interested in for answering our research questions. Team members are also encouraged to

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define which behaviors they are looking for to record, which ETC was diligent in doing so by dividing the lesson plans into parts for easier recording. Classroom engagement is measured based on activities that the students are doing, where the observer is the judge in the types of behaviors seen (Chesterfield, n.d.). By developing a standardized observation sheet ETC ensured that the actions recorded were written in a similar fashion and were consistent throughout the different sessions facilitated.

“Running logs” were also used by ETC as a narrative description of the sessions with the students (Chesterfield, n.d.). Modifications were made to the format to incorporate the objectives of this study. It was suggested that codes were incorporated into these logs, however it was of the opinion of ETC that these were not necessary based on the examples provided and limited time for the preparation prior to facilitated sessions. Developing a coding system in the time permitted seemed to be very complex and was not understood to be elemental in evaluation of the classroom, however, certain codes were discussed by ETC indirectly prior to the evaluations. An example of this would be what was considered and recorded as a comment by the students during classroom sessions. ETC discussed that any raised hand, positive verbal interaction with the facilitator or question answered would be considered as a comment and would be recorded and included in our quantitative data.

Since this document provided an overview of several tools to use when answering research questions, ETC decided to incorporate many of them into a mixed methods approach, which was recommended as the most appropriate action.

## **6.2 A Review of Research on the Effectiveness of Environmental Education in Promoting Intergenerational Learning**

Duvall and Zint (2007) reviewed research literature between 1992 and 2003 pertaining to the intergenerational effects of environmental education programs. Seven articles were reviewed in total, and the authors also identified factors that may facilitate intergenerational learning as well as future recommendations for research.

The importance of intergenerational learning is stressed by the pressing issue of the problems faced to the environment today. Most education programs only focus on children and their ability to change the future; however, the influence of parents and grandparents has the ability to create positive changes now rather than in the future. Adults, however, are much more rarely available to be taught, but the design of environmental education programs that encourage students to

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share their knowledge with adults has the potential to influence their behaviours. (Duvall & Zint, 2007).

Duvall and Zint concluded that the studies performed thus far suggest that environmental education programs only have “a modest potential to influence parental knowledge, attitudes and behaviour.” They also identified some limitations to the studies that may have influenced this general outcome. The length of most of the programs was short and intergenerational learning and changes in behaviour might occur best over a longer period of time. (Duvall & Zint, 2007). This can also be identified in parallel to the short classroom program that ETC experienced in the duration of this report.

Secondly, only one of the studies conducted a follow-up post-test to measure the durability of intergenerational transfer of learning. This study also demonstrated that some information may have spread beyond immediate family members. Given the duration of the ETC research for this report, it was not feasible to assess the durability of intergenerational learning properly; however, this could be a consideration in further studies. Only a few of the studies reviewed incorporated homework components that were designed to actively engage parents, rather than dependence on “spontaneously initiating discussions”. These studies showed generally more success at intergenerational transfer of knowledge with the incorporation of take-home assignments (Duvall & Zint, 2007). The original Solar Colwood education program incorporated homework components in its design prior to ETC delivery. It was the impression of ETC that these homework assignments were critical to the program; however, in retrospect, the program and intergenerational transfer may have benefitted from slight changes to the assignments so as to require parental involvement or supervision.

One of the supporting objectives of this project was the design and implementation of an extracurricular or community activity involving Dunsmuir Middle School. This review also discussed the research suggesting that a strong relationship between schools and the community fosters a sense of ownership and creates roles for all members involved as “agents of social change” (Duvall & Zint, 2007). An extracurricular activity, such as development of a Green Team within Dunsmuir Middle School, was discussed and would have been beneficial in increasing dialogue between students and ETC. However timetable conflicts prevented ETC from completing this additional activity. ETC participated in the YesBC Youth Action Climate Summit alongside our sponsor in an effort to increase the presence of Solar Colwood in the

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community and support the underlying objective of this project to gain workshop facilitation experience.

There were several other factors identified in this review. For instance, the status of children within the family is often considered to be below the parents; parents are seen and project themselves as the “expert”; however, the information children are armed with in school is often more current. It has been identified that programs may benefit from focusing on how to practice environmentally conscious behaviours rather than solely provide background on the issues. In addition, a focus on local issues is often more effective and will promote action at the very level that students or their parents can participate in. (Duvall & Zint, 2007). Based on this principle, ETC was able to add components of the local watershed to the third session of the program, with the aim of increasing interest among the students and to promote a discussion with their families.

## 7.0 Program Delivery

### 7.1 Curriculum Outline

Sessions lead by the original facilitator of the program were observed by the team and the standardized classroom evaluation sheet was used to record observations. A classroom quiz was also developed for the two in-class sessions that had the purpose of assessing the uptake of the information presented to the students (Appendix J).

Based on the observations made by the team and the results of the quizzes, revisions were made to the lesson plans provided by the original facilitator. The original curriculum delivery is located in Appendix A, and the revised curriculum delivery is located in Appendix B. Revisions made along with justifications are identified in the following table:

*Table 1: Brief description of the revisions made from the original curriculum delivery.*

Lesson 2	Revisions	Justifications
<b>Part 1: Energy Use Review</b>	The meaningful connection formula was replaced with general questions posed to the class to find out the level of greenhouse gas and climate	The formula seemed better suited to the beginning of the field trip review section, to present the example associated with the field trip. The questions asked were intended to provide the

	<p>science knowledge among the students.</p> <p>Two videos were shown rather than three and the videos were changed.</p> <p>A greenhouse gas game was developed to further the students understanding of greenhouse gas emission sources and clarify the difference between renewable and non-renewable resources.</p>	<p>facilitators with direction on leading discussions throughout the session.</p> <p>Three consecutive videos seemed to lose the attention of many students. The videos were changed in an effort to contain less narrative style.</p> <p>The game had the intention of incorporating the entire class into a discussion and participation was to increase the uptake of information presented.</p>
<b>Part 2: Field Trip Review and Other Energy Saving Ideas</b>	<p>The meaningful connection formula was presented first, using the SC home as an example. A Solar Colwood representative was unavailable to discuss the field trip, so a discussion was had with the students reviewing what they learned.</p>	<p>The formula seemed better suited to this section for a smooth transition.</p>
<b>Part 3: Take-home Assignment - Water Conservation &amp; Sustainability Action</b>	<p>No changes were made to this section. As the take-home assignment handout was relevant to the research questions it was not changed (Appendix K).</p>	<p>Take-home assignment was necessary for Lesson 3.</p>
<b>Lesson 3</b>	<b>Revisions</b>	<b>Justifications</b>
<b>Part 1: Hot Water Energy Conservation Results</b>	<p>Added water conservation video.</p>	<p>Funny video to catch student's attention as well as demonstrate where water is used in the home. The team started the conversation with the students about water conservation tips.</p>

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	<p>Added information on water conservation and the local watershed.</p> <p>Students calculating amount of water use per day.</p>	<p>Information on the local watershed to connect the importance of water conservation on a local scale.</p> <p>Intention was for the students to see the effects of flow rate, number of showers and amount of time in shower on the amount of water used.</p>
<p><b>Part 2: Building Community Engagement through Youth Empowerment &amp; Environmental Stewardship</b></p>	<p>No changes to this section</p>	

## 8.0 Results and Observations

This section presents the qualitative and quantitative data collected during the sessions facilitated by Susan Kerr and ETC.

### 8.1 Classroom Observations: Group 1

This section presents the results of data collection during the sessions lead by the original facilitator of the Solar Colwood educational program and observed by all four team members.

#### 8.1.1 Field Trip

The first session of the original curriculum involved a field trip to a local solar home. This gave the students a hands on approach to learning about energy efficiency and renewable energy methods. We found that the field trip was an integral part the curriculum as examples presented during the field trip were used as a backbone for the information presented in the classroom sessions. Our data indicated that the students showed the most interest in the electric car station, as well as the thermal imaging camera station (Appendix N). Organizing the flow of the groups of students through the stations was a major challenge during the field trip, as time for the field trip was very limited.

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### **8.1.2 Classroom Session 1**

The first in-class session of the original curriculum delivery focused on renewable and non-renewable energy, greenhouse gases and how energy is used in the home. This gave the students an understanding of how non-renewable energy such as oil and gas contribute to greenhouse gas production. The students also learned ways to reduce energy consumption in the home and they were introduced the concept of meaningful connections to the environment.

Overall the original classroom curriculum delivery was presented very well and gained an substantial amount of participation from the students. The quiz was completed by all of the 27 students present. The questions asked were designed to allow the students to write as much as they could, so one mark was awarded for every correct answer given. The highest mark achieved was 21 and the lowest 4, with an average of 12.7 (Appendix N)

It appears that the subject's students had the greatest difficult grasping were greenhouse gas emissions and renewable versus non-renewable energy sources.

### **8.1.3 Classroom Session 2**

The second in-class session of the original curriculum delivery focused on water conservation and meaningful connections to the environment. The PowerPoint describing water usage in the home aided the students in understanding how different factors can influence daily water consumption. The sticky note assignment engaged the entire class.

The quiz was completed by all of the 27 students present. The questions asked were designed to allow the students to write as much as they could, so one mark was awarded for every correct answer given. The highest mark achieved was 17 and the lowest was 2, with an average of 7.23 (Appendix N).

It seemed that much attention was lost among the students during discussion surrounding the take-home assignment.

## **8.2 Classroom Observations: Group 2**

As discussed earlier, an ethical review was conducted and this included developing both student and parent/guardian consent forms. These forms were necessary in order to use information collected pertaining to individual students in the class. Of the 28 students that were given consent forms, 93% of the students gave their consent, and 39% of the students returned completed

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parent/guardian consent forms (Appendix N).

### **8.2.1 Field Trip**

The second field trip replicated the first field trip. Students in this group saw the same three stations as the previous field trip with an additional session showing computer graphs of energy produced by PV solar panels. The PV solar panel graphs showed students the amount of energy being produced over the past several days as well as the current energy production. The data collected indicates that the students show the most interest in the electric car and the thermal imagery camera (Appendix N). Most of the questions asked by the students were about the electric car.

### **8.2.2 Classroom Session 1**

This classroom session was facilitated by two members of ETC. Revisions to the previous curriculum delivery were completed to determine if there was more student participation and uptake of the information. Three videos were used in this lesson, but were spaced apart to increase the amount of time the students were engaged. Two of the videos that were also used in the previous classroom facilitation by Susan Kerr were about renewable and non-renewable resources and energy saving tips. The video on the carbon cycle was replaced by a video about greenhouse gasses presented by Bill Nye. The students seemed to enjoy the new greenhouse gas video as well as the game which was also introduced to increase individual participation from the students. For the game each student was given a piece of paper with a type of energy and were instructed to divide into renewable or non-renewable energies. Majority of the students understood which types of energy were renewable and which were non-renewable. The game seemed too easy for most of the students; however, some of the students were confused about the biomass and nuclear energy resources since they were not well discussed in the beginning of the lesson. Transitions between the videos were lengthy and some attention was lost from the students. A recap of the information covered in the videos could have been used to increase the uptake of knowledge.

The results of the quiz showed slightly less uptake of information from the two new facilitators. When the Solar Colwood representative facilitated the previous classroom session

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the average from the quizzes was 12.70, whereas when members of ETC facilitated the classroom session the average from the quizzes dropped to 11.81 (Appendix N).

### **8.2.3 Classroom Session 2**

The classroom session was facilitated by two members of ETC. Revisions to the previous curriculum delivery were applied to determine if there was more student participation and more uptake of the information. The classroom session had been prepared for and improved on from Session 1 of the ETC facilitations. The types of questions asked to the students were open-ended rather than closed, as had occurred in the previous session, which seemingly resulted in higher interest from the students. Some students lost attention during the PowerPoint exercise discussing water use in the shower; however, it was noted that others were discussing the information presented among their peers. The lesson plan seemed to be at an appropriate level for the students; there were questions asked that demonstrated interest from the students and that new concepts were being learned. This was particularly exemplified during the discussion of the Capital Regional District's water supply. A video was used to introduce the lesson for the day, which engaged the students to pay attention as they were intrigued by the replacement of water with other liquids for everyday activities.

Overall, the lesson went very well and the students seemed to enjoy learning about the various components introduced. The results of the quiz were indicative of the participation and engagement of the class, as the results increased by 200%; Group 1 have an average of 7.2, and Group 2 had an average of 14.1 (Appendix N).

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### 8.3 Curriculum Delivery Comparison

Figure 1 shows the quantitative data collected by ETC during both groups of grade 7 Environmental Stewardship students from Dunsmuir Middle School. It shows the number of comments made by students, the number of questions asked by students, how many different students participated during each session and the average marks awarded for the quiz completed by the students in each session. Comments were considered to be any interaction with the facilitator regarding the lesson including answers to questions asked by the facilitator or a raised hand. Questions were considered to be any question asked to the facilitator relevant to the lesson. The number of different students asking questions or commenting was also noted to determine if all the students were engaged or if only certain students were participating in the lesson. The number of comments made by students in Group 1 during both sessions were higher than those made in Group 2. The mean quiz results were generally consistent among both groups and sessions, with the highest being Group 2 Session 3 and the lowest being Group 1 Session 3, indicating the greatest improvement during this session.

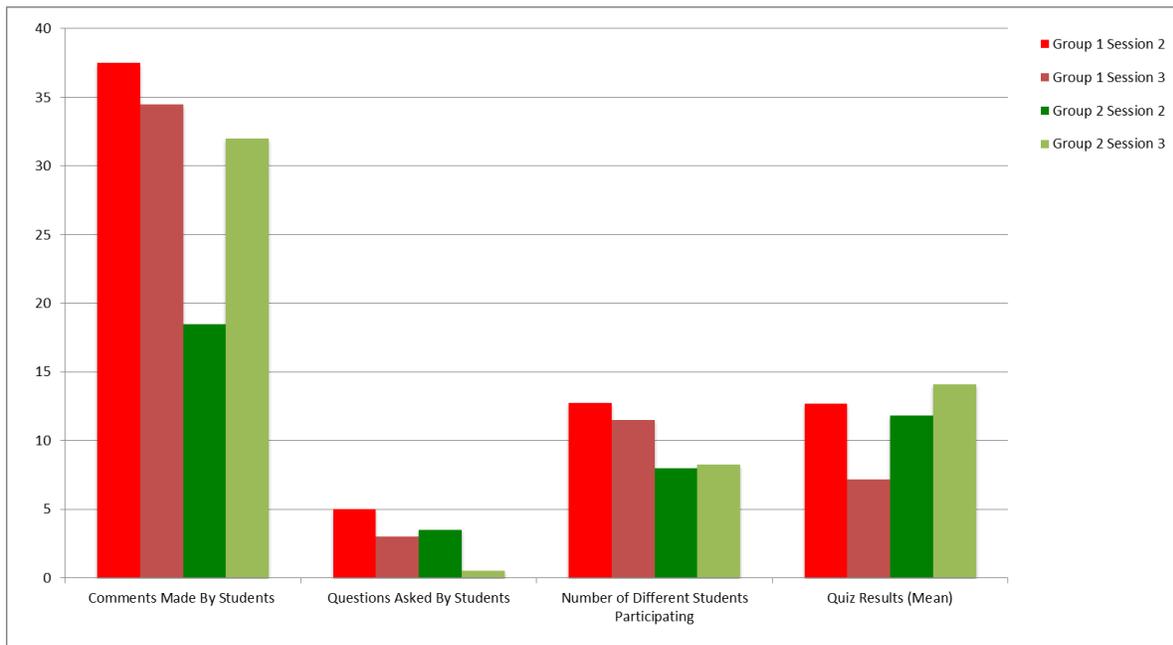


Figure 1: Quantitative data from classroom sessions in order to examine Dunsmuir Middle School student engagement, participation and uptake of knowledge from facilitated sessions by Susan Kerr (Group 1 - March 26, April 2 & 9, 2013) and ETC (Group 2- May 7, 14 and 21, 2013).

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Figure 2 shows the results of quizzes given to the Environmental Stewardship students during the different sessions facilitated by both Susan Kerr and ETC. The marks were arranged into different categories and the number of students with marks falling into that category were recorded. The results from Group 1 Session 2 had large percentage of students in the 10-14 category showing that the majority of the students had a good understanding of the concepts presented in the session. The quiz results of Group 1 Session 3 had a large portion of the students in the 5-9 category indicating less understanding by the majority of the students in this lesson. The revised delivery by ETC in Group 2 Session 3 appeared to increase the uptake of the same concepts covered in the first group as the majority of the students had marks above 10 including 10 students with marks above 19.

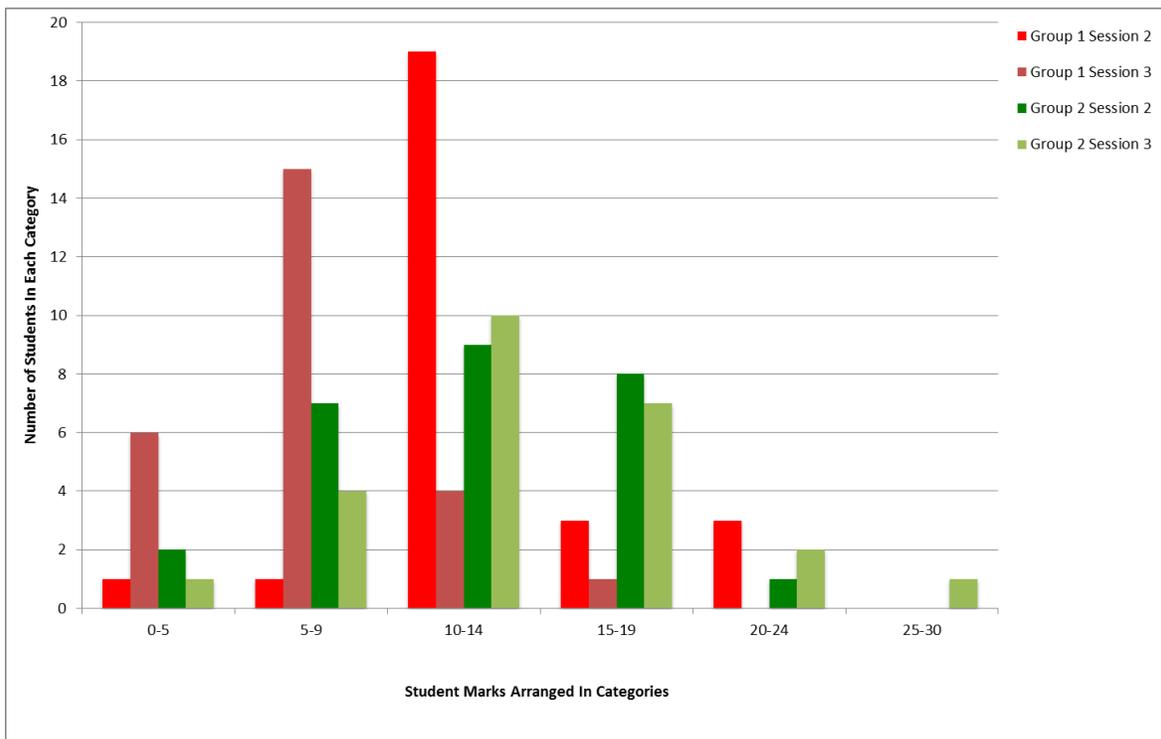


Figure 2: Results from quiz given to Grade 7 Environmental Stewardship Class regarding information delivered during a facilitated lesson from Susan Kerr (Group 1 - March 26, April 2 & 9, 2013) and ETC (Group 2- May 7, 14 and 21, 2013).

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Figures 3, 4 & 5 below were generated from the answers given by the grade seven Environmental Stewardship students at Dunsmuir Middle School during a classroom activity. In this activity the students were given three coloured post-it notes where each coloured note pertained to a question regarding their perceptions about the environment. The students would write their answers on the post-it note and then stick it on a large cardboard sheet on the wall that was labeled with the question they answered. The answers to these questions were organized into more general themes and quantified to develop trends in the student’s values. The graphs pertain answers supplied in sessions facilitated on April 9 (27 students in attendance), and May 21, 2013 (25 students in attendance).

Figure 3 below shows the responses of the students when asked “What makes you feel good about the environment or what do you like about your community?” The results indicate that the students valued the amount of forests and natural spaces in their community, as well as the number of community members helping to save the environment. In the April 9th session, solar electricity was mentioned five times regarding community members completing actions to reduce impacts on the environment.

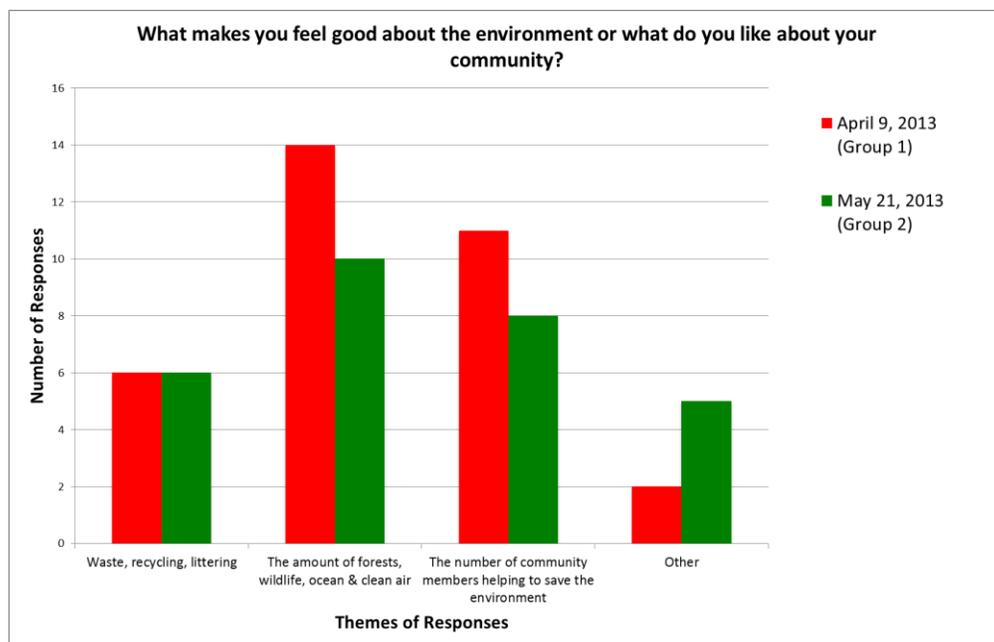


Figure 3: The results from the Post-it note activity showing answers to the questions regarding student’s feelings about their community and the environment.

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Figure 4 below shows the responses of the students when asked “What concerns you about the environment or your community?” The results indicate that the students were concerned about air pollution and the use of fossil fuels as well as the destruction of forests and habitat for animals. Water use was mentioned three times in the May 21, 2013 session.

Figure 5 below shows the responses of the students when asked “What would you change and how would you do it?” The results show that reducing the use of fossil fuels was a top priority followed by reducing water and energy use. There appeared to be a substantial drop in the student’s values regarding educating the community in the revised delivery of the curriculum for Group 2.

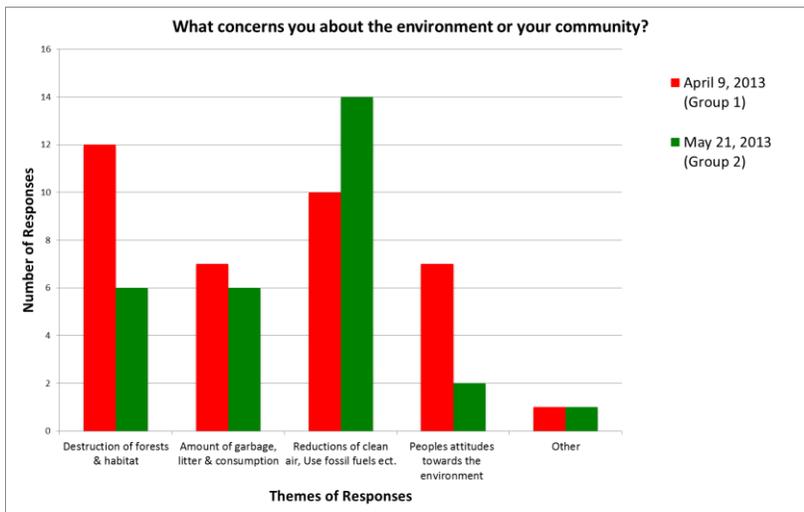


Figure 4: The results from the Post-it note activity showing answers to the questions regarding students concerns about their community and the environment.

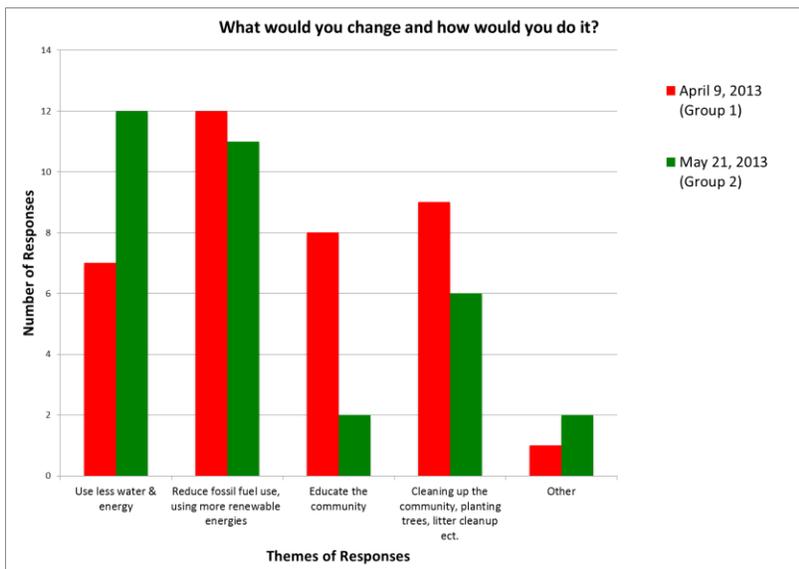


Figure 5: The results from the Post-it note activity showing answers to the questions regarding how the students could make a positive change for the environment.

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Table 2 below shows the common themes extrapolated from the quizzes during Session 2 (the first in-class session) performed by Group 1 and 2. The results show that there were extremely similar themes seen between the two groups, which is expected as the curriculum remained the same only the method of delivery changed.

Table 2: Group 1 and 2 quiz theme comparisons for Session 2.

<b>Group:</b>	<b>List how you or your family produce GHG.</b>	<b>List some examples of renewable energy.</b>	<b>List some examples of non-renewable energy.</b>	<b>List some ways to save energy in your home.</b>
<b>1</b>	Gas cars	Wind, Solar	Oil, Gas	Short shower
<b>2</b>	Cars	Hydro, Wind	Oil, Coal	Turn off the lights

Table 3 below shows the common themes extrapolated from the quizzes during Session 3 (the second in-class session) performed by Group 1 and 2. The results show similarities between the two classes. The length of showers was a common theme, which indicates that the PowerPoint on daily water consumption was effective.

Table 3: Group 1 and 2 quiz theme comparisons for Session 3.

<b>Group:</b>	<b>What would increase water consumption in your home?</b>	<b>What would decrease water consumption in your home?</b>	<b>How can you get your family/and or community to decrease their energy use and greenhouse gas emissions?</b>	<b>Put in order which energy source emits the lowest greenhouse gases to the highest. (Solar, hydro electricity, natural gas, heating oil, coal)</b>	<b>What concerns you about the environment?</b>
<b>1</b>	Long showers	Short showers	Solar panels	Solar, hydro, natural gas, heating oil	Deforestation
<b>2</b>	Long showers	Shorter showers	Walk/bike/bus/car-pool	Solar, hydro, natural gas, heating oil, coal	Littering/garbage/landfill

Table 4 (Appendix N) shows the number of forms and assignments handed in from students in the different classroom groups. The data from the first three groups was obtained from the facilitator Susan Kerr. The classroom group in January showed less participation from the student's with the least amount of child consent forms returned out of the four group facilitated. This group also had the highest number of parent consent forms returned out of the four groups with 16 parent consent forms returned out of the 19 students (84%) that agreed to participate in

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the research. The group facilitated by ETC had the lowest return of parent consent form (39%). The second group (January) also had more students complete the take home assignments followed by the first group (October) than the group in May with the lowest number of take home assignments returned in the March/April group. Groups facilitated by Susan Kerr had higher parent consent forms returned than the group facilitated by ETC.

### 8.4 Parent/ Guardian Survey

The PICS data can be found in Appendix N. The data comprised of the Solar Colwood parent survey sent to the parents or guardians of the students after lesson facilitations. It has been presented in graph form for interpretation, and the data are arranged into groups to identify participation during the different sessions. The data from March represent those parents/guardians that are associated with students in Group 1, and the data from May represent those parents/guardians that are associated with students in Group 2. These are the two groups of students that ETC used for the purpose of this report. The previous data on the graphs include information from the two education sessions that occurred prior to ETC’s involvement. The group with the highest participation from parents/guardians was the first group that Susan Kerr facilitated in October 2012. Responses from parents/guardians indicated that only half the people who completed the survey in October were residents in Colwood. The group of parents/guardians in January 2013 indicated that one was a Colwood resident and two were from the surrounding communities such as Metchosin and Langford. Everyone who completed the survey for the March 2013 and April 2013 groups lived in Colwood.

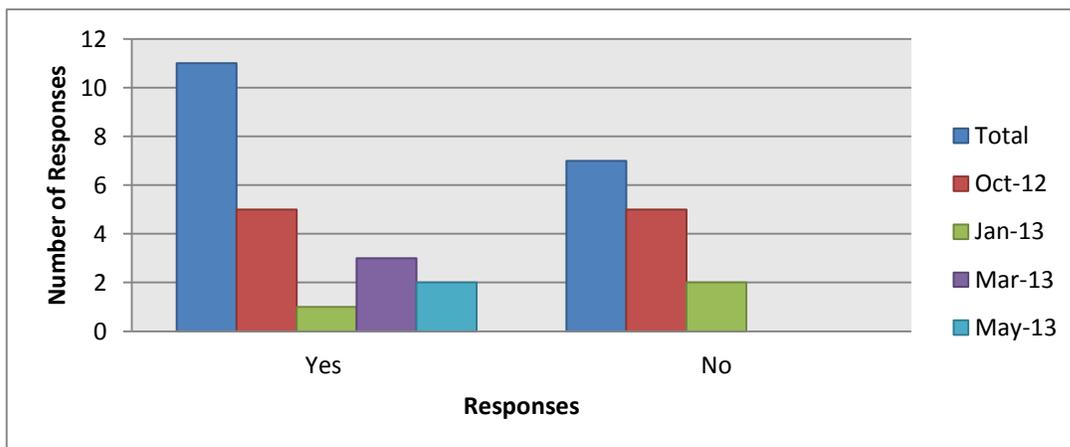


Figure 6: Responses to ‘Do You Live in Colwood’ for total overall group, as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

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Figure 7 denotes how many people noticed their energy bills. Majority of the people who completed survey indicated they take a lot of notice or notice their energy bill often. Three have indicated that they do not take notice of their energy often. Two people have indicated that they only notice their energy bills sometimes. Of the ten parents/guardians that completed the survey in October 2012, half the group’s response was that they notice their energy bills often. The respondents from January 2013 one respondent indicated they check their energy bills a lot, while two respondents responded that they check their not that often. Participants from the group in March 2013 indicated that they only check their energy bill sometimes and not that often. Finally both participants from the group in May 2013 indicated that check their energy bills often to a lot.

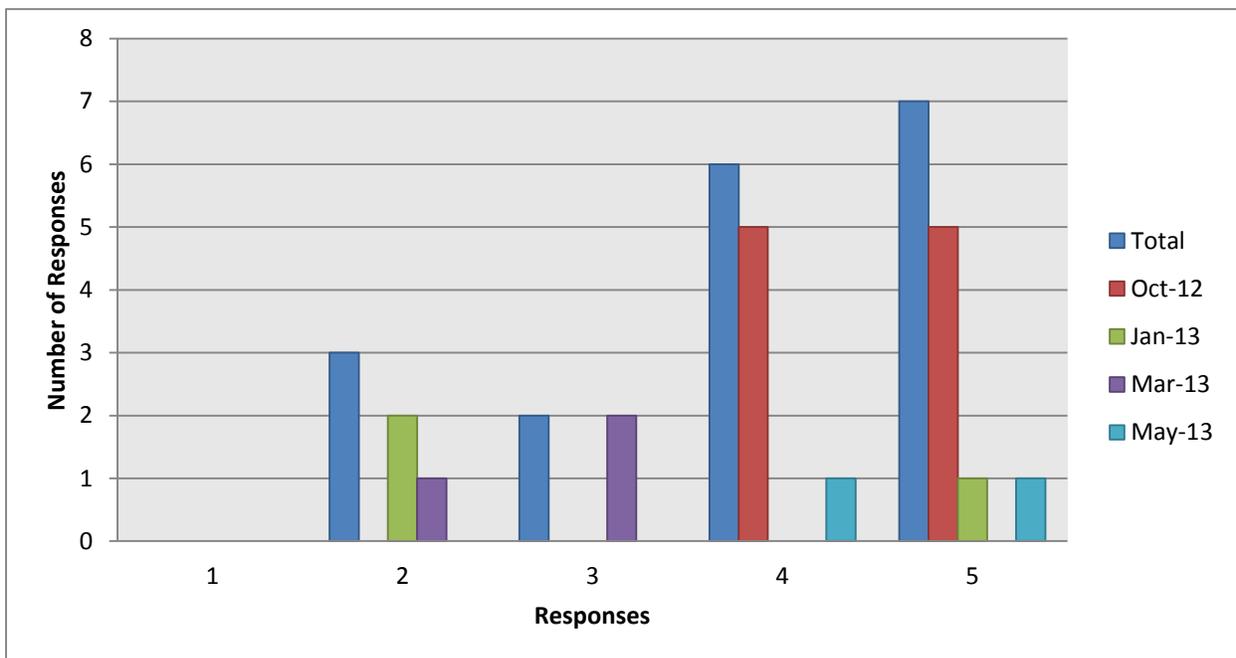


Figure 7: Responses to ‘How much notice do you take of your energy bills (1 a little – 5 a lot)’ for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

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Figure 8 shows how respondents currently heat their water. Nine of the respondents use electricity to heat their water and eight use gas to heat their water. Three respondents designated that they use wood to heat their water. When respondents indicated that they use wood to heat, they also use a secondary method to heat their water. Two of the people indicated they use both wood in combination with electricity and one person indicated that they use wood in combination gas.

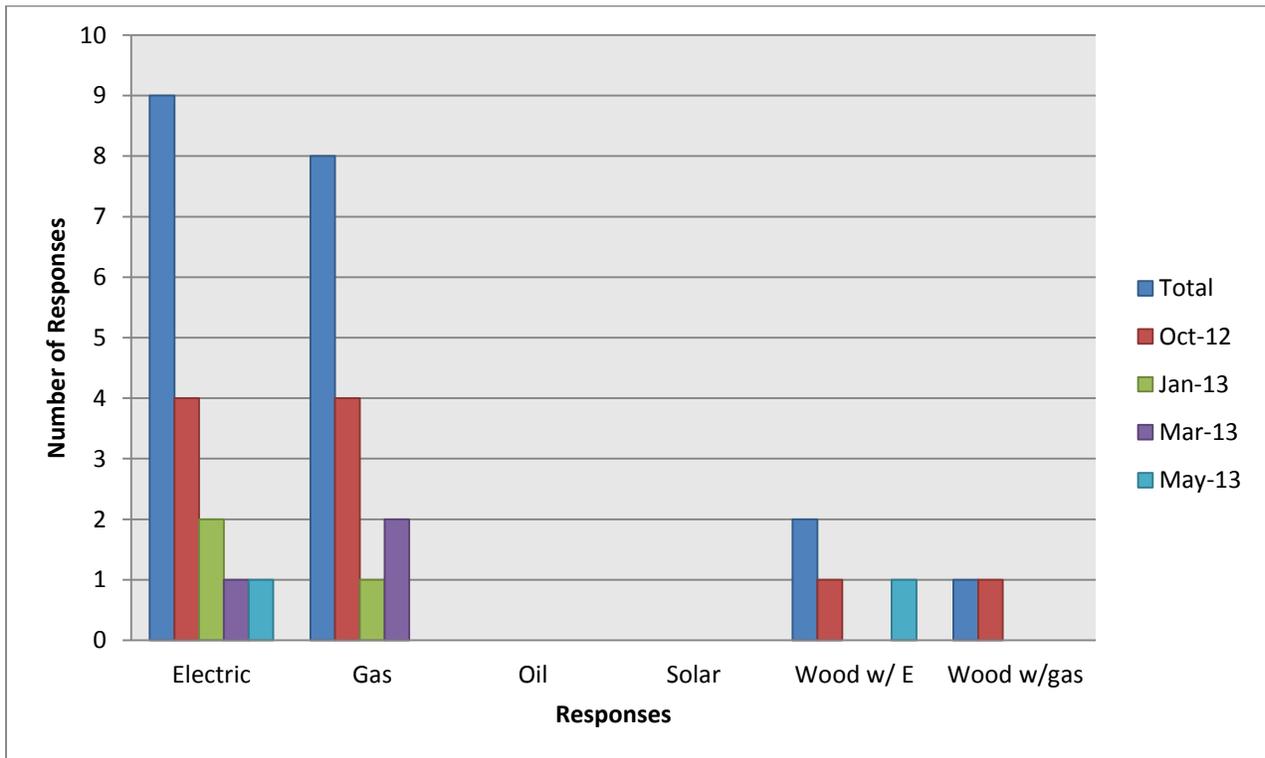


Figure 8: Responses to ‘How do you currently heat your water?’ for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

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Figure 9 illustrates the level of targets participants possessed about energy saving and energy efficient technologies. Seven of the participants responded that they had a moderate amount of knowledge about energy saving and energy saving technologies. Five of the participants responded that they have some knowledge about energy saving and energy saving technologies. Three said they knew a lot and 2 indicated that they knew a little about energy saving technologies. Figure 9 also shows the answers that were given from the individual groups. The group from March 2013 indicated that they had little knowledge about energy saving and technology.

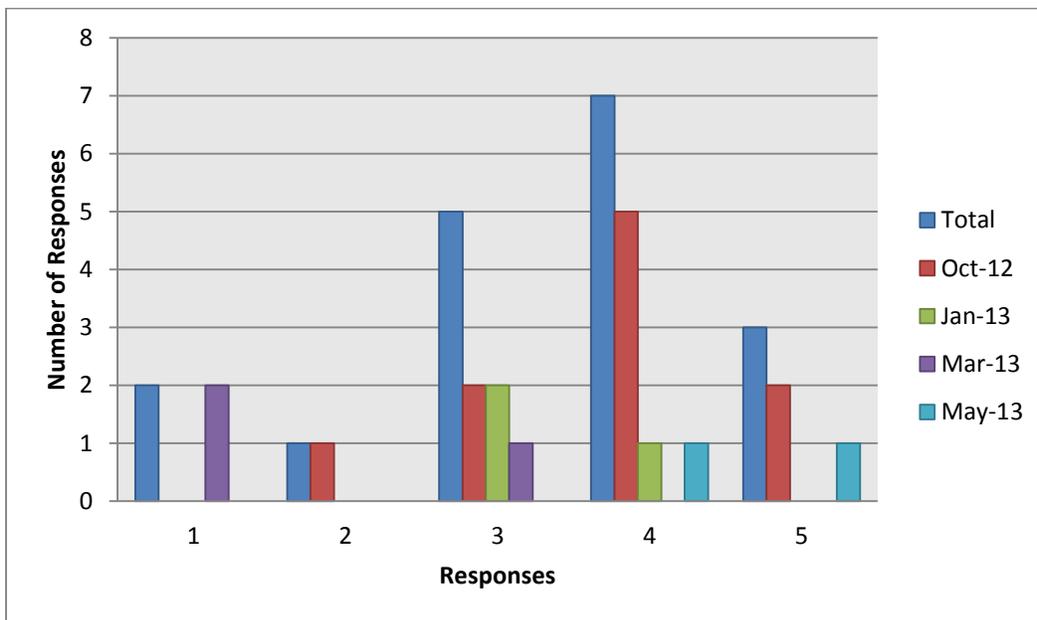


Figure 9: Responses to ‘What do you know about energy saving and energy efficiency technologies (1 a little – 5 a lot)?’ for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

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Figure 10 show if the respondents have had a home energy audit. Most of the respondents (14) indicated that they have not had a home energy audit. One respondent did not answer the question and 3 had indicated that they have had a home energy audit.

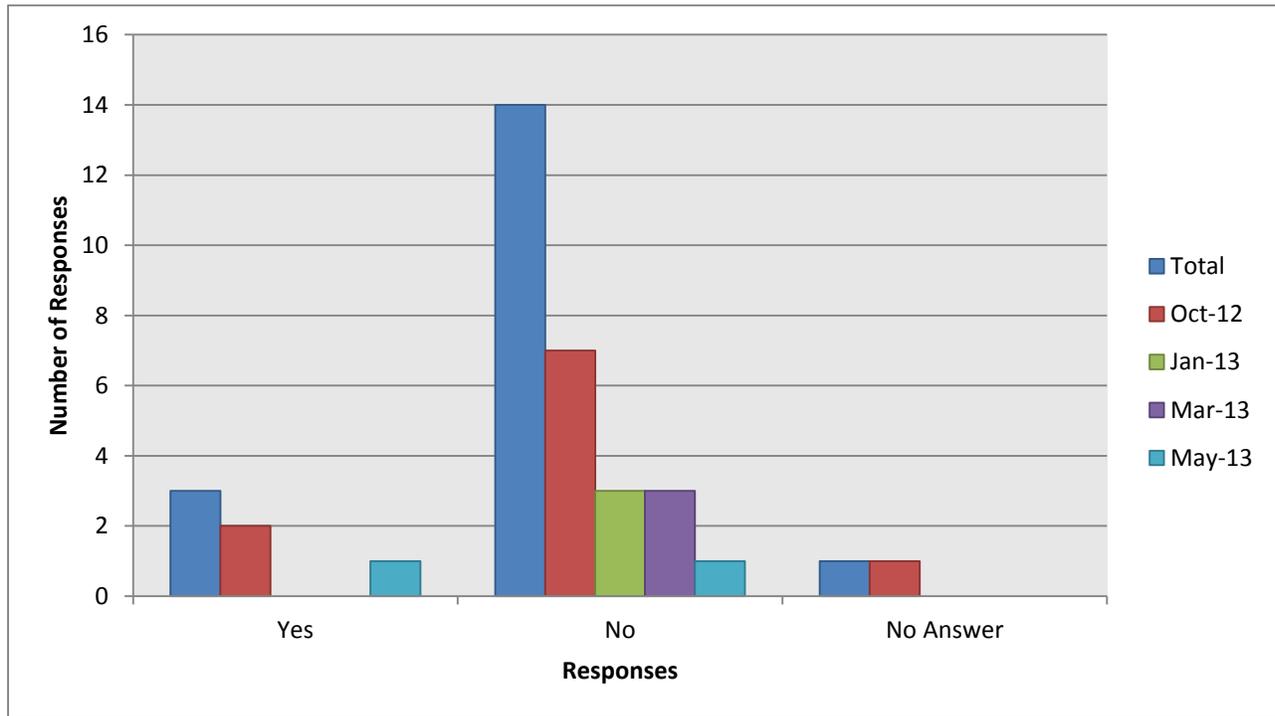


Figure 10: Responses to 'Have you undertaken a home energy audit?' for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

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Figure 11 shows the level of knowledge about solar water heating technology. Most participants indicated they knew a little (6 participants) about solar water heating or had some (5 participants) knowledge of solar water heating. One participant did not answer the question and only one participant responded that they knew a lot about solar water heating.

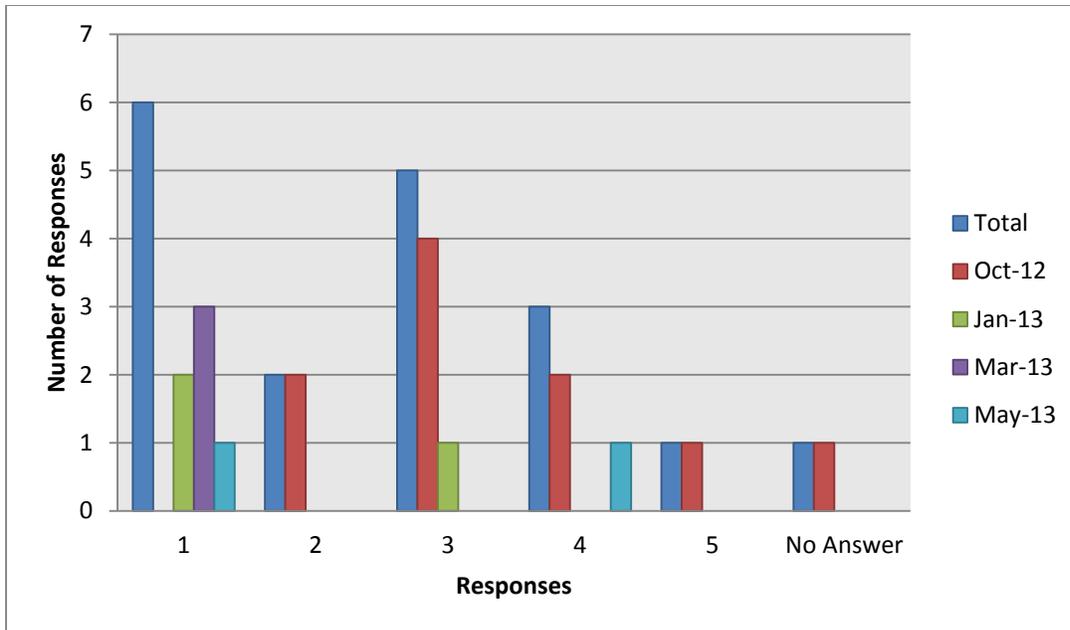


Figure 11: Responses to ‘How much do you know about solar water heating technologies (1 a little – 5 a lot)?’ for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

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Figure 12 illustrates the number of people who know other people that currently have solar water heating. 13 participants indicated that they do not know anyone that uses solar water heating. Four indicated that they knew someone with solar water heating. One person did not answer this question.

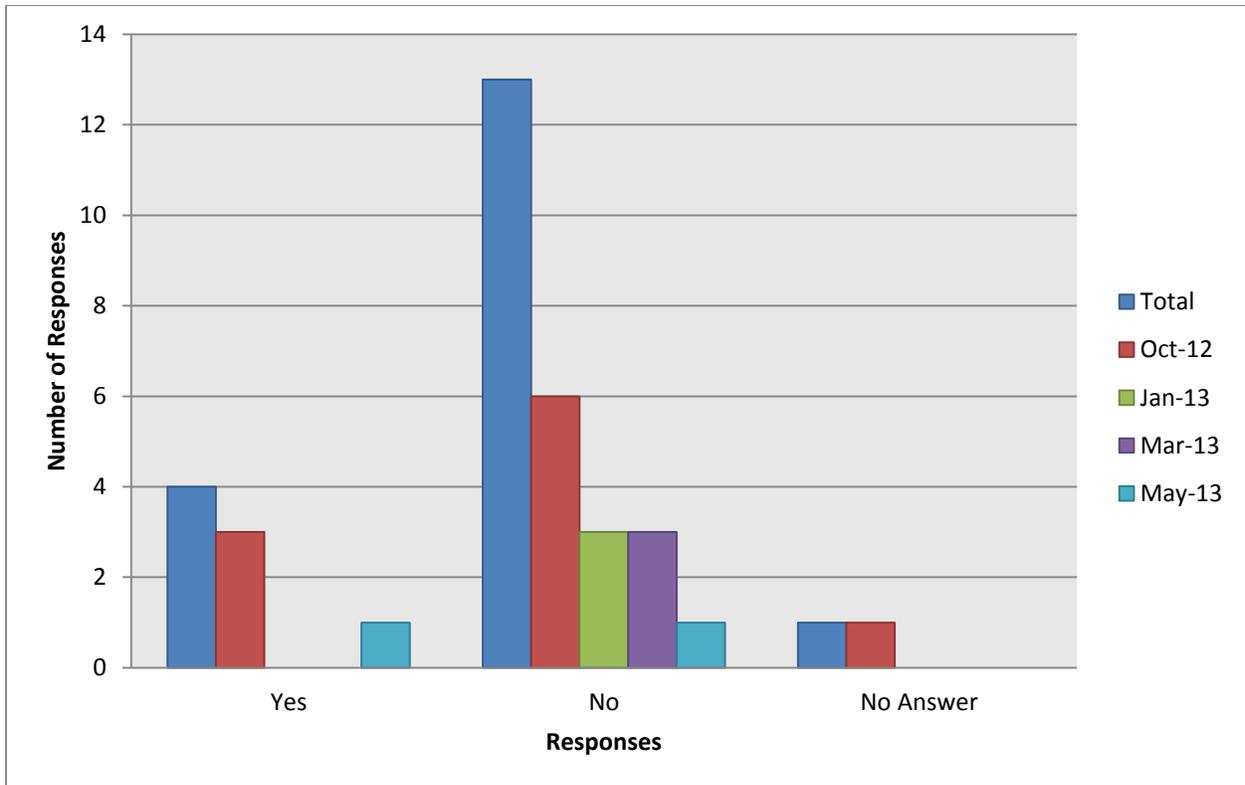


Figure 12: Responses to 'Do you know anyone with solar water heating' for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

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Figure 13 shows the extent they the participant is aware of the City of Colwood’s ‘Solar Colwood’ program. Five participants indicated they were more than somewhat aware of the Solar Colwood program. Most (6) participants that there were not aware of the Solar Colwood program and 4 participants indicated that they were slightly aware of the Solar Colwood program. Three participants responded that they were somewhat aware of the Solar Colwood program.

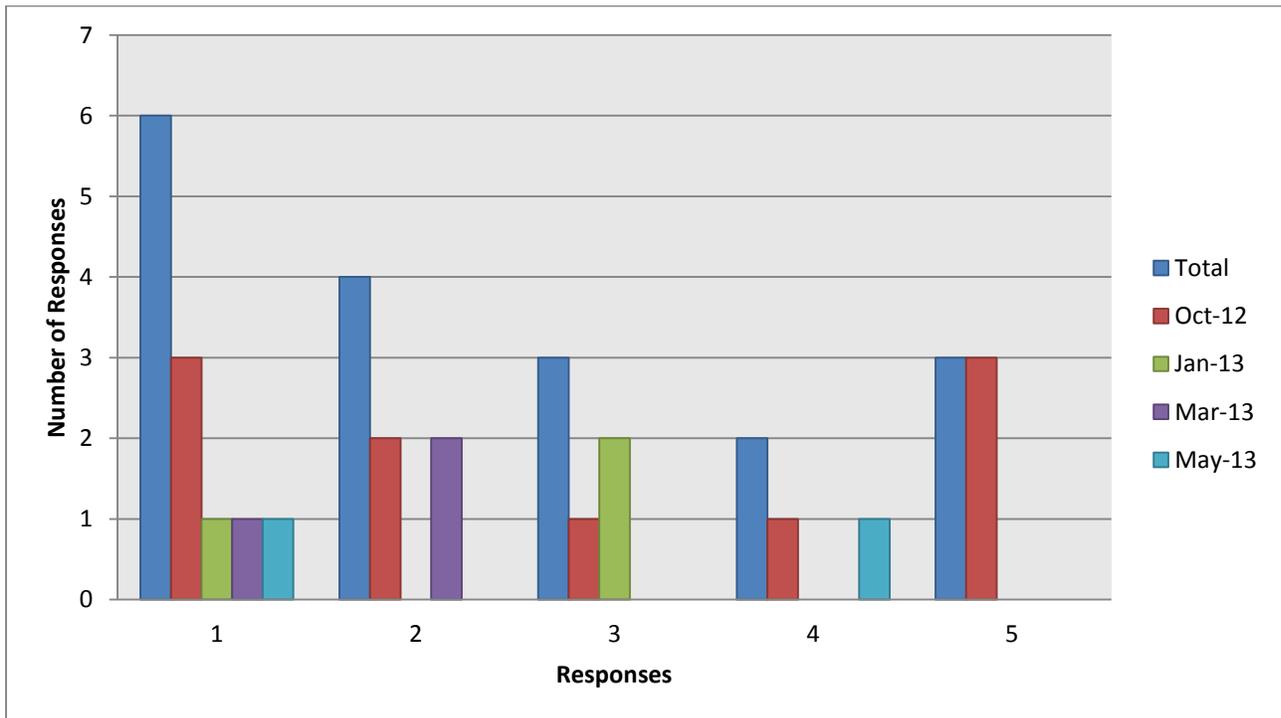


Figure 13: Responses to ‘To what extent are you aware of the City of Colwood’s ‘Solar Colwood’ program (1 not at all – 5 a lot)?’ for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

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Figure 14 below shows the Parent / Guardian survey responses to the question ‘If you had heard of ‘Solar Colwood’ where did you hear about it?’ From the results the majority of respondents indicated that they heard about Solar Colwood in the local paper and the City of Colwood website. Radio ads and the Solar Colwood website accounted for the least amount of exposure in the community. The respondents had the option to choose more than one answer.

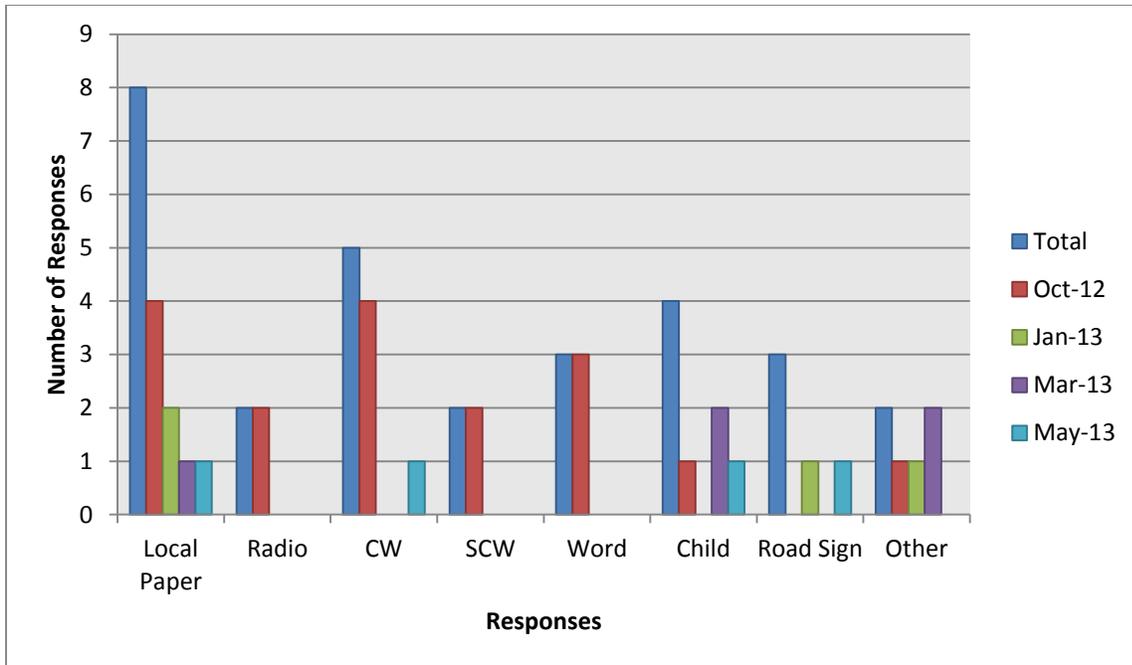


Figure 14: Responses to ‘If you had heard of ‘Solar Colwood’ where did you hear about it?’ for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013 LP- local paper; Rad-Radio Coverage; CW- City of Colwood Website; SCW- Solar Colwood Website; Word- word of mouth; RS- road sign.

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Figure 15 below shows the Parent / Guardian survey responses to the question ‘How likely are you to apply for a solar hot water incentive grant under the Solar Colwood program?’. The results indicate that the respondents were not very likely to install a solar hot water system. Only one respondent indicated they were definitely going to apply for the incentive program.

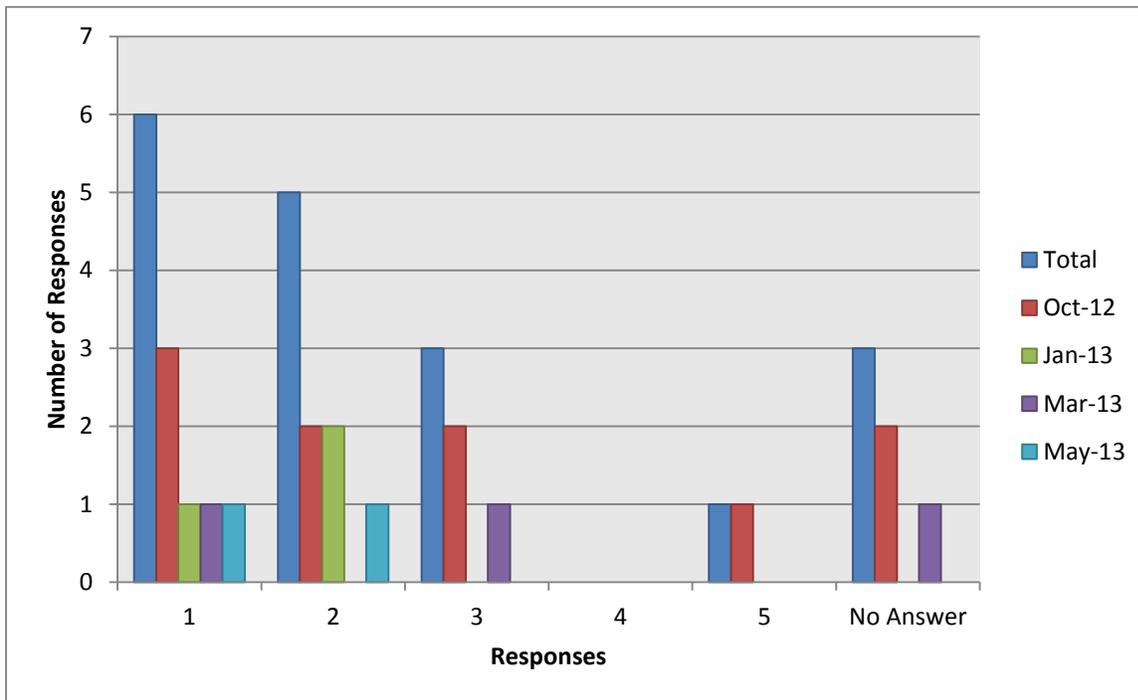


Figure 15: Responses to ‘How likely are you to apply for a solar hot water incentive grant under the Solar Colwood program (1 not at all likely – 5 definitely)?’ for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

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Figure 16 below shows the Parent / Guardian survey responses to the question “Are you aware that your child is currently exploring energy efficiency in class?”. The majority (16 of 18) of the respondents appeared to know that their child was learning about energy efficiency in their studies at school.

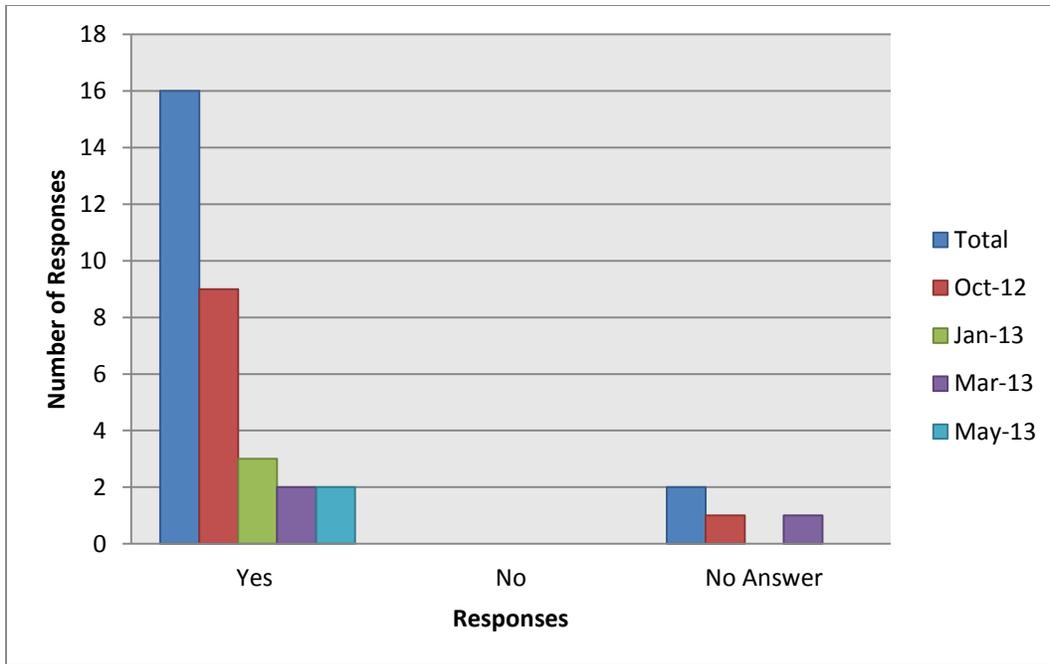


Figure 16: Responses to ‘Are you aware that your child is currently exploring energy efficiency in class?’ for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

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Figure 17 below shows the Parent / Guardian survey responses to the question ‘To what extent has your child's class experience and homework led to family discussions about energy efficiency?’. The results indicate that some conversations in the home have occurred due to the student’s learning about energy efficiency in the home; however, it doesn't appear that these conversations have been very in depth.

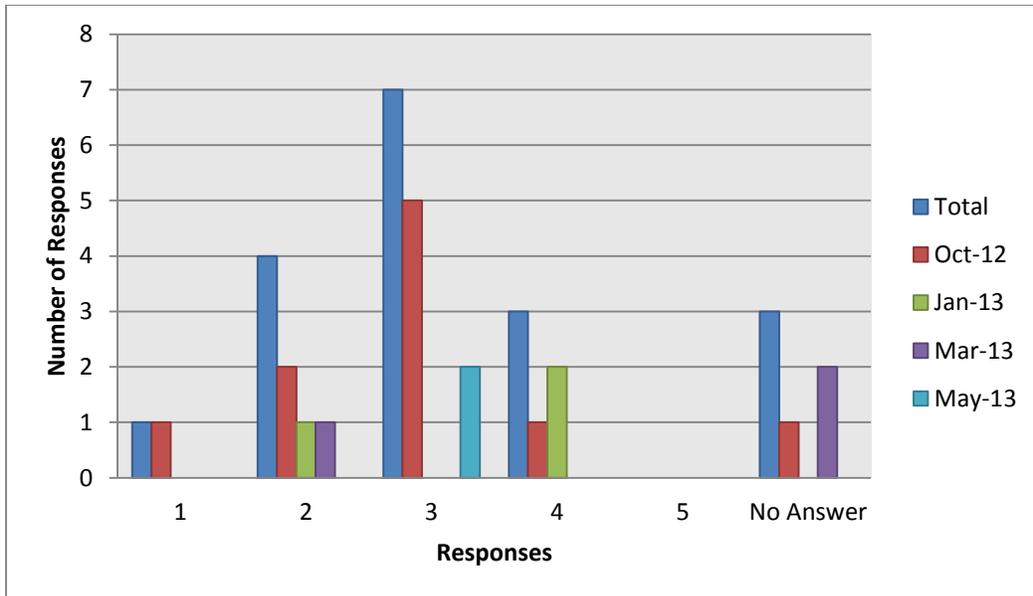


Figure 17: Responses to ‘To what extent has your child's class experience and homework led to family discussions about energy efficiency? (1 not at all - 5 a lot of discussion)’ for total group, groups in October 2012, January 2013, March 2013, and May 2013.

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Figure 18 below shows the Parent / Guardian survey responses to the question ‘Has your child's in-class experience and any resulting discussion at home changed your thinking about energy efficiency?’. The results indicate that some discussion with their children has occurred and changed their thinking however it has not likely contributed to a major shift in their opinions or practices about energy efficiency.

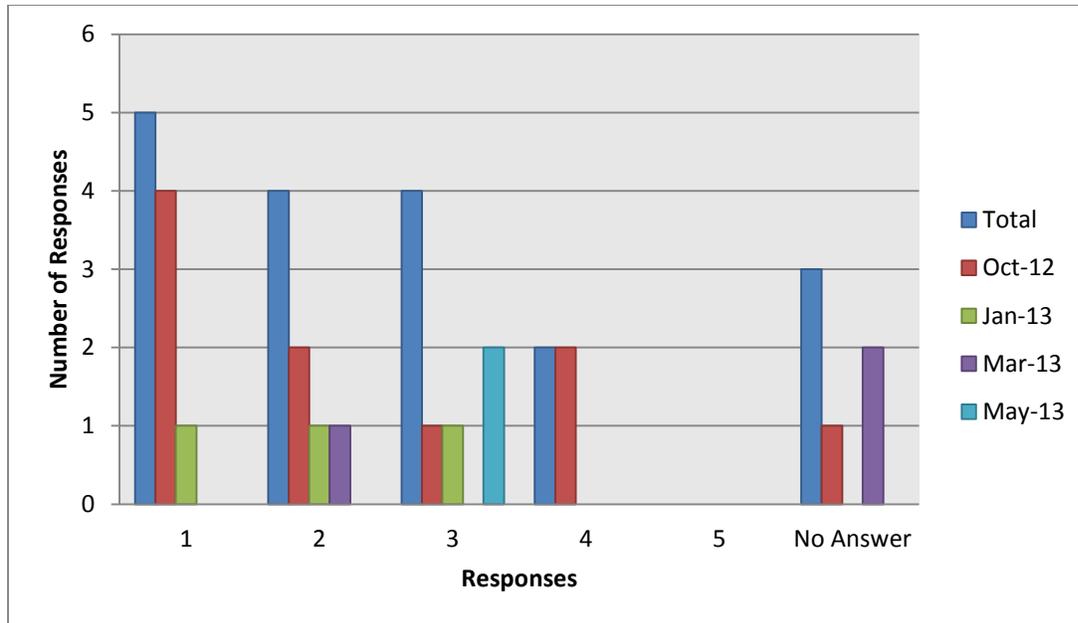


Figure 18: Responses to ‘Has your child's in-class experience and any resulting discussion at home changed your thinking about energy efficiency? (1 not at all - 5 a lot)’ for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

Figure 19 below shows the Parent / Guardian survey responses to the question ‘Has your child's in-class experience changed your thinking about the Solar Colwood program?’. The results indicate that the respondent’s perceptions regarding the Solar Colwood Program were not substantially changed due to their child’s involvement in classroom sessions regarding home energy efficiency.

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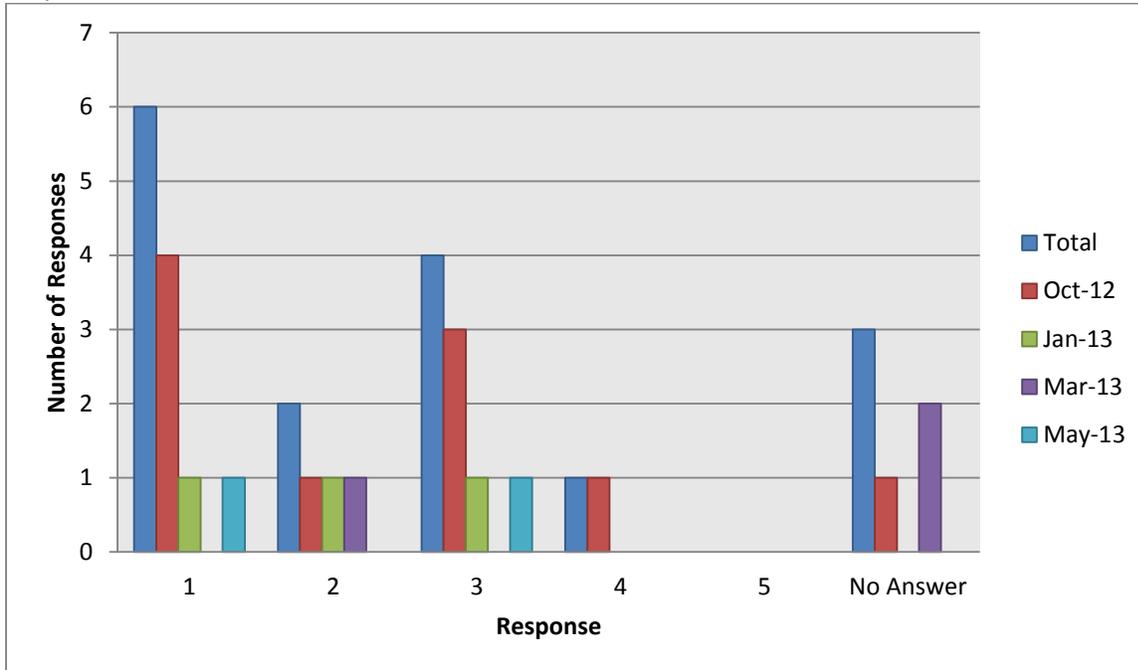


Figure 19: Responses to ‘Has your child's in-class experience changed your thinking about the Solar Colwood program? (1 not at all - 5 a lot)’ for total overall group as well as individual groups in October 2012, January 2013, March 2013, and May 2013.

## 9.0 Discussion

This section discusses the results obtained during the field trip to the Solar Colwood home and the classroom sessions facilitated by Susan Kerr and ETC as well as data from the PICS survey, in an attempt to answer the research questions posed. Each question has been broken down into pieces that examine each aspect of the project in relation to the question for ease of examination.

- a) **Does an environmental education and outreach program conducted by the RRU PICS research team encourage youth in talking with their parents or guardians about the Solar Colwood Program and increase participation in the Solar Colwood Program.**

### 9.1 Take Home Assignment

The take home assignment completed by students in both groups found that there was not a major difference between the return rates of either group, as Group 1 had a 27% return, and Group 2 had a 30% return. This is a decrease from the groups that were taught prior to the start of ETC's portion of the research, which had a return rate of at least 50%. The take home assignment may be seen as an indication that students discussed water use and shower flow in the home with their parents or guardians; however, the students did not require supervision to complete the assignment. There is one question involved with the assignment that may require gathering information from the parents; the students are asked to "Discover how your water is heated". By increasing the level of parental assistance required in the take home assignment this may help to foster more dialogue between the students and their parents (Chesterfield, n.d).

### 9.2 Home Energy Saving Kits

To receive the home energy savings kits, the students required consent from their parents; therefore, the return rates can be used as an indication that the students have engaged in a discussion with their parents or guardians regarding the home energy savings that were discussed during the sessions. The return rate of Group 1 was 17%, and the return rate of Group 2 was 20%. There is not a major difference between the two groups. Prior to the start of this research study, the return rate was 19% in both groups that were involved. There has been no substantial change noted.

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### **9.3 Action Challenge**

Both of the groups had students that completed the Action Challenge that was given out during the classroom sessions. This could be another measure of interaction and discussion with parents or guardians, as it was requested that students creatively demonstrate an energy saving action that they participated in. This activity did not, however, require parental supervision or participation, so the results do not accurately reflect any parent student discussion. Table 1 shows that Group 1 had a return rate of 20%, while Group 2 had a return rate of 10%, representing a 50% reduction in participation. It was expected that there would be an increase with the participation of Group 2 owing to the shortened length of Session 2, which gave the students more time to complete the challenge. This data may be partially skewed since some of the work completed by the students within the class period was not necessarily recorded due to the lack of preparation for this aspect of the session. It was initially included in the lesson plan as an additional piece in the case that there was extra time at the end, and there was definitely more time than anticipated.

### **9.4 Parent Consent Forms**

Parent consent forms were used as an indicator that students talked to their parents about the environmental stewardship class and that there is research occurring in their classroom. Appendix N shows the number of parent consent forms returned by students. Out of the 94 students that chose to participate in the research overall, 60% of the students returned signed parent consent forms. While this may not be accurate to the actual number of students that talked to their parents about the environmental stewardship workshops, it portrays the number of students that went to their parents to have them sign the consent form. Therefore, the students most likely had to explain what was occurring in the classroom to their parents prior to the parents signing consent forms. Of the classes that were observed by ETC, Group 1 had 77% of the students sign consent forms and 70% of those students had also returned parent/guardian consent forms; Group 2 had 93% of the students sign consent forms and 39% of those students also returned parent/guardian consent forms. There appears to have been an increase in students interest in the program between the two groups; however, there was far less return of the parent consent forms among Group 2. Multiple copies of the forms were handed to some of the students who misplaced forms, but the return was still less than expected.

A total of 18 parents/guardians filled out the Solar Colwood Survey. Within the sample

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of 18 surveys, 11 residents resided in Colwood and the remaining 7 lived in the surrounding community.

## 9.5 Parent Survey Results

The results of the survey sent to parents and/or guardians of the students involved in the Environmental Stewardship class are presented throughout Figures 6 to 19. Two of the questions asked were omitted from analysis because they did not pertain to this particular study. A total of 18 parents/guardians completed the survey. From the two Groups observed by the team, Group 1 facilitated by Susan Kerr had a total of three parents/guardians that participated in the survey, while Group 2 facilitated by ETC had a total of two parents/guardians that participated in the survey. This was far less than what was hoped or expected. The small sample size renders these data unreliable for conclusions; however, connections that are possible are inferred here, with speculation into possible sources of error.

Figure 6 indicates that both Groups 1 and 2 had students with parents or guardians that participated in the survey and were eligible for participation in the SC program. The original facilitation of the program prior to ETC involvement also elicited responses from parents/guardians residing within the Colwood area. The first program delivery in October 2012 had the highest number of responses from the parents/guardians of students that were involved. Of the 18 parents/guardians that completed the survey 11 indicated that they were eligible to participate in the SC program and 7 were not eligible to participate. There were some families that indicated that they are not eligible to participate in the SC program, it may be assumed that some parents/guardians did not complete the survey because they were not eligible to participate in the SC program.

Figure 7 indicates that the majority of the respondents take notice of their energy bills a lot or at least a moderate amount. Answers from the survey indicated that Group 1 paid little to moderate attention to their energy bills, indicating that there may be less of an inclination to participate in the program. The respondents associated with Group 2 noticed their energy bills a lot, indicating that they may be more likely to participate in the SC program.

The majority of respondents' water is heated via electricity or gas, as shown in Figure 8. The respondents in Group 1 are included within this majority, while one of the two respondents in Group 2 heats their water with wood in combination with electricity. All respondents in both groups are therefore eligible for SHW system rebates under the SC program. An interesting trend

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found in the data was that when the families used wood to heat their water, it was in combination with another method. Two parents/guardians indicated that they use the combination of wood and electricity to heat water and one parent/guardian indicated that they use the combination of wood and gas.

The majority of the total respondents replied that they knew a moderate or more than a moderate amount about energy savings and energy savings technology, as indicated in Figure 9. The respondents in Group 1 indicated that their level of knowledge regarding energy saving and energy efficient technologies was little to moderate, while respondents in Group 2 indicated their level of knowledge was high. The respondents in Group 2, then, should be more informed about the SC program in general, and respondents in Group 1 would more likely need more information about the program.

From the 18 respondents, only two replied that they have had a home energy audit. None of the respondents in Group 1 indicated that they have had a home energy audit, whereas one of the two respondents in Group 2 indicated that they have had a home energy audit, as indicated in Figure 10. The respondent who has undertaken the audit is expected to be more likely to participate in the SC program because they have taken further actions and are potentially interested in lowering their energy bills.

The responses from the survey indicate that people in the community do not know a lot about the solar water heating technologies. Overall, six people indicated that they knew little about the technology, two respondents knew some, five respondents knew a moderated amount, three knew more than a moderate amount and only one respondent replied that they knew a lot about solar water heating technology. All three respondents from Group 1 answered that they knew a little about solar water heating technology and in Group 2, one respondent answered that they knew little about solar water heating while the other respondent answered that they knew more than a moderate amount about the solar water heating technologies. If more people knew about solar water heating technologies, they may be more inclined to make the investment to reduce their energy bills.

Figure 12 indicates that majority of respondents do not know people with solar water heating technology already installed. None of the respondents from Group 1 knows anyone using SHW, and one of the two respondents in Group 2 knew someone that used SHW. It is speculated that knowing someone with a SHW system would encourage interest of others.

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Figure 13 indicates the level of awareness among respondents regarding the SC program. The data obtained from the survey indicate that most of the respondents are not aware of the SC program. The respondents in Group 1 indicated they were only slightly or not aware of the program, while one of the respondents in Group 2 indicated they were aware of the program and one indicated they were not aware. The local newspaper was determined to be the most effective way to bring attention to the SC program, which is illustrated in Figure 14. The City of Colwood website also seemed to be an effective way to promote SC. A total of five respondents indicated that they heard about SC from their child, which indicates that some students have talked to their parents about the program and what they have been learning in school. Many respondents also have indicated that they heard about the SC program from more than one source. A few respondents indicated that they learned about SC from the sign situated on Sooke Road in Colwood, B.C. Another respondent indicated that they learned about the SC program because of their occupation. Two of the three respondents in Group 1 indicated that they had heard of the SC program through their children; the results of the previous question indicate that the information from the children may not be as clear, since it was indicated they were only slightly aware of the program. The respondents in Group 1 and 2 also indicated that they were unlikely to apply for a solar hot water incentive grant under the SC program, as seen in Figure 15. The trend noticed in the overall data was that most respondents are not interested in the incentive grant for the green technology. Only one respondent indicated that they were interested in participating in the program. This would be expected if the information passed along was not clear to the respondents, as indicated in previous questions.

Two of the three respondents in Group 1 were aware that their child is exploring energy efficiency in class, and both respondents in Group 2 were also aware of this, as shown in Figure 16. All respondents that answered the question if they knew their child was exploring energy efficiency in school answered yes, or they did not answer the question. This can be an indication that there has been at least a discussion between students and their parents regarding the activities in the classroom and therefore the SC program. However, the level of detail that may be required to influence the parents or guardians to participate in or actively research the program may not be sufficient. Figure 17 indicates that this is the case; both respondents in Group 2 indicated that there has been some conversations in the home due to the student's activities in the classroom. Overall most respondents indicated that some discussion has occurred

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due to their child's class experience and home. Figure 18 indicates that one of the respondents in Group 1 has slightly changed their thinking about energy efficiency due to their child's in-class experience, and both respondents in Group 2 indicated that they have moderately changed their thinking on the subject. The in-class activities do not appear to change respondents' views on the SC program, as indicated in Figure 19.

Many comments made by the respondents (Appendix N) stated that they were interested in participating in the program but they did not live in Colwood and therefore were not eligible to participate in the SC program. One respondent made a comment on that they might not live in the area for very long and the initial cost is too expensive; however, if they were planning to live in the area more than 5 years they would be interested in participating in the SC program.

The results of this survey indicate that overall the education program delivery does not affect intergenerational learning, nor does it increase participation in the Solar Colwood program. It does indicate that there is a potential to increase the transfer of knowledge from students to their parents.

## **9.6 Themes Relating to Parental Involvement**

Session 2 of both groups included discussions with the students about the highlights and lessons learned during Session 1, the field trip to the SC demonstration home. The students all seemed most interested in the electric car and thermal imagery camera within both groups shown in ETC's classroom evaluation found in Appendix N. Group 2 was asked specifically during Session 2 whether or not the students discussed the field trip with their parents or guardians. Interestingly, the students that indicated they had spoken to their parent/guardian had comments to make regarding the electric vehicle. One student mentioned her conversation had a negative outcome - she was left under the impression that electric cars required the use of an expensive battery that needed frequent replacement and cost half the price of the vehicles original price. This illustrates an example of how the parents' "expert" status in the family can affect transgenerational teaching (Duvall & Zint, 2007). The ETC facilitators of this session were unaware of the exact costs to replace the batteries and neither were any of the others facilitators present. This comment was not adequately addressed during this session as the facilitators did not want to discredit the parent or guardian in front of the rest of the students.

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The Post-It activity performed in the classroom during session 2 of both groups generated responses by the students and are shown in Figures 3, 4 and 5. The general themes of the responses were quite similar among both groups, with some variances. These themes do not directly reflect whether the students have discussed anything with their parents or guardians; however, it is interesting to note that some themes among the responses were related to activities that occur in and around the home, such as waste and recycling, and water and energy use. Involvement and education in the community was another theme that was noticed among both groups, and was notably higher among Group 1 as a concern, as seen in Figure 5. As energy use, water use and making change within the community were the general topics during the lessons it was expected that the frequency of answers in the Post-It activity relating to these topics should be higher. There were no themes found which indicated that students were going to talk to their parents specifically, although many comments related to their involvement in educating others in the community.

### **9.7 Solar Colwood Participation**

Appendix P contains information obtained from Solar Colwood regarding the number of participants in the Solar Colwood program since its start in 2011. The data provided to us includes: the total number of participants in each category (solar hot water systems, ductless split heat pumps, non-PV electric vehicle charging stations, and PV electric vehicle charging stations) that have had the incentive cheques issued to them; the SHW participants by cheque issue date; and the DSHP participants by cheque issue date. All of the cheques for both the SHW and the DSHP were issued prior to the start of the educational program that was developed. Based on this information alone, it would appear that the education program was not at all effective. However, there are various aspects that need to be considered here. Comparison of the bar graphs for both SHW and DSHP indicates that the cheques were all issued within the same months (January, October, November and December 2011 and March, April and May 2012). This would indicate that there is likely a lag between an application, its review and disbursement of the grant money. There may have been grants applied for since the start of the program that are not represented in this data set.

**a) Did revising the delivery of the curriculum increase participation and uptake of knowledge for middle school students?**

### **9.8 Participation in Classroom Sessions**

Figure 1 presents the observations made in both groups and sessions. Overall, there appears to have been a decrease in participation from Group 1 to Group 2. All three sessions of both groups had some questions asked by a few students. This indicates that the lessons were engaging the students to participate and there was an interest in learning the material. Both classroom sessions of Group 1 had a higher number of different students that participated than those of Group 2, which may indicate that the lessons were delivered to be more involving of the entire class. This is not a surprising result, as this group was the third group overall that the original facilitator had taught. It would be expected that she has been well-versed and seasoned in her presentation of the material, as well as development of her own personal knowledge that may have been of aid during the sessions. The sessions facilitated by ETC did show a reduced number of questions compared to sessions carried out by the previous facilitator.

Participation from the students is evident from the amount of comments that were recorded in each session. Again, all three sessions of both groups had comments made, where the only major difference recorded is that of Group 2 Session 2, where there were under 20 comments recorded compared to the other three sessions which all were above 30 comments. This may be attributable to the type of questions asked by the facilitators, which can generally be described as close-ended questions. The members of the ETC team that had facilitated this session had not been as prepared to lead a lesson as previously thought. Due to this, the session was cut short with lack of information to present, so the number of comments recorded could be cut short because the lesson ended well before any of the other three sessions did. The delivery of Session 2 assisted the preparation of Session 3 - ETC did not want to see this occur once again, so the types of questions asked were framed differently (open-ended) to elicit participation from the class.

The number of questions asked by the students during the classroom sessions did not appear to show any major differences, as there was generally very few questions asked during the classroom sessions as shown in Figure 1. The sessions facilitated by ETC did show a reduced number of questions compared to sessions carried out by the previous facilitator.

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## **9.9 Classroom Quizzes**

The quizzes at the end of each session are the quantitative measure of the level of uptake between the different facilitators. Based on the data presented in Figure 1, the only substantial difference between responses occurred in Session 2, where there was a marked increase from Group 1 to Group 2. It is speculated that one reason for the increase may be the students' connection to the facilitators as youth themselves; however, there is not sufficient evidence to support this idea. The spread of total quiz marks is presented in Figure 2. The results of Group 1 are less normally spread than that of Group 2. The totals for Session 2 were highly concentrated between 10 and 14, which is considered an average score, with less than one third of the class outside of this. This indicates that overall the lesson was successful. Group 1 Session 3 had the highest concentration of marks between 5 and 9, which is considered fair, with no marks awarded past the 15-19 range. As indicated by qualitative observations, this session was in most need of revision by way of quiz results as well. Group 2 Session 2 had the highest concentration of marks awarded within the 10-14 range, as did Session 3. Group 2 Session 2 also had a substantial portion of marks within the 15-19 range, which is considered good. Only Group 2 Session 3 had excellent results, with one student awarded marks within the 25-30 range. When comparing between groups, it seems that there was an improvement of understanding from Group 1 to Group 2 based on the spread of the marks awarded. However, this may be presented with a bias. The ETC team designed the quiz based on the lesson plan and material provided by the original developer, and therefore, made the changes to the delivery of the program to specifically increase the quiz results.

## **9.10 Sources of Error**

The ETC team identified some other potential sources of errors with the data collection of the classroom sessions. The first source of error identified is the variation between the two classes. The class sizes were very similar; however, the team noticed a difference in the maturity level between the two classes. The second class (Group 2) that the team facilitated seemed to act older than the first class (Group 1). The students in the second group appeared older and dressed in a more mature manor. The maturity level of the students may have an influence on their participation in the classroom activities- there may be a stigma among students that participate often that affects their popularity among their peers.

The team also identified the use of different facilitators for each class as a potential

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source of error. The initial observations on the original classroom session were based on Susan Kerr as the main facilitator with some help from a representative from Solar Colwood.

Observations for the revised curriculum delivery were based on facilitation done in pairs. Two female members of the ETC team facilitated the first classroom session and two male members facilitated the second session. There might be a difference in uptake of information and attention span with just having one teacher versus two people teaching the lessons but also with differences between the different genders facilitating.

Another potential source of error is that the team had little experience teaching. Nerves were experienced by team members when in front of the class; the team was worried about timing of the session, mainly that there was not going to be enough time to get through the material. If there had been more sessions the team could have become accustomed to being in front of the class and become more comfortable with the information that was being taught. Discrepancies also occurred in observations. There were discrepancies in the types of qualitative observations made such as student's behaviour etc. When making observations the team sat at the back of the classroom and the side of the classroom so we would not distract the students. However, some students were not visible from all positions. Lastly, the team's presence in the class was a distraction for some of the students.

## **10.0 Conclusion and Recommendations**

Intergenerational learning can be useful to accomplish changes to behaviors and have the potential to solve problems faced in the environment today. Members of ETC observed a group of students that were participating in the program and made changes to the delivery of the program based on the qualitative and quantitative observations that were made and assessed these changes along with the effects, if any, to the transfer of knowledge between students and their parents/guardians.

In assessing the transfer of knowledge from students to parents/guardians and whether or not this has had any effect on participation in the Solar Colwood program, there were various factors that were examined. The take-home assignment, the home energy saving kits and the action challenge, as indications that students had a discussion on the information presented during the sessions with their parents/guardians, had low return rates in both groups examined. Only the savings kit required parental consent; neither of the others required a discussion

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between the two parties and it is therefore recommended that any further assignments given to students have a component that does require this dialogue. It would be expected that return rates of the assignments would increase and this could further encourage a discussion between children and their parents. The return of parent/guardian consent forms was also used as an indicator that there had been at least a brief conversation between students and their parents regarding the activities that were occurring the classroom as a result of this research. The students in the first group had a substantially higher return rate than those in Group 2; overall, these results do not allow for an important connection to be made regarding intergenerational learning.

The survey sent to the parents/guardians of the students had a low return rate. The surveys that were completed indicated that there is a general lack of interest and/or knowledge of the Solar Colwood program, but that some were aware of the program or heard of it through their children. These results indicate that information may be getting transferred to their parents/guardians; however, the extent of this information is not fully known and is likely minimal. Participation in the Solar Colwood program has not increased since the implementation of the education program, even prior to ETC's involvement. The results indicate that there was not a substantial amount of transfer of knowledge between students and parents/guardians, nor does it have any effect on participation in the Solar Colwood Program. It should also be noted that the sample size is considerably small and therefore results are inconclusive, but speculations have been made for the purposes of this report.

Overall the revised delivery showed there was not a major difference between Group 1 and 2 in Session 2, but an increase was observed from Group 1 to Group 2 in Session 3. To enhance these results, it is recommended that the observation form be used in conjunction with a coding system developed prior to the start of the research. Given the short length of time of this project, it is recommended also that the observation forms and quizzes be used consistently through numerous different classroom sessions over a longer period of time to increase validity of results.

The program itself was well received by the students with the field trip as the highlight. There are a few recommendations that may improve on results of further studies; both field trips occurred in the afternoon prior to students catching their buses home, so a morning field trip may prevent any perceived rush and allow for thorough explanation of all of the station; an invitation

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extended to the parents/guardians of the students to join in the guided tour may also increase interest and participation in the SC program, along with encourage discussion between children and their parents/guardians. The program may also benefit from being introduced to other grade levels within the school to assess differences of intergenerational learning among different age groups and maturity levels.

Upon completion of the study it is recommended that:

- More parental participation be incorporated into the take-home assignment and action challenge;
- The observation form and quiz format be consistent through numerous classroom sessions to ensure the validity of results;
- The amount of educational materials and Solar Colwood promotional materials the students are given is increased to help with uptake of knowledge (Chesterfield, n.d.);
- More time is allotted for on hands-on activities, such as the field trip; and
- Further research regarding the effectiveness of transgenerational learning with different age groups needs to be conducted and evaluated for its applicability to this program.

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## 12.0 Appendices

### Appendix A: Curriculum

#### Class Outline Flow – Solar Colwood at Dunsmuir

##### Action Research (RRU)

#### Lesson 1: Tuesday, March 26, 2013 (1:59 – 3:10 pm)

##### *PART 1: In-class room (1:59 – 2:10 pm):*

- Susan introduces the 3-day workshop (personal connection, Solar Colwood in your community, relationship to environmental stewardship).
- Solar Colwood Team member (Chris) will give a brief overview of the Solar Colwood program, what the students will see at the home,

##### *PART 2: Walk to the Solar Colwood home (2:10 – 2:15 pm):*

- Walk to Judith Cullington's home – 3338 Acemink Road (2 block walk)

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- Torsten (SCT) already at Judith's. (note: Glenys will also work with students as in Term 2 workshop).

*PART 3: At the Solar Colwood home (2:15 – 2:55ish to 3:00 pm)*

- Students separated into 3 groups and each proceed to 1 of 3 stations:
  1. Low flow hot water kit pieces & Solar Hot Water System (Glenys – with Solar Pathfinder analysis) – start outside, then move inside
  2. Electric vehicle charging station & Smart Home technology energy tracker (Judith)
  3. Insulation and Air Sealing (Torsten – Insulation, Airsealing, Thermal Imaging)

SCT presenters will each prepare:

- A short overview of their technology
  - 3 key points to share with each group, for consistency
  - 3 open-ended questions to engage the group(s) if no one has questions
- Student will rotate after 10-15 minutes at each station

Note: Susan will float between stations for “class” management purposes and to encourage student engagement, and record research observations (notes/photos).

*Class walks back to Dunsmuir (2:55 ish-3:00 pm) – to catch school buses*

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**Lesson 2: Tuesday, April 2, 2013 (1:59 – 3:10 pm) In-classroom**

*PART 1: Energy Use Review (1:59 – 2:25 pm)*

- Introductions of the visiting/observing BSc students
- The following formula will be introduced: (Susan) – BREIF!!

Meaningful/Personal **Connection** + Individual/Community **Action** = Positive **Change**

- Susan will reintroduce the concept of meaningful connection and how it relates to sustainability and community driven initiatives, such as Solar Colwood. Formula put on board.
- Susan will talk about greenhouse gases, basic climate change science, the carbon cycle and how all this relates to energy conservation.
- Show a YouTube clip (<http://www.youtube.com/watch?v=Bnc6KcAw3fA&feature=related>) to give an analogy of GHGs generated from energy use in a home, and a light brainstorm about why saving energy is important with the class. The following statement will be introduced: (draw Earth diagram on the board)

**Every time non-renewable energy is used, greenhouse gases are created that harm the planet**

*My energy saving actions protects the planet.*

- Review Greenhouse gases with a short TEDed video clip (animated) on the carbon cycle and how it is being overloaded through the use of fossil fuel consumption – Statement of energy use/GHG will be put on the board. <http://ed.ted.com/lessons/the-carbon-cycle-nathaniel-manning>
- Short YouTube clip (stop motion animation) of the difference between renewable and non-renewable energy sources <https://www.youtube.com/watch?v=pBTnVoElb98>
  - Short open discussion on the science and concept of climate change/GHG (if necessary)

*PART 2: Field Trip Review and Other Energy Saving Ideas (2:25 – 2:45 pm)*

- Chris will review what they learned on the field trip to the Solar Colwood home (ask what they saw, what was most surprising, did it make them want to see something like that in their homes, did they talk to their parents)

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- Susan will record answers on either flip chart paper or the board.
- Show another YouTube clip (animated) of how a family is making energy saving ACTIONS in their home and community. <http://www.youtube.com/watch?v=1-g73ty9v04> (Susan to draw triangle diagram)
- SCT will ask the students to brainstorm in groups on as many home energy saving ideas as possible; BC Hydro ideas brochure (BC Hydro a partner in SC). Each group will give one or two examples/ideas of what energy saving ACTION they can do (individual or as a family).  
**Brochure supplied by SCT.**
- Open the discussion up by asking the class of what energy saving ACTIONS they can make or do as a group (in their school and/or community). How would this have meaning for them; what is their CONNECTION? Will this lead to positive CHANGE? How? (Susan and SCT)
  - Susan or students will record answers on either flip chart paper or the board.
- SCT to introduce the Home Energy Savings kits and form (**Forms supplied by SCT/shows example of kit**).
- *STRETCH BREAK!*

*PART 3: Take-home Assignment – Water conservation & sustainability action (2:45 – 3:10 pm)*

- Susan will go over the purpose of the take home assignment (how it ties in to the field trip/brainstorm session)
- Each student will be given a flow rate measurement bag and a take-home assignment sheet (**CRD plastic flow rate bag supplied by SCT**).
- SCT/Susan will demonstrate with the class how to do this home experiment, how to calculate their flow, how to make flow rate comparisons, and discuss their findings (take-home assignment)
- Emphasize that the assignment is *due next class April 9*. Bring back the assignment on that day. Full participation will make the next class more fun and a better learning experience.

### **Action Challenge: Hand out sheet**

- Students are “challenged” to write, draw or create a structure about them doing one or more energy saving actions. Bring completed action challenge project into Mr. May. The assignment is **due on April 9** (near the last day of class of Environmental Stewardship of Term 3). Susan will come to the school to pick up the completed assignments. Within this period, Mr. May may be able to display the work of the students in his classroom. Susan will also hand out the Energy Savings Kits on the day the Action Challenge is due. Susan to collect forms on Apr 9 and hand out kits; **SCT will have kits ready at City Hall for Susan to hand out during the last class (Apr 9)**.

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- Note: if the students have permission of their parents/guardians, they can also take a picture of their self-doing one action (home efficiency, conservation efforts) and post on SC Facebook.
- BSc-ES students to group survey student during last 5 minutes of lesson (Lindsey, Steph, Brent, Shaun)

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**Lesson 3: Tuesday, April 9, 2013 (1:59 – 3:10 pm) In-class**

*PART 1: Hot water energy conservation results (1:59 to 2:40 pm)*

**Go over results of take home assignment (Susan)**

- Talk about (briefly) Solar Colwood’s **overall home approach** – water consumption and energy saving is one method
- Talk about their **experience with their shower experiment** (children share their stories of how, what, where)
- Tally up number of the 4 categories of flow rate showerheads in the class
  - Each flow rate group: physically split the kids into their groups based on their experiment findings (in a corner of the room) – post-it notes to show group (shower flow rate)
  - ON THE BOARD: Determine % for each category – to see class **ratio distribution** – Q: representative of their community perhaps?
    - Get the kids to determine # of kids in class, and then **divide group # by their class # X 100%**. This will be done on the board.
    - In their group(s), find out the **number of people living in their houses**
    - Get them to estimate how long an **average shower** takes in their home
    - Everyone then sits down (they remember their avg. and no. of people)

Put up PowerPoint showing flow rate calculations – **Susan bring USB stick**

- How does **flow rate** affect water consumption? - (slide 1) – **Susan bring 1L jug**
- How does **number of persons** affect water consumption? (slide 2)

*Flow rate L/min \* time min \* # of people = average H2O consumption/day in L (slide 2)*

Calculate 1 person shower time at 5 min (have 1 kid stand at their desk)

Calculate 2 person shower time at 5 min (have 2 kids stand up at their desk)

Calculate 3 person shower time at 5 min (have 3 kids stand up at their desk)

Calculate 4 person shower time at 5 min (have 4 kids stand up at their desk)

Calculate 5 person shower time at 5 min (have 5 kids stand up at their desk)

Calculate 6 person shower time at 5 min (have 6 kids stand up at their desk)

- How does **time** affect water consumption? (slide 3)

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- How do all the variables affect water consumption **overall**? (slide 4, 5)
  - Show chart/table of flow rate, time, number of persons (4) in one week, one month, one year

**Discussion on energy saving and GHGs** – talk about how their water tank is heated has an effect on the GHGs that are emitted. No numbers will be given.

**Every time non-renewable energy is used, greenhouse gases are created that harm the planet**

*My energy saving actions protect the planet.*

- Show of hands how their tank is heated (slide 6)
- Ask the children to put in order, which emits the lowest GHGs to the highest (solar, electricity, natural gas, heating oil, other?) Why?! **Question:** Electricity – hydro vs. coal fired plants, which emits more GHGs and how does that relate to heating hot water tanks. Define possibilities of other.
- Have pictures or large print of word of each to on order on the board (electricity, solar, oil, coal, heating oil, other).
- Susan will collect all the assignments

*PART 2: Building Community Engagement through youth empowerment and environmental stewardship (2:40 to 3:10 pm)*

***CONNECTION + ACTION = POSITIVE CHANGE***

Susan will ask the students three questions: (slide 7)

1. What makes you feel good about the environment/nature OR what do you like about your community?
2. What concerns you about the environment or your community?
3. What would you change and how would you do it?

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The students will write their answers on coloured sticky pads (Post-its) and place them on a coloured poster board attached to the wall/board at the front of the class.

Q1 - Blue

Q2 - Red

Q3 - Green

Offer example: (i.e. Example for the class: Judith has a connection with her community and wants to protect nature in the Westshore and beyond. She is concerned about the effects of climate change on her community. So she helped to create the Solar Colwood program for her community so they can reduce GHGs, save energy and water, and build a strong and healthy community. She wants happy homeowners). Give my own example about my love and connection of parks. Misuse and abuse is my concern. Action is to talk/communicate with people.)

Susan and Tim will then discuss their answers until the class. Pull in Solar Colwood whenever possible

Susan will take home the boards to record the student's answers. I will also share a copy of this with Mr. May's class and the SCT. The purpose is:

- For the youth to be heard
- For the community to know what is meaningful to their youth

*End of the workshop*

*Note: Following this third round of outreach, Susan will conduct will conduct a minor evaluation on aspects of design, sequencing, engagement, flow, materials, activities, response, goals obtained, etc., However, the BSc-ES students will be conducting a complete evaluation of the program as part of their major project assignment. The students will observe and help out in Term 3, and then will conduct the entire workshop in Term 4.*

*Note: the PICS funded portion of the Action Research has been extended to December 2013.*

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Lindsey Martini, Shaun Chadburn, Brent Steven,  
Steph James

## **Appendix B: Revised Curriculum Delivery**

### **Class Outline Flow – Solar Colwood at Dunsmuir**

#### **Action Research (RRU)**

#### **Lesson 1: Tuesday, March 26, 2013 (1:59 – 3:10 pm)**

*PART 1: In-class room (1:59 – 2:10 pm):*

- Brent introduces the 3-day workshop (personal connection, Susan introduces Solar Colwood in your community, relationship to environmental stewardship).

*PART 2: Walk to the Solar Colwood home (2:10 – 2:15 pm):*

- Walk to Judith Cullington’s home – 3338 Acemink Road (2 block walk)
- Torsten and Glenys (SCT) already at Judith’s.

*PART 3: At the Solar Colwood home (2:15 – 2:55ish to 3:00 pm)*

- Students separated into 3 groups and each proceed to 1 of 3 stations:
  4. Low flow hot water kit pieces & Solar Hot Water System (Glenys – with Solar Pathfinder analysis) – start outside, then move inside
  5. Electric vehicle charging station & Smart Home technology energy tracker (Judith)
  6. Insulation and Air Sealing (Torsten – Insulation, Airsealing, Thermal Imaging)

SCT presenters will each prepare:

- A short overview of their technology
  - 3 key points to share with each group, for consistency
  - 3 open-ended questions to engage the group(s) if no one has questions
- Student will rotate after 10-15 minutes at each station

Note: Lindsey, Steph, and Brent will float between stations for “class” management purposes and to encourage student engagement, and record research observations (notes/photos).

*Class walks back to Dunsmuir (2:55 ish-3:00 pm) – to catch school buses*

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**Lesson 2: Tuesday, May 14th, 2013 (1:59 – 3:10 pm)** In-classroom

*PART 1: Energy Use Review (1:59 – 2:35 pm)*

Lindsey and Steph will ask the students about their knowledge on greenhouse gases, basic climate change science, and how this relates to energy conservation.

- **What are greenhouse gases?**
  - Gases which contribute to global warming by absorbing and emitting infrared radiation and trapping heat in the earth's atmosphere (I.e. Water vapor, carbon dioxide, methane, nitrous oxide, and ozone)
- **How are greenhouse gases produced?**
  - Some greenhouse gases such as water vapor and carbon dioxide occur naturally. However the burning of fossil fuels (or non-renewable resources) in our cars and in industrial processes increases the rate that these gases are produced. Greenhouse gases are individually produced at home by driving, using electricity, heating your home, and the amount of waste that goes to the landfill.
- **How do GHG's affect climate change?**
  - They allow sunlight to enter the atmosphere freely, but traps the heat in, increasing the Earth's surface temperature. Rising temperatures can change weather patterns and sea levels.
- **What are some ways that you can lower your GHG emissions at home?**
  - Turn off the lights in rooms you aren't in, unplug appliances, walk or bus instead of driving, recycle and compost, conserve water, grow your own food.

**Every time non-renewable energy is used, greenhouse gases are created that harm the planet.**

- Review Greenhouse gases with a short Bill Nye video clip renewable energy and how it is— Statement of energy use/GHG's will be put on the board.
  - <http://www.youtube.com/watch?v=grI3BDSGEC4>
- Short YouTube clip (stop motion animation) of the difference between renewable and non-renewable energy sources <https://www.youtube.com/watch?v=pBTnVoEib98>
  - Short open discussion on the science and concept of climate change/GHG's (if necessary)
  - Game should help clarify any question.

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### Greenhouse Gas Line-up

- Hand-out signs with renewable and non-renewable resources on them. Ask the students to go the appropriate side of the room designated for renewable and non-renewable energy. Discuss with the students why they were in the right (or wrong) place and get them in the correct section.
  - *Coal, Oil, Natural Gas, Solar, Biomass, Geothermal, Nuclear, Hydro, Wind*
- Get volunteers (one holding each of the individual signs) to stand in the front of the class. Ask the remaining students for help putting them in order from the highest GHG emissions to the lowest.
  - Were there any surprises in the line-up?
  - How did you come to these conclusions?
  - If more people knew about this information do you think it would affect their fuel choices?

<http://wildbc.org/publications-resources/climatechange/greenhouse-gas-lineup-v2.pdf>

*PART 2: Field Trip Review and Other Energy Saving Ideas (2:25 – 2:45 pm)*

The following formula will be introduced:

Personal **Connection** + **Action** = Positive **Change**

- Lindsey and Steph will introduce the concept of meaningful connection and how it relates to sustainability and community driven initiatives, such as Solar Colwood. Formula put on board.
- Talk about Judith Cullington. I.e, she cares about the environment and the community, she installed solar panels and purchased an electrical car. This reduces her GHG emissions and inspires other community members.
- Lindsey and Steph will review what they learned on the field trip to the Solar Colwood home (ask what they saw, what was most surprising, did it make them want to see something like that in their homes, did they talk to their parents)
- Lindsey and Steph will record answers on either flip chart paper or the board.
- Show another YouTube clip (animated) of how a family is making energy saving **ACTIONS** in their home and community. <http://www.youtube.com/watch?v=1-g73ty9v04>

*PART 3: Take-home Assignment – Water conservation & sustainability action (2:45 – 3:00 pm)*

- Lindsey and Steph will go over the purpose of the take home assignment (how it ties in to the field trip/brainstorm session)
- Each student will be given a flow rate measurement bag and a take-home assignment sheet (**CRD plastic flow rate bag supplied by SCT**).

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- Lindsey and Steph will demonstrate with the class how to do this home experiment, how to calculate their flow, how to make flow rate comparisons, and discuss their findings (take-home assignment)
- Lindsey and Steph to introduce the Home Energy Savings kits and form (**Forms supplied by SCT/shows example of kit**).
- Emphasize that the assignment is *due next class May 21<sup>st</sup>*. Bring back the assignment on that day. Full participation will make the next class more fun and a better learning experience.

**Quiz on the lesson plan will be handed out in the last 10 minutes. Prizes will be awarded to the top three students.**

**\*Time Permitting:**

**Action Challenge: Hand out sheet**

- Students are “challenged” to write, draw or create a structure about them doing one or more energy saving actions. Bring completed action challenge project into Mr. May. The assignment is **due on May 21** (near the last day of class of Environmental Stewardship of Term 3). Lindsey and Steph will come to the school to pick up the completed assignments. Within this period, Mr. May may be able to display the work of the students in his classroom. Susan will also hand out the Energy Savings Kits on the day the Action Challenge is due. Susan to collect forms on Apr 9 and hand out kits; **SCT will have kits ready at City Hall for Susan to hand out during the last class (Apr 9)**.

Note: if the students have permission of their parents/guardians, they can also take a picture of their self-doing one action (home efficiency, conservation efforts) and post on SC Facebook.

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**Lesson 3: Tuesday, May 21<sup>st</sup>, 2013 (1:59 – 3:10 pm) In-class**

*PART 1: Hot water energy conservation results (1:59 to 2:30 pm)*

### **Water Conservation**

- Video on water uses in the home
- <http://www.youtube.com/watch?v=SaNw3a0JZ3Y>
- Tips of saving water at their home
- Power point about Colwood's reservoir – USB

### **Go over results of take home assignment**

Put up PowerPoint showing flow rate calculations – **Shaun or Brent bring USB stick**

*Flow rate L/min \* time min \* # of people = average H2O consumption/day in L*

- show example of calculations and hand out the exercise to be performed in groups (5 mins- plan to go around and help the groups)
- How does **flow rate** affect water consumption? Have the students give answers
- How does **number of persons** affect water consumption? Have the students give answers
- How does **time** affect water consumption? Have the students give answers
- How do all the variables affect water consumption **overall**?
  - Show chart/table of flow rate, time, number of persons (4) in one week, one month, one year

**Discussion on energy saving and GHGs** – talk about how their water tank is heated has an effect on the GHGs that are emitted. No numbers will be given. (Use the pictures → ask students if energy source is renewable/non-renewable)

- Water consumption and energy saving is one method (use energy with for heating water)
- Talk about their **experience with their shower experiment** (children share their stories of how, what, where)

**Every time non-renewable energy is used, greenhouse gases are created that harm the planet**

*My energy saving actions protect the planet.*

- Ask the children to put in order, which emits the lowest GHGs to the highest (solar, electricity, natural gas, heating oil, other?) Why?! **Question:** Electricity – hydro vs. coal fired plants, which emits more GHGs and how does that relate to heating hot water tanks. Define possibilities of other.

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- Have pictures or large print of word of each to on order on the board (electricity, solar, oil, coal, heating oil, other).
- Shaun and Brent will collect all the assignments

*PART 2: Building Community Engagement through youth empowerment and environmental stewardship (2:30 to 3:00pm)*

**CONNECTION + ACTION = POSITIVE CHANGE**

- Brent and Shaun will ask the students to brainstorm in groups on as many home energy saving ideas as possible; BC Hydro ideas brochure (BC Hydro a partner in SC). Each group will give one or two examples/ideas of what energy saving ACTION they can do (individual or as a family). How would this have meaning for them; what is their CONNECTION? Will this lead to positive CHANGE? How? **Brochure supplied by SCT.**
  - Brent and Shaun will record answers on either flip chart paper or the board.

Brent and Shaun will ask the students three questions:

1. What makes you feel good about the environment/nature OR what do you like about your community?
2. What concerns you about the environment or your community?
3. What would you change and how would you do it?

The students will write their answers on coloured sticky pads (Post-its) and place them on a coloured poster board attached to the wall/board at the front of the class.

Q1 - Blue

Q2 - Red

Q3 - Green

Offer example: (i.e. Example for the class: Judith has a connection with her community and wants to protect nature in the Westshore and beyond. She is concerned about the effects of climate change on her community. So she helped to create the Solar Colwood program for her community so they can reduce GHGs, save energy and water, and build a strong and healthy community. She wants happy homeowners).

Shaun and Brent will then discuss their answers until the class. Pull in Solar Colwood whenever possible

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Shaun and Brent will take home the boards to record the student's answers. They will also share a copy of this with Susan Kerr, Mr. May's class and the SCT. The purpose is:

- For the youth to be heard
- For the community to know what is meaningful to their youth

### **Quiz- 3:00-3:10**

**Quiz on the lesson plan will be handed out in the last 10 minutes. Prizes will be awarded to the top three students.**

### **Extras**

[http://www.youtube.com/watch?feature=player\\_embedded&v=ScX29WBJI3w](http://www.youtube.com/watch?feature=player_embedded&v=ScX29WBJI3w)

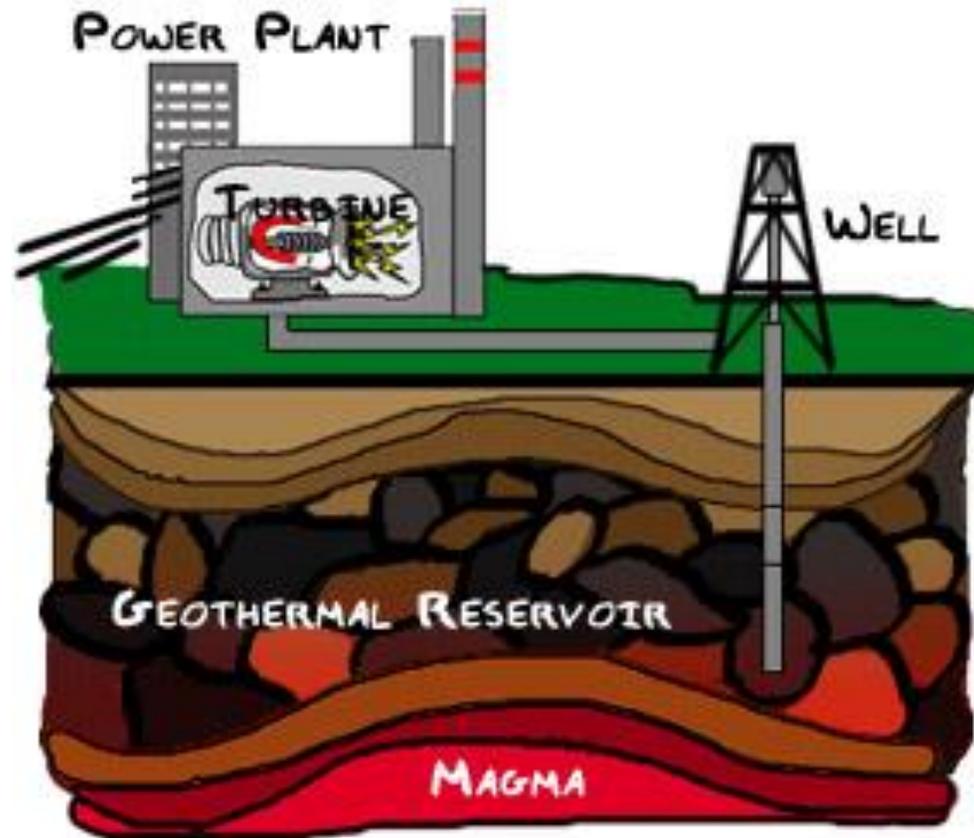
<http://ed.ted.com/lessons/where-we-get-our-fresh-water-christiana-z-peppard#review>

- **Ask if anyone completed Action Challenge – share what they did**

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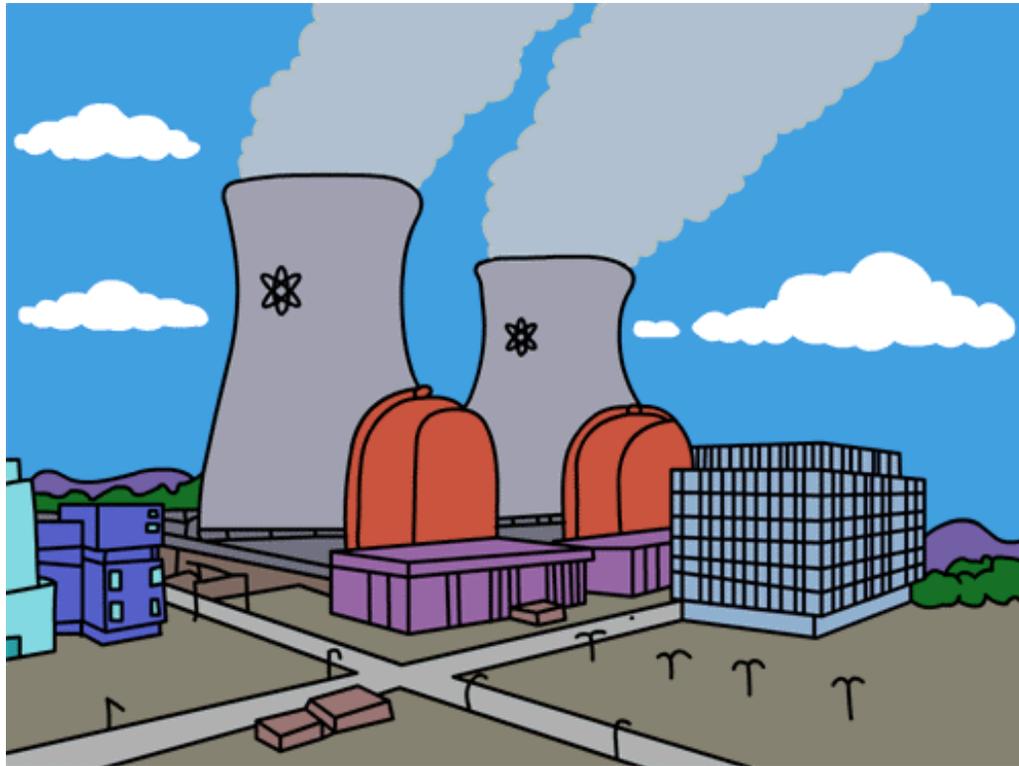
**Appendix C: Visual Aids**

Greenhouse Gas Line-Up (Revised Curriculum: Lesson 2)

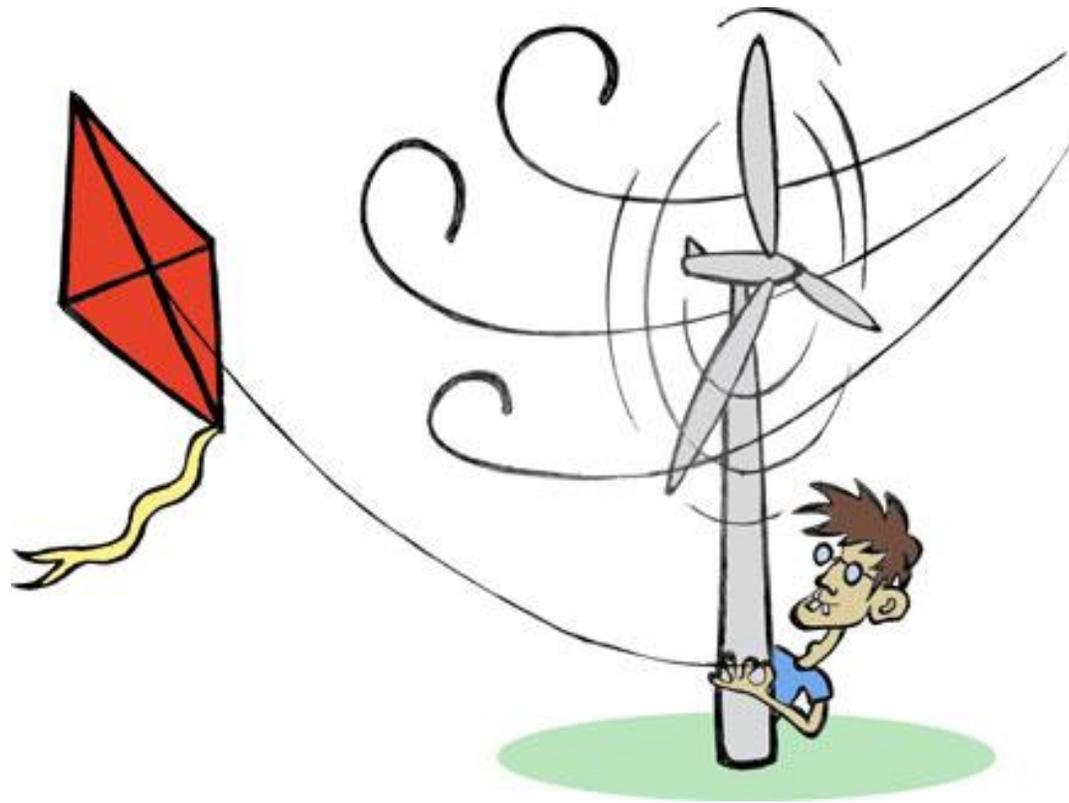


# Geothermal

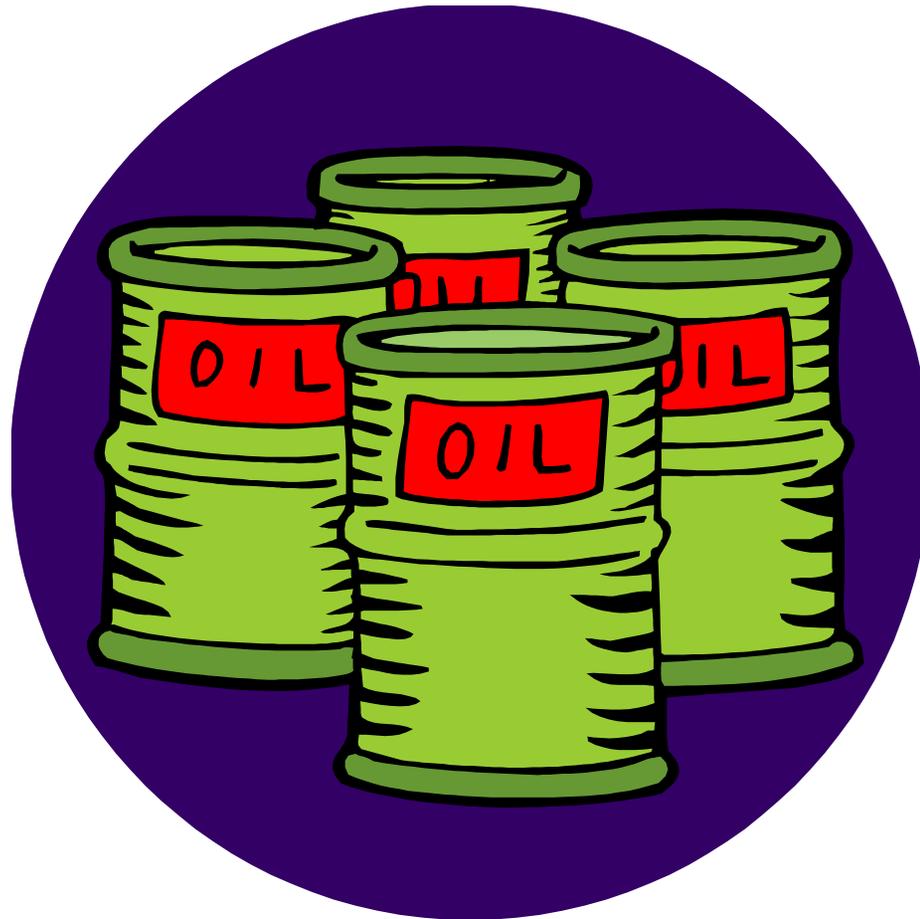
# Nuclear



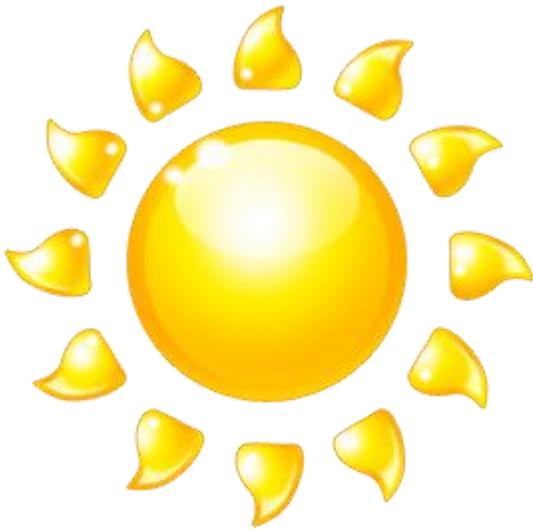
# Wind



# Oil



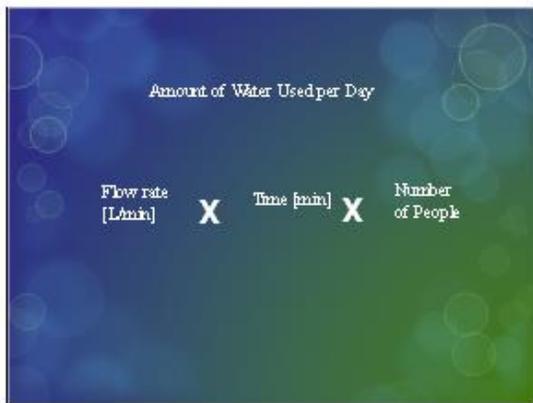
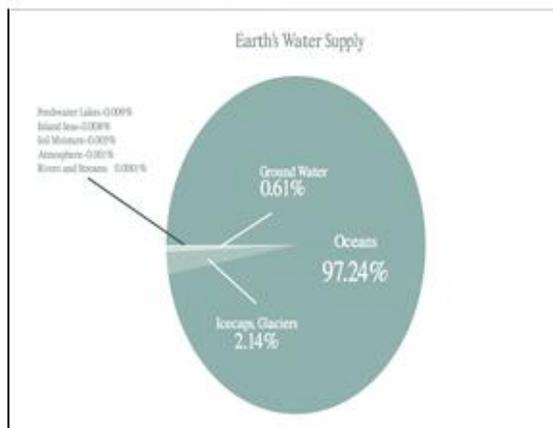
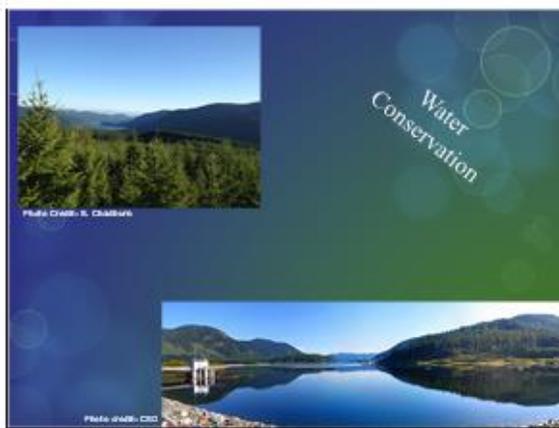
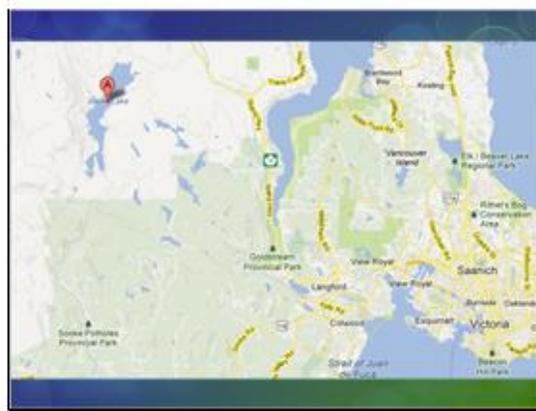
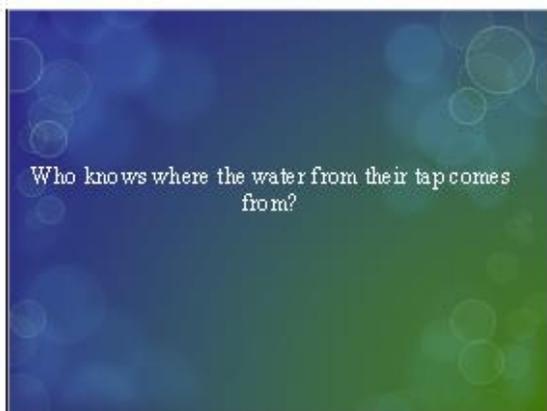
# Solar Power



# Biomass



### Water Conservation: Lesson 3



### Number of People/ Showers

$10 \text{ L/min} \times 5 \text{ min} \times 5 \text{ people/the week} =$	250L
$10 \text{ L/min} \times 5 \text{ min} \times 10 \text{ people/the week} =$	500L
$10 \text{ L/min} \times 5 \text{ min} \times 15 \text{ people/the week} =$	750L
$10 \text{ L/min} \times 5 \text{ min} \times 20 \text{ people/the week} =$	1000L
$10 \text{ L/min} \times 5 \text{ min} \times 25 \text{ people/the week} =$	1250L

### Time per day

$10 \text{ L/min} \times 5 \text{ min} \times 4 \text{ people/the week} =$	200L
$10 \text{ L/min} \times 10 \text{ min} \times 4 \text{ people/the week} =$	400L
$10 \text{ L/min} \times 15 \text{ min} \times 4 \text{ people/the week} =$	600L
$10 \text{ L/min} \times 20 \text{ min} \times 4 \text{ people/the week} =$	800L
$10 \text{ L/min} \times 25 \text{ min} \times 4 \text{ people/the week} =$	1000L

$10 \text{ L/min} \times 5 \text{ min} \times 1 \text{ shower/person}$   
 One day = 50L  
 One week = 350L  
 One year = 18,250L

$15 \text{ L/min} \times 5 \text{ min} \times 1 \text{ shower/person}$   
 One day = 75L  
 One week = 525L  
 One year = 27,375L



### Making A Meaningful Connection

1. What makes you feel good about the environment OR what do you like about your community?
2. What concerns you about the environment OR your community?
3. What would you change and how would you do it?

## Appendix D: Supplies List

### Lesson Plan 2: May 14<sup>th</sup>, 2013

- Whiteboard Markers
- Greenhouse Gas Line-up
- Hand-out signs of renewable and non-renewable resources
- Video Clips:
  - <http://ed.ted.com/lessons/the-carbon-cycle-nathaniel-manning>
  - <https://www.youtube.com/watch?v=pBTnVoE1b98>
  - <http://www.youtube.com/watch?v=1-g73ty9v04>
- Flip Chart
- Take-home assignment-Water conservation
- Shower flow rate measurement bag
- Home Energy Saving kit and forms
- Action challenge hand-out sheet
- Quizzes
- Extra consent forms

### **Lesson Plan 3: May 21<sup>st</sup>, 2013**

- USB for hydro power point
- Whiteboard Markers
- Flip Chart
- Bottle of water
- Tablespoon
- 5 gallon bucket
- Tape (to hold posters)
- Signs for GHG emissions
- Multi-coloured Post-it Notes
- Coloured poster board
- BC Hydro brochure
- Calculators (Equal to number of groups)
- Quizzes
- Prizes from previous quizzes

## Appendix E: Ethical Review

### Pending Approval by RRU Academic Council December, 2012

If your research involves human participants then it most likely requires an ethical review by the Royal Roads University Research Ethics Board (or one of its subcommittees). Please refer to the *Royal Roads University Research Ethics Policy* for specific guidance on identifying research that requires ethical review.

The *Royal Roads University Research Ethics Policy* will assist you in understanding the questions below and will help you formulate your responses. If you have additional inquiries, contact your Project Advisor or Academic Supervisor or the Research Ethics Coordinator.

**Research involving human participants cannot be initiated until the Request for Ethical Review has been approved. (This includes sending out invitations for participation, as well as any data-gathering.)**

Incomplete requests for Ethical Review will not be considered – all questions must be answered and all requested attachments provided.

Please **do not** delete any of the questions or prefatory materials. If you need more space than provided, please attach additional blank sheets. Please remember to note the number of your response.

Please have your academic supervisor submit the completed form, via email, to [ethicalreview@royalroads.ca](mailto:ethicalreview@royalroads.ca). Please allow **four weeks** for the decision of the Research Ethics Board.

<b>I. PRINCIPAL INVESTIGATOR</b>	
Name:	<u>Brent Steven</u>
Faculty / Program: (Please specify)	<u>B.Sc. Environmental Science</u> <input type="checkbox"/> Faculty <input type="checkbox"/> Graduate Student <input checked="" type="checkbox"/> Undergraduate Student <input type="checkbox"/> Staff <input type="checkbox"/> Other (Please Specify):
<b>A. CONTACT INFORMATION</b>	
Address:	<u>605 Eiderwood Place</u>
City:	<u>Colwood</u> Province: <u>BC</u>
Postal Code:	<u>V9C 2L1</u>
Home Phone:	<u>(     )</u> Work Phone: <u>(     )</u>
Cell Phone:	<u>( 226 ) 932 5569</u> Other: <u>(     )</u>
E-Mail:	<u><a href="mailto:Brent.1steven@royalroads.ca">Brent.1steven@royalroads.ca</a></u> <small>Please use the current email address which you check regularly. Correspondence and/or approval will be sent to this address.</small>
<b>If Student, specify: FACULTY PROJECT ADVISOR / ACADEMIC SUPERVISOR</b>	

Name:	<u>Alison Moran</u>
Office Phone:	<u>( 250 ) 391 2600</u> Extension: <u>4534</u>
E-Mail:	<u><a href="mailto:Alison.moran@royalroads.ca">Alison.moran@royalroads.ca</a></u>
Supervisor:	<i>Faculty Members Only - Specify Your Supervisor:</i>

<b>If applicable, specify: SPONSOR / CLIENT</b>	
Name:	<u>Chris Ling</u>
Company:	<u>Royal Roads University</u>
Office Phone:	<u>( 250 ) 391 2600</u> Extension: <u>4171</u>
E-Mail:	<u><a href="mailto:Chris.ling@royalroads.ca">Chris.ling@royalroads.ca</a></u>
<b>If Faculty member, specify: SUPERVISOR AND SCHOOL/FACULTY</b>	
Name of Supervisor:	_____
Office Phone:	<u>(       )</u> _____ Extension: _____
E-Mail:	_____
Your School/ Faculty:	<i>Faculty Members Only - Specify Your Supervisor:</i>

<b>CO-INVESTIGATOR</b>	
Name:	<u>Lindsey Martini</u>
Faculty / Program: (Please specify)	<u>B.Sc. Environmental Science</u>
	<input type="checkbox"/> Faculty <input type="checkbox"/> Graduate Student <input checked="" type="checkbox"/> Undergraduate Student <input type="checkbox"/> Staff
	<input type="checkbox"/> Other (Please Specify): _____

<b>CONTACT INFORMATION</b>	
Address: Unit 310 611 Brookside Road, Colwood, BC, V9C 0C3	
Cell Phone: (250) 896 2909	
Email Address: <u><a href="mailto:lindsey.martini@royalroads.ca">lindsey.martini@royalroads.ca</a></u>	

<b>CO-INVESTIGATOR</b>	
Name:	Shaun Chadburn
Faculty / Program: (Please specify)	<b>B.Sc. Environmental Science</b>
	<input type="checkbox"/> Faculty <input type="checkbox"/> Graduate Student <input checked="" type="checkbox"/> Undergraduate Student <input type="checkbox"/> Staff <input type="checkbox"/> Other (Please Specify):
<b>CONTACT INFORMATION</b>	
Address: 11 Camden Avenue, Victoria, BC, V8Z 1P6	
Cell Phone: (250) 886 0186	
Email Address: <a href="mailto:shaun.chadburn@royalroads.ca">shaun.chadburn@royalroads.ca</a>	

<b>CO-INVESTIGATOR</b>	
Name:	Steph James
Faculty / Program: (Please specify)	<b>B.Sc. Environmental Science</b>
	<input type="checkbox"/> Faculty <input type="checkbox"/> Graduate Student <input checked="" type="checkbox"/> Undergraduate Student <input type="checkbox"/> Staff <input type="checkbox"/> Other (Please Specify):
<b>CONTACT INFORMATION</b>	
Address: 2056 Sooke Road, Colwood, BC, V9B 1W3	
Cell Phone: (778) 350 1466	
Email Address: <a href="mailto:steph.1james@royalroads.ca">steph.1james@royalroads.ca</a>	

<b>B. CONFLICT OF INTEREST</b>
<p>Provide full details of any actual, perceived, or potential conflicts of interest (economic, family-related or otherwise) on the part of the principal investigator and/or co-investigators. For example, if you plan to incorporate into your research staff whom you employ, students whom you teach, or fellow employees, this constitutes a conflict of interest. Because the researcher has power over potential participants in areas outside of the research, such individuals may perceive their participation to be coerced, and are therefore not fully free to refuse participation in your research, regardless of your best intentions. Please indicate how you would acknowledge and address this issue. What measures would you take to ensure research participants are aware of potential or actual conflict? Any and all conflicts of interest must be disclosed in your consent documentation (as outlined in Question IX).</p>
N/A
<p>Do you supervise or have influence over individuals in the study? If so, please explain how you would minimize undue influence over these individuals?</p>
N/A
<p>Is there any possibility that the activities or results of your study could impact negatively on the organization?</p>
Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<p>If Yes in what ways might the activities or results of your study impact negatively on the organization? If this is a potential outcome, please explain how you would mitigate this impact.</p>
N/A

<b>II. SHORT TITLE OF PROJECT</b>	
Project Title: (10 Words Max.)	<b>Role of Youth in Environmental Stewardship in Generating Awareness</b>
Provide 4 keywords / phrases that describe the project:	<b>1. Solar education</b>
	<b>2. Social mobilization</b>
	<b>3. Sustainable communities</b>
	<b>4. Municipal incentive program</b>

<b>III. SUMMARY OF PROPOSED RESEARCH</b>
Provide a brief but complete description, in non-technical language, of the purpose, objectives and research questions of the project. Use no more than one page.
<b>A. Purpose – [Why are you conducting this research?]</b>
Developing and implementing an educational program for students at Dunsmuir Middle School about energy efficiency and renewable technologies, as well as exploring ways to encourage Colwood families to participate in the Solar Colwood program through the educational program.
<b>B. Objectives – [What do you hope this research will accomplish?]</b>
Framing research in the context of social marketing, we will examine how the project will be/has been communicated to the community and what we can learn from this, as well as what best practices can be created and shared from this knowledge.
<b>C. Research Questions:</b>
What extent is school activity affecting the parents in regards to solar education?
What is the most effective way to engage with middle school children regarding solar energy?

<b>IV. SUMMARY OF METHODOLOGY AND PROCEDURES</b>
Provide a brief but complete description, in non-technical language of the methodology and procedures. Use no more than one page.
<b>Note: Attach to this application a copy of your questionnaire, interview guide, survey, test instrument, or other research instrument (for each method). If any instrument, informed consent, or letter of invitation is incomplete; or if you plan to finalize your instruments after you begin your research, then please submit your “best draft”. When your final instrument is available, please submit it to your faculty Project Advisor or Academic Supervisor for approval. Your Supervisor will forward your final version to the RRU Research Office to add to your file. If there are significant changes between initial and final submissions, approval may be required from the REB or from the appropriate</b>

**subcommittee that monitors amended submissions, or you may be asked to resubmit a Research Ethics Request Amendment (see Section VII. Research Project Details, Part D).**

Consent forms for parents and children (attached) will be handed out by the classroom teacher prior to the evaluation sessions. Both signatures from parents and child must be obtained before the data can be collected. Copy of both consent forms will be provided to the parents signed by one of the team members. A pre-evaluation of the students knowledge will also be completed prior to the research teams evaluation sessions to provide a baseline assessment of the students knowledge on the topics being taught. This will be handed out during the research teams introduction to the class prior to the evaluation sessions. A post-evaluation of students knowledge will be completed to assess the uptake of information. The students will be made aware that these evaluations will not affect grades earned in their regular class and will be used to assist the team in improvement of the lesson plan and as an evaluation of the content delivery methods.

Classroom observations made during the activities facilitated by Susan Kerr will be performed by all research team members. The class will be divided in half, with two research team members observing each half from the back or sides of the classroom. In the event that participation is required of the research team, two members will continue observations while two members aid in delivery of the content. The students will be introduced to the research team and advised of the project so as to avoid confusion and ensure that student behaviour and participation is not disrupted.

Through the classroom observations made during the sessions facilitated by Susan Kerr and the use of background literature, a revised curriculum will be developed, implemented and facilitated in the following term by the research team. The content relayed to the class will be the same as the previous sessions but delivered in a different manner as developed from observations made to enhance engagement. Classroom observations made during the facilitation of classroom activities by the research team will be conducted by two of the team members in the same fashion described above, while two members are presenting the information. Observations will be taken in the form of handwritten notes for both sets of classroom sessions based on the data collection sheet provided as well as personal observations.

A survey that has been designed by the sponsors will be used to measure the uptake of information to the parents from the students. The survey will be sent home with the children after the course delivery and asked to return completed forms either back to the school where they will be picked up, or an identical on-line survey can be completed. The research will consist of this survey and is foreseen to take no more than 15 minutes to complete. Questions refer to personal home energy use and awareness of energy efficiency and the Solar Colwood project. Aggregated results of the survey, but no personal data, will be shared with the City of Colwood, and may be published in a publicly available final report, in a project website and in academic journals.

## V. DESCRIPTION OF POPULATION

### A. How many participants will be required for this study? What is the total sample size?

Participation is dependent on completed consent forms from both grade 7 students at Dunsmuir Middle School and their parents. Each class is estimated to have 20-30 students, and two classes are expected to participate. The estimated sample size is between 75 and 100. In addition, a voluntary extra-curricular team of students is planned, with participation numbers pending enrollment. The total sample size is unknown at this time.

### B. Who will be recruited and what are the criteria for their selection? (Justify any exclusion of research participants on the grounds of attributes such as race, sex, age, culture, race, and mental or physical disability).

Grade 7 students at Dunsmuir Middle School and their parents/guardians are the targeted participants, with no exclusions. The extra-curricular team is open to all students at the school.

## VI. RECRUITMENT AND WITHDRAWAL

Provide a brief but complete description, in non-technical language, of the purpose, objectives and research questions of the project (USE NO MORE THAN ONE PAGE).

### A. How will the participants be recruited?

- By letter (enclose a copy)
- By telephone or other online electronic medium? (Complete the Telephone or Online Electronic Contact Form)
- By advertisement, poster, flyer (enclose a copy)
- Other (explain): Pre-determined class

### B. How and when are participants informed of the right to withdraw?

Consent form will be handed out prior to research activities. Class members wanting to be excluded from data collection will still participate in the classroom as it is a registered course, but no data will be collected from those students. Students and parents will be informed that they have the right to withdraw prior to classroom research. Consent form will be read to students to ensure they fully understand what being involved in the research incorporates.

### C. What procedures will be followed for participants who wish to withdraw at any time during the study?

Participants wishing to withdraw from the study may do so by contacting the investigators directly using the contact information provided on the consent form. Data already collected from students that wish to withdraw will be removed from the rest of the data and disposed of (i.e. shredded or deleted)

## VII. RESEARCH PROJECT DETAILS

**A. Where will the project be conducted?**

During normal school hours at Dunsmuir Middle School and at community events (e.g. Sunfest), that have yet to be planned.

**B. Does your sponsoring organization (or any of the organizations involved in your research) require an ethical review in addition to the RRU review?**

Yes.

**C. Conducting Research Outside of Canada:  
a. Research conducted outside Canada may require additional (formal or informal) approvals. Have you addressed this requirement?**

Yes

No

N/A

**If such approvals are required, please describe your intended process:**

**b. If applicable, describe cultural, political, and/or legal differences that are likely to create a challenge in your study and how you plan to address them. (For example, how will you respond if participants abroad depart from the common interpretation of the Tri-Council Guidelines in their understanding of applicable research ethics?)**

**D. Is this an amendment of a previously approved protocol?**

Yes

No

Date of previous approval:

**VIII. INVOLVEMENT OF ABORIGINAL INDIVIDUALS OR COMMUNITIES**

**Will the research involve aboriginal individuals?**

Yes

No

**If yes, do any of the following statements apply? (Provide a brief explanation and indicate how approval of the community as a whole will be obtained.)**

Property or private information belonging to an aboriginal group as a whole will be studied or used.

- Leaders of the group will be involved in the identification of potential participants.
  - The research is designed to analyze or describe characteristics of the group.
  - Individuals are selected to speak on behalf of, or otherwise represent, the group.
- Class may include Aboriginals, but will not be singled out in the data collected

## IX. FREE AND INFORMED CONSENT

Evidence of free and informed consent by the participants or by authorized third parties should ordinarily be obtained in writing. (See Checklist for Consent Form and include a copy of the Consent Form or other document with which you will obtain consent in writing). Obtaining informed consent from your research participants is mandatory; however, the method by which the informed consent is obtained may vary. For example, on a survey form a preface or a preamble could include the same information found in a consent form.

**A. Have you included, attached to this “Request for Ethical Review,” a sample consent form for each method in this research?**

Yes  No

**If no, document the procedure by which free and informed consent will be obtained.**

**B. Will the participants face any impediment to giving free and informed consent? (Consider physical or mental condition, age [e.g., under 18], language, incarceration or other barriers.)**

Yes  No

**If “Yes”, please provide details [e.g., for minors, two signatures are required: one from the participant and one from the legal guardian.]**

Study will deal with minors.

**Please describe the proposed resolution of this impediment.**

Consent from child and legal guardian (signature).

**C. Research Involving Vulnerable Participants**

The Criminal Code of Canada Section 122 (1) Subsections 6.3(1) defines a vulnerable person as “a person who, because of his or her age, a disability or other circumstances, whether temporary or

permanent,

- (a) is in a position of dependency on others; or
- (b) is otherwise at a greater risk than the general population of being harmed by a person in a position of trust or authority towards them.”

As a Canadian university, Royal Roads University abides by the Tri-Council Policy Statement: *Ethical Conduct for Research Involving Humans* and the Canadian Laws protecting potentially vulnerable participants. As a RRU sanctioned researcher, if you involve participants under 18 years old or other vulnerable persons, you will be subject to a Vulnerability Sector Search.

### VULNERABLE SECTOR SEARCH

**A VS search is initiated by the local police in the jurisdiction where you live. The police will use the Canadian Police Information Centre (CPIC) system as well as their own database to conduct a background search based on your name, gender and date of birth. If your gender and date of birth match a pardoned sex offender record, you will be asked to provide fingerprints to confirm your identity. (<http://www.rcmp-grc.gc.ca/cr-cj/vulner/index-eng.htm>)**

**In BC, the VS Search is accomplished through a Criminal Records Check – Children and Vulnerable Adults, as mandated by the [BC Criminal Review Act](http://www.pssg.gov.bc.ca/criminal-records-review/index.htm) (<http://www.pssg.gov.bc.ca/criminal-records-review/index.htm>).**

**RRU International students resident and/ or conducting research overseas with vulnerable populations are also required to provide their supervisor with a criminal records check on themselves from their country of citizenship and from their resident location (if this differs from their country of citizenship). *Please note: if you feel this requirement poses a risk, you should discuss your concern with the Research Ethics Office before proceeding* ([ethicalreview@royalroads.ca](mailto:ethicalreview@royalroads.ca))**

- I do not plan to involve Vulnerable Participants in my research (or practicum)
- OR**
- I intend to involve Vulnerable Participants in my research (or practicum); and I have reviewed the RCMP information on [Vulnerable Sector Search](#), the [BC Criminal Review Act](#) as it pertains to the process for Criminal Records Checks in BC, and the [specific offences](#) that will be subject to review.
  - I have already completed a Criminal Record Check (**Please provide a copy to your supervisor/advisor**)
  - I have applied for a Criminal Records Check – Children and Vulnerable Adults. Researchers can find the link at <http://www.pssg.gov.bc.ca/criminal-records-review/apply/index.htm>. Or I have applied for an equivalent Vulnerability Sector Search through my local police force.
  - The costs of the Vulnerability Sector Search/Criminal Record Checks are my sole cost as the researcher (check to confirm understanding).
  - The results of the Vulnerability Sector Search/Criminal Records Checks will be provided to my Project Advisor /Academic supervisor and Program Head before any human interaction with Vulnerable Persons is undertaken (check to confirm understanding).

**Note: If a criminal record is found, your research proposal will be reviewed. This may result in (1) denial of your proposed research, (2) limitations imposed on your Research's methods or scope, or (3) imposition of additional specific conditions set by RRU and the Academic Supervisor.**

## **X. RISKS**

### **A. Does the research in your view conform to the standard of "minimal risk"?**

**"Minimal Risk":**

"For the purposes of this [TCPS] Policy, "minimal risk" research is defined as research in which the probability and magnitude of possible harms implied by participation in the research is no greater than those encountered by participants in those aspects of their everyday life that relate to the research". [Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, & Social Sciences and Humanities Research Council of Canada, 2010, p. 23]

Yes  No

**If no, please explain how it exceeds minimal risk.**

### **B. Describe the potential and anticipated risks of the proposed research.**

- Work in the school may be used in future curriculum development; students may feel they are penalized for not participating with our project, but we will endeavor to ensure that there will be no repercussions.

### **C. What inducements (monetary or otherwise) will be offered to prospective participants? If payment is to be made, provide details such as amounts and payment schedules.**

None

### **D. How much time will a participant be expected to dedicate to the project?**

- Classroom activities will be performed as part of regular curriculum.
- Voluntary time commitments will be extra-curricular (green team, sun fest).
- Survey time will require approximately 20 minutes to complete (parents).

## **XI. BENEFITS**

### **A. Benefits to Researcher:**

Collection of data that will help answer the research questions. Insight into the uptake of municipal incentive programs.

**B. Benefits to Participants:**

- Provision with an opportunity to discuss their opinion and develop their knowledge and perspectives about solar energy and municipal green energy programs.
- Opportunity to contribute to our knowledge about developing environmental stewardship in classroom.

**C. Benefits to Sponsor:**

PICS is a network of researchers engaged in climate-related research; this project will add to the body of knowledge available to the network.

The City of Colwood will receive objective monitoring and evaluation of the initial stages of the Solar Colwood program.

**D. Benefits to Society:**

The encouragement of energy efficiency improvement and reductions in carbon emissions is a stated policy aimed at all scales of government. This research will improve knowledge regarding the processes municipalities can engage with to fulfill those policy objectives at a community scale.

**XII. PRIVACY, CONFIDENTIALITY AND ANONYMITY**

- A. For some researchers, depending on the nature of your research, your client/sponsor or the sponsoring organization, will require you to sign a research privacy agreement. The responsibility is yours to ensure that your research adheres to all privacy legislation and regulations in the jurisdiction where you will conduct your research. Please check with your client/sponsor or sponsoring agency, to see if they will require a research privacy agreement.

**Does your client/sponsor require a research privacy agreement??**

Yes  [Skip to XII.b]                      No

**If “No”, have you completed some other form of agreement to protect the personal information of participants?**

Yes                       No

**If “Yes”, please describe the agreement.**

**If “No”, please describe how you have explained to your client/sponsor the RRU and Tri-Council Guidelines for maintaining participant confidentiality:**

The consent form developed and attached ensures participant

confidentiality.

**B. Will the project obtain private information from research participants?** (For example, will names linked to opinions, views, etc. be collected?)

Yes

No

By marking "No" you confirm that you will obtain information only from public sources (e.g., publications from Statistics Canada).

If "Yes", please describe "a" through "f" below and respond to "g":

**a. The type of information you will collect.**

Opinions and knowledge of renewable energy and related technologies No information regarding age, gender and other demographic variables will be collected.

**b. The purpose for which the information will be used.**

Support Solar Colwood in maximizing participation from residents. Data collected will be presented at Royal Roads University in August 2013. Also data will be used to write a report that will be available to Solar Colwood, Dunsmuir Middle School, Sponsors and Royal Roads University.

**c. The limits in place on the use, disclosure and retention of the information.**

Any information collected will be limited to use and retention by the research team and sponsors of the project. The final project will be available to the general public, as per consent form. Raw data will be provided to the Sponsors to continue with research. Any data remaining in our possession, once the report and raw data is handed over for the project "The public uptake and acceptance of a green energy program" approved By Royal Roads University, will be destroyed and deleted.

**d. The safeguards in place for confidentiality and participants' security**

(Note: If you warehouse data on US servers or a subsidiary of a US company manages your information you should notify your research participants that US authorities are legally entitled to access that information under the Patriot Act. Typically, this can be done in the Request for Informed Consent document).

Data will be kept on a password protected computer and will not be linked to individuals.

**e. Any media you may collect such as photographs, videos or sound recordings that allow identification of particular participants.**

Photographs may be taken, consent is included on the consent form to students and parents.

f.	<b>Any anticipated linkage of your research data with other participant data in public or personal records.</b>
N/A	
g.	<b>Do you plan the secondary use of individually identifiable data that you gather for: (1) non-research purposes, such as a journal article or conference presentation, or (2) as part of a subsequent research project?</b>
Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
<b><u>If yes, please describe the following:</u></b>	
i.	<b>Why individually identifiable information is essential for this secondary use;</b>
ii.	<b>What measures you will take to protect the private information of individuals;</b>
iii.	<b>How you will obtain informed consent from those who contributed the data or from authorized third parties.</b>

<b>XIII. FEEDBACK TO PARTICIPANTS AND DISSEMINATION OF RESEARCH</b>	
<b>Participant Deception:</b>	
<b>Does your research involve deception of your participants regarding the true nature of your research?</b>	
<input type="checkbox"/>	Yes. <b>Explain how and why this will be done.</b>
<input checked="" type="checkbox"/>	No.
<b>If yes, will the participants deceived in your research be debriefed, and, if so, how and when will this take place?</b>	
<b>Debriefing</b> refers to the full disclosure of the research purpose and other pertinent information to participants who have been involved in research employing partial disclosure or deception. In other words, the study requires some degree of deception or omission so that the participants are not aware of the true nature, or all of the true nature, of the study. In such cases, debriefing is typically done after participation has ended, but may be done at any time during the study.	
<input type="checkbox"/>	Yes. <b>Explain how this will be done.</b>
<input type="checkbox"/>	No. <b>Explain why not.</b>

#### XIV. RESEARCH DISSEMINATION

Please describe your process for reporting research findings and recommendations back to your participants and to key stakeholders in your research.

Research findings and recommendations will be reported in the form of a research report and presentation to sponsors. Participants will be continuously informed of ways to improve on energy efficient processes involved in everyday life.

#### XV. COMPLIANCE

I understand that the Royal Roads University Research Ethics Board may request from me my research documentation and my research results to demonstrate compliance with RRU Research Ethics Policy and to demonstrate my compliance with my approved Request for Ethical Review.

Please check here to confirm acceptance:

#### XVI. SIGNATURES

For electronic submissions, the researcher's supervisor/advisor can email his/her approval to [ethicalreview@royalroads.ca](mailto:ethicalreview@royalroads.ca) or fax the signed signature page, attention Research Ethics Coordinator, Office of Research, to 250-391-2500.

***All applicants:***

\_\_\_\_\_  
Principal Investigator Date

\_\_\_\_\_  
Co-investigator Date

\_\_\_\_\_  
Co-investigator Date

\_\_\_\_\_  
Co-investigator Date

***If student:***

\_\_\_\_\_  
Faculty Project Advisor/ Academic Supervisor Date

***If faculty member or other:***

\_\_\_\_\_  
Dean

\_\_\_\_\_  
Date

Where the Dean is the Principal Investigator, or where the subject of the Research is an individual, program, or department within RRU the signature of the Vice President Academic is required.

\_\_\_\_\_  
Vice President Academic

\_\_\_\_\_  
Date

## APPENDICES

### Checklist for Consent Form

Researchers can obtain free and informed consent by various means, such as having participants sign a Consent Form; by an explanatory letter accompanying a questionnaire; or by an introductory statement (preamble) at the beginning of a questionnaire. Whatever means is used, the burden is on the researcher to ensure that the participants understand what they are being asked to do and are giving their **free and informed consent** to participate in the project. The participants should retain a copy of the Consent Form (or other document) for their reference. You should convey the following information to participants. (Regardless of the means you use to obtain consent, please check each item on this form as you address it.)

- Give the title of Project.
- Identify the researcher and the University affiliation. Include contact name and telephone number for the Faculty Supervisor and/or School Director.
- Invite the individual to participate in a research project.
- Provide a clear statement of the research purpose.
- Describe the nature and duration of the participant's involvement.
- Describe the nature of questions you will ask, especially if sensitive questions will be asked. (You can place warnings in the body of the interview itself. Indicate how you propose to deal with sensitive items, if any, in your interview.)
- State how you will record the information.
- Provide a statement about protection of privacy, confidentiality and anonymity.
- Describe any foreseeable harms and benefits to the participant, including any financial costs or benefits and/or inconveniences.
- Disclose any and all conflicts of interest.
- Assure prospective participants they are free not to participate and have the right to withdraw at any time without prejudice to pre-existing entitlements.  
These assurances (which may come from third-parties) address conflict of interest issues. They apply especially to:
  - a. **Students:** Whether they choose to participate or not will have no effect upon their grades and standing.
  - b. **Employees:** Whether they choose to participate or not will have no effect upon their employment or advancement.

c. **Public:** Whether they choose to participate or not will have no effect upon medical care or services they receive or will receive, if applicable.

d. **Dependent populations (e.g. prisoners, others in institutional settings):** Whether or not they choose to participate will have no negative consequences.

- Address the possibility of any commercialization of research findings, and the presence of apparent, actual or potential conflicts of interest on the part of researchers, their institutions or sponsors.
- Offer to answer any questions before proceeding.
- Offer the name and telephone number of a person who can verify the authenticity of the research project. Investigators should provide a contact outside the research group if potential respondents request it.
- State that if the participant completes and submits an online or paper questionnaire, it is assumed that consent has been given.
  
- Describe how the research results will be published and how participants will be informed of the results of the research.
- If appropriate, have the participant or authorized representative sign and date the document.

**The following statements relate to participant anonymity and record confidentiality. Please check those that apply to you and respond where requested.**

- The use of code numbers or pseudonyms to identify the results obtained from individual participants will protect anonymity.
- The participant's name will not appear on any final documentation (whether the report is published or unpublished).
- Any data collected will remain confidential; interview results and questionnaires will be kept in a locked cabinet.
- Loss of anonymity will occur for participants in a focus or discussion group, however, the researcher will still maintain participant confidentiality in any report.
- Only specified individuals will have access to raw data or identifying information.
- There is a record retention plan for this project. (If so, describe what will happen to all records and documentation once the study is complete (e.g., they are destroyed or archived). Describe when this will occur (e.g., immediately or after a certain number of years).
- In the event a participant leaves the study prematurely, there is a plan for handling that participant's information. (If so, describe what will happen to their information if a participant withdraws early? Note: with large-group data-gathering methods participants may leave the group, but their previously recorded comments remain in the data set as these comments cannot be separated out of a group recording)

**The following statements relate to the audio, video, or photographic recording of participants. Please check those that apply to you and respond where requested.**

- The researcher will secure the participants' permission for disposal of media and will specify how and when this will occur.
- A participant has the right to decline electronic recording. In this case the researcher may seek the participant's agreement for a different, anonymous data collection method.
- The media from this research will be further used after the project is completed. Additional permission is required if recordings, transcriptions of recordings, or photographs are used after the research is completed (e.g., in a public exhibition). Describe the required permission.

**The following statements relate to participants who are not competent to give free and informed consent. If your research involves such participants, please identify their authorized representatives (e.g. parents or legal guardians), check the statements that apply to you and respond where requested.**

- Describe how the free and informed consent will be obtained from the authorized representatives and how the participant's best interests will be protected.

Consent form

- Confirm (with check mark) that the authorized representative is not a researcher or any member of the research team.
- Describe how the continued free and informed consent of an authorized representative will be maintained during the course of the research activity, so long as the participant remains incompetent.
- If an individual understands the nature and purpose of the research, but full consent is not possible, describe how the researcher will attempt to ascertain the individual's wishes.

***Note: If a participant becomes competent during the course of a project, his or her informed consent must be obtained as a condition of continuing participation.***

#### **TELEPHONE OR ONLINE ELECTRONIC CONTACT FORM**

**The following statements relate to telephone or other electronically-mediated contact with participants. Please check those that apply to you and respond where requested**

- Initial contact with the participant is made by telephone or other electronic media. (Where such initial contact is made, if possible, please attach a text copy of your introductory words.)
- Contact with the participants in your project is solely by telephone or other electronic media. (This makes it impossible to obtain a signed record of consent, and necessitates a verbal, recorded consent.) If this is the case, indicate why you believe such contact is necessary to achieve your research objectives.
- Include a text copy of the proposed introduction for your telephone interview. Please check each item on the following list before submission to be sure your introduction covers as many of the

normal consent items as possible.

- Identification of researcher and the University affiliation.
- Identification of fieldwork agency, if applicable.
- Invitation to participate in a research project.
- Clear statement of the research purpose.
- Description of the nature and duration of the participant's involvement.
- Description of the nature of the questions to be asked, especially if there are sensitive questions. (Warnings may be included in the body of the interview itself. Indicate how you propose to deal with sensitive items, if any, in your interview.)
- Statement about how information obtained over the phone will be recorded.
- Description of measures for the protection of anonymity and confidentiality.
- Description of any foreseeable harms and benefits.
- Assurance that prospective participants are free not to participate. If they do, they have the right to withdraw at any time without prejudice to pre-existing entitlements.
- Statement on the possibility of any commercialization of research findings, and the presence of apparent, actual or potential conflict of interest on the part of researchers, their institutions or sponsors.
- Researcher's offer to answer any questions before proceeding
- Offer to provide the name and telephone number of a person who can verify the authenticity of the research project. Investigators should provide a contact outside the research group, if potential respondents request it.
- Disclosure of any and all conflicts of interest
- Description of how the research results will be published and how participants will be informed of the results of the research.
- Specific request for the participant's informed consent and willingness to proceed with the telephone or online interview
- Indicate how interviewers are trained to answer respondents' questions.

#### **ADDITIONAL APPENDICES**

Please list (below) and attach all of the appendices of your Proposal, including your Letters of Invitation, Letters of Informed Consent, your Protocol and/or Questions for each method. **Your documents should be presented in the sequence in which they would be used.**

Criminal Record Checks (4) from each of the investigators

## Appendix F: Legal Guardian Consent Form

### LEGAL GUARDIAN CONSENT TO PARTICIPATE IN APPLIED RESEARCH:

#### **The Role of Youth Environmental Stewardship in Generating Awareness about Energy Efficiency and Renewable Technologies in Colwood**

##### **Introduction and Purpose**

You and your child are being asked to be a participant in a major project as part of our Bachelor of Science in Environmental Science at Royal Roads University. The project will be conducted by Royal Roads' students Shaun Chadburn, Stephanie James, Lindsey Martini and Brent Steven. This research project is funded by the Pacific Institute for Climate Solutions and is supported by Dunsmuir Middle School, School District 62, Solar Colwood and City Green Solutions. The purpose of this applied research project is to engage youth, schools and community in green energy initiatives and conservation, and to generate awareness about energy efficiency and renewable technologies. You and your child are invited because he/she is attending Dunsmuir Middle School and is a Grade 7 student.

##### **What are you and your child being asked to do?**

If your child is in Grade 7, he/she will be participating in the Environmental Stewardship class as part of their normal Grade 7 curriculum. The goal is for students to learn and experience sustainability initiatives taking place in their community. This will involve a field trip to a Solar Colwood home (walking distance from the school), in-class discussions and creative project activities focused on the students' vision for their families, school, and community.

As part of this applied research project we are asking for your consent to allow us to gather data related to your child's participation in these in-class or voluntary school activities. Data gathered may include observations of in-class activities, review of academic outcomes from regular Grade 7 class activities (e.g. student work, photos and videos), household energy usage data, general attitudes about energy conversation and technology, and knowledge and opinions related the Solar Colwood project. The Royal Roads University research team will co-design and facilitate the student in-class activities based on Susan Kerr's Action Research project. The research team will be primarily responsible for the data gathering and will be working with researchers, faculty and staff at Royal Roads University and Dunsmuir Middle School to facilitate activities.

##### **What are the benefits and risks to you and your child?**

The results of the project will help Grade 7 students learn about home energy efficiency and how youth can make positive changes in their homes, school and community. It may also help clarify some of the questions you may have about green energy and the Solar Colwood program. There is no risk to either you or your child from being in this project. The class room activities will take place during school hours and are part of the normal curriculum. Any extra-curricular work that occurs outside of the mandatory classroom activities at Dunsmuir Middle School will be voluntary.

##### **What will we do with the information gathered?**

Aggregated observations and results of the in-class activities (but no data attributable to individuals) will be analyzed by the research team and will be published in a publically-available final report, and in academic journals or at relevant conferences. This report, or any other publication resulting from this project, will not use any specific identifying information such as real names. Use of multimedia is an important engagement tool in the classroom. Any photos of

video recordings taken either by students or the researcher will be used primarily for educational purposes in-class, student-led initiatives and project outputs such as blogs, websites and reports. The researchers may also use some photos for publication purposes in academic journals.

**Voluntary Participation/Withdrawal**

Please note that your or your child’s participation in this project is voluntary. If you do choose to participate, you and your child are free to withdraw at any time without prejudice. You may exercise the option of removing your data from the study. Similarly, if you or your child chooses not to participate in this research project this information will also be maintained in confidence and your child will continue to participate in daily curriculum classroom activities at Dunsmuir Middle School unaffected.

If you have any questions or concerns about the project and its outcomes, as well as the research team’s credentials with Royal Roads University, please feel free to contact Alison Moran, School of Environment and Sustainability at Royal Roads University, on 250-391-2600 extension 4534 or [Alison.moran@royalroads.ca](mailto:Alison.moran@royalroads.ca). You may also call Dunsmuir Middle School’s Principal Mrs. Yushy Wallace at 250-478-5548 ext.225.

**Signature of Research Participants/Parent or Guardian**

I have been given a copy of this consent form to keep and have read the information provided for the project as described herein and

- I agree for my child \_\_\_\_\_ to participate in this educational applied research project.
- I am willing to allow for my home energy use data, provided to my child as part of the school curriculum, to be analyzed by the research team.
- Should the opportunity present itself, I agree to my child being photographed or videoed as part of this educational project.
- I am *not* willing to allow for my home energy use data, provided to my child as part of the school curriculum, to be analyzed by the research team.
- I *do not* agree to my child being photographed or videoed as part of this educational project.

Parent/Guardian: (Please Print):

\_\_\_\_\_

Signature of Parent/Guardian:

\_\_\_\_\_

Date: \_\_\_\_\_

## Appendix G: Student Consent Form

### CHILD CONSENT FORM TO PARTICIPATE IN APPLIED RESEARCH

*This script will be read to the children. Then each child will sign the bottom section.*

Our names are Shaun Chadburn, Lindsey Martini, Steph James and Brent Steven and we are research assistants conducting a project for Royal Roads University. Our background is in environmental sciences and sustainability. We look forward to learning *what is important to you* about environmental stewardship and sustainability in your school and community.

If you are in **Grade 7**, you will:

- Visit a Solar Colwood home to learn about home energy efficiency improvements;
- Participate in classroom activities about how to measure home energy efficiency, solar hot water flow rates, and greenhouse gas emissions;
- Create and express your own ideas about your family, school, and community's future for sustainability and environmental stewardship; and
- Contribute to the success of Colwood's Sunfest celebration.

As part of these initiatives we will be looking to gather some data that may include observations on the different activities you take part in, viewing some of your student work, and your attitudes towards energy conservation and renewable technologies. If you would like to know more about the project, please contact either your teacher, any one of us or Alison Moran, our project supervisor.

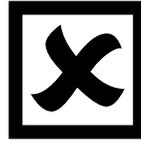
By signing this form, I agree that:

- The project has been explained to me;
- All my questions were answered;
- I understand I have the right not to participate and the right to stop at any time without prejudice;
- I understand that if I choose not to participate in this project I will still continue to take part in regular scheduled classroom activities;
- I am free now, and in the future, to ask any questions about the project;
- I understand that no information that would identify me will be released or printed without prior permission;
- I have been told that all my personal records will be kept in confidence; and
- I understand I will receive a copy of this consent form.

-----  
This information was read to me and I would like to participate in this project. Please put a circle around No or Yes, and sign below



YES, I want to participate



NO, I do not want to participate

Signed:.....

Please print your name:.....

Date:

## Appendix H: Program Evaluation

NAME:

DATE:

ATTENDANCE:

QUESTIONS FROM STUDENTS		COMMENTS FROM STUDENTS		# OF STUDENTS PARTICIPATING (i.e, comments, questions, hands up)	ATTENTION SPAN (4 students lost)	OBSERVATIONS (same individuals, challenge, mannerisms, transitions, barriers favourites, etc)
RELEVANT	NOT	RELEVANT	NOT			
		POSITIVE	NEGATIVE			

\*Note: Every statement, question answered and hands up is considered a comment.

## Appendix I: Survey

### Dunsmuir Energy Efficiency Survey

Survey into energy awareness of parents with children at Dunsmuir school

Dear Parent/Guardian

Our names are Shaun Chadburn, Steph James, Lindsey Martini and Brent Steven, and we are students at Royal Roads University. We would like to invite you to complete this survey as part of a research project, “understanding the public uptake and acceptance of a municipal green energy incentive program”.

This project is a review of the City of Colwood’s Solar Colwood incentive program. The research is being carried out at Royal Roads University and is funded by the Pacific Institute for Climate Solutions. Our credentials with Royal Roads University can be established by telephoning Dr. Alison Moran, School of Environment and Sustainability at Royal Roads University, on 250-391-2540, [Alison.moran@royalroads.ca](mailto:Alison.moran@royalroads.ca).

The research will consist of this survey and is foreseen to take no more than 15 minutes to complete. Questions refer to your home energy use and your awareness of energy efficiency and the Solar Colwood project. Aggregated results of the survey, but no personal data, will be shared with the City of Colwood, and may be published in a publicly available final report, in a project website and in academic journals.

The information you provide will be summarized, in anonymous format, in the body of the final report. At no time will any specific comments be attributed to any individual unless your specific agreement has been obtained beforehand. All documentation will be kept strictly confidential.

You are not compelled to participate in this research project. If you do choose to participate, you are free to withdraw at any time without prejudice. Similarly, if you choose not to participate in this research project, this information will also be maintained in confidence.

Your completion and return of this survey in the enclosed envelope will constitute your informed consent. Once the survey is completed, *please return* it via your child to Dunsmuir Middle School.

You may also complete this survey on-line at <http://alturl.com/yb4vq>

Thank you in advance for assisting us in this research.

Yours sincerely,

Shaun Chadburn, Steph James, Lindsey Martini and Brent Steven  
Bachelor of Science in Environmental Science Candidates, Royal Roads University

1. What is the age of your home? \_\_\_\_\_
2. Do you live in Colwood?  
Yes No
3. How much notice do you take of your energy bills (1 a little – 5 a lot)?  
1 2 3 4 5
4. How do you currently heat your water?  
Electricity Gas Oil Solar Other (please state)  
\_\_\_\_\_
5. What do you know about energy saving and energy efficiency technologies (1 a little – 5 a lot)?  
1 2 3 4 5
6. Have you undertaken a home energy audit?  
Yes No
7. To what extent have you acted on the audit recommendations (1 not at all – 5 implemented all the recommendations)?  
1 2 3 4 5
8. How much do you know about solar water heating technologies (1 a little – 5 a lot)?  
1 2 3 4 5
9. Do you know anyone with solar water heating  
Yes No
10. To what extent are you aware of the City of Colwood’s ‘Solar Colwood’ program (1 not at all – 5 a lot)?  
1 2 3 4 5
11. If you had heard of ‘Solar Colwood’ where did you hear about it?  
Local paper  
Radio coverage  
TV News  
City of Colwood website  
Solar Colwood website  
Word of mouth  
From my child

Other (please state) \_\_\_\_\_

12. How likely are you to apply for a solar hot water incentive grant under the Solar Colwood program (1 not at all likely – 5 definitely)?

1      2      3      4      5

13. Are you aware that your child is currently exploring energy efficiency in class?

14. To what extent has your child's class experience and homework led to family discussions about energy efficiency? (1 not at all - 5 a lot of discussion)

1      2      3      4      5

15. Has your child's in-class experience and any resulting discussion at home changed your thinking about energy efficiency? (1 not at all - 5 a lot)

1      2      3      4      5

16. Has your child's in-class experience changed your thinking about the Solar Colwood program? (1 not at all - 5 a lot)

1      2      3      4      5

17. If you have any comments about Solar Colwood, solar water heating, residential energy efficiency or this survey please feel free to write them here:





## Appendix K: Take-Home Assignment



### Water / Energy Conservation & Sustainability Action with Solar Colwood

Name: \_\_\_\_\_

Date: \_\_\_\_\_



**Discover how your water is heated.** Check the box that is the same in your home.

- Electricity (tank or on demand)
- Natural Gas (tank or on demand)
- Heating Oil (oil is delivered to your home by a small tanker truck)
- Solar Panel (with electric back up)
- Solar Panel (with natural gas back up)
- Other) \_\_\_\_\_



**Measure the flow rate of your showerhead.** (Hint: Flow rate is how fast the water comes out)

You might get wet, so dress appropriately! It also might be useful to have an assistant to be your timekeeper.

**Action!** Get your flow rate measurement bag and a clock with a second hand or digital seconds. Turn on your shower full blast, fill the bag for exactly 5 seconds, and then read on your bag how much water was collected.

My showerhead's flow rate in litres per minute is = \_\_\_\_\_ [L/min]

**Compare!** Look at your measured showerhead's flow rate and compare it to the chart below. *Estimate and circle* the flow rate category your showerhead belongs to.

<b>20 L/min</b>	<b>15 L/min</b>	<b>9.5 L/min</b>	<b>5.6 L/min</b>
Super High flow (older showerhead)	High flow (older showerhead)	Low flow (newer showerhead)	Super low flow (newer showerhead)
Not efficient	Not efficient	Efficient	Efficient

**Important!** A shower that uses 9.5 litres every minute or less is considered efficient. (Hint: Efficient means low flow and uses less water)

My showerhead is (check box)

- Efficient
- Not Efficient



### Thinking & Action

What is the **most** surprising result of your shower experiment? Why?

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What is the **least** surprising result of your shower experiment? Why?

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Does this experiment and/or the field trip encourage you to practice more energy conservation in your home? **Why?**

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**REMEMBER!** Bring this completed take-home assignment to your next Environmental Stewardship class on THURSDAY, JANUARY 17. We will be discussing the results in class.



**Make a Difference & Take Action!**

Stay tuned for the **Action Challenge** .... You will get more information during *next* class. (Hint: You get to be as creative as you want!)

**Curious about Solar Colwood?!** Have a look at the Solar Colwood Facebook site at <http://www.facebook.com/solarcolwood> (ask permission from your parent or guardian first!). Information about Solar Colwood can also be found at [www.solarcolwood.ca](http://www.solarcolwood.ca)

# Appendix L: Home Energy Saving Kit Form



## Dunsmuir School Environmental Stewardship Class Energy and Water Saving Kit Giveaway Survey



Please complete this survey in exchange for a free water and energy saving kit from Solar Colwood. The information collected will allow Solar Colwood to measure the energy and greenhouse gas savings from installing the kits. Kits are available to Colwood residents and/or households of students in the Dunsmuir Environmental Stewardship class.

Homeowner First Name		Homeowner Last Name	
Street Address	City	Province	Postal Code
Home Phone Number		Email Address	

### Questionnaire

- How many people live in your home? \_\_\_\_\_
- How many showers are in your home? \_\_\_\_\_
- How many bathroom faucets are in your home? \_\_\_\_\_
- How many kitchen faucets are in your home? \_\_\_\_\_
- What energy source do you use to heat your home?
  - Natural Gas       Electricity (hydro)       Other \_\_\_\_\_
  - Do Not Know       Apartment/Suite- heat included in rent
- What energy source do you use to heat your water in your home?
  - Natural Gas       Electricity (hydro)       Other \_\_\_\_\_
  - Do Not Know       Apartment/Suite- heat included in

### TERMS AND CONDITIONS:

**Consent to Use Information:** The information on this form is collected under the authority of the Community Charter. The information will be used for the operation of a low flow fixture exchange program. I provide consent to the City of Colwood or City Green Solutions to contact me (by phone, email, direct mail or similar method) for the purposes of program evaluation and providing information about other energy efficiency programs and offers. Any information included in any publicly released analysis, study or report regarding program effectiveness will not include any personal or identifying information.

**Disclaimer and Release:** The Solar Colwood program makes no representation or warranty, express or implied, relating to any fixture or the availability, competence, workmanship or financial status of any installer, and by submitting this survey the undersigned will be taken to have fully and unreservedly released City of Colwood and City Green Solutions with respect to any claims for costs and liabilities arising from or in relation to the preparation for and/or the replacement of any fixture and the installation and/or use of any fixture for the purposes of participating in this low-flow fixture exchange program including, without restrictions, all costs and all liabilities for any and all loss or damage, whether direct, special, consequential, indirect or of any other nature.

Renters: By signing below, I am indicating I have obtained any required permissions from my landlord to participate in this program.

I certify that I have read and understand the program Terms and Conditions

Signature: \_\_\_\_\_ Date: \_\_\_\_\_ Kit # \_\_\_\_\_ Staff Initials \_\_\_\_\_

*This Project was undertaken with the financial support of the Government of Canada*

through the Department of the Environment.



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## Appendix M: Action Research Hand-out



## Make a Difference & Take Action!

### ACTION CHALLENGE!

Draw a picture, write a story, or build a structure about how you are **taking action** in saving energy. How are you making a difference in your home, school or community? (Hint: You can be as creative as you want!)

OR / AND

Take a photo of yourself doing one 'green' **action** and post it on the Solar Colwood Facebook site <http://www.facebook.com/solarcolwood> (ask permission from your parent or guardian first!).

**Need ideas?** Think about what is important to you and what is your 'meaningful connection'.  
Hint: Look at the *Solar Colwood Residential Energy Saving Action Checklist* or the *BC Hydro Power Smart Checklist* (it was handed out in the second class of the workshop). See also the Power Smart website <http://www.bchydro.com/powersmart/residential.html?WT.ac=Spring2012>

**REMEMBER!** Bring your art, design, ideas, or story to Mr. May no later than

**THURSDAY, JANUARY 31.**

Team 5: Energy Transformation Consulting  
 Lindsey Martini, Shaun Chadburn, Brent Steven,  
 Steph James

**Appendix N: Raw Data**

Data figures for all 2012-2013 facilitations.

<b>Date</b>	<b>Class Size</b>	<b>Child Consent Form</b>	<b>Parent/Guardian Consent Form</b>	<b>Home Energy Saving Kit</b>	<b>Take Home Assignment</b>	<b>Action Challenge</b>	<b>Quiz 1</b>	<b>Quiz 2</b>
Jan 10, 15, 17	26	19	16	5	14	3	-	-
Oct 25, 30, Nov 6	26	24	13	5	13	3	-	-
Mar 23, Apr 2, 9	30	23	16	5	8	6	12.7	7.2
May 7, 14, 21	30	28	11	6	9	3	11.8	14.1

Data from Dunsmuir Parent/Guardian survey obtained from Chris Ling (Solar Colwood?). Question numbers correspond to the questions on the Dunsmuir Parent/Guardian Survey found in Appendix I.

	Completed	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	
Group 1	1	2012-11-07 12:46:05	N/A	Yes	5	Gas	5	Yes	3	4	Yes	2	Rad	3	Yes	2	1	1
	2	2012-11-07 14:52:14	2003	Yes	4	Gas/Wood	2	No	N/A	2	N/A	1	N/A	2	Yes	3	4	3
	3	2012-11-07 15:34:36	1978	No	4	Elec	4	No	N/A	3	No	4	LP/CW/SCW/Word/Child		Yes	3	1	3
	4	2012-11-07 16:00:56	1985	Yes	5	Elec	5	No	N/A	5	Yes	5	Occupation	1	Yes	3	1	1
	5	2012-11-07 20:31:59	1979	Yes	5	Elec	3	N/A	N/A	3	No	5	CW		Yes	1	1	1
	6	2012-11-08 08:28:52	1992	No	5	Elec	4	No	N/A		Yes	1	CW	1	Yes	3	2	1
	7	2012-11-08 17:32:45	1999	No	5	Gas	3	No	N/A	3	No	3	LP/Rad/Word	3	N/A	N/A	N/A	N/A
	8	2012-11-10 07:42:12	2001	Yes	4	Gas	4	No	N/A	2	No	1	Word	2	Yes	3	3	3
	9	2012-11-11 17:17:04	1971	No	4	Elec/Wood	4	Yes	2	3	No	2	LP	5	Yes	2	2	2
	10	2012-11-11 18:17:28	2011	No	4	Gas	4	No	N/A	4	No	5	LP/CW/SCW	1	Yes	4	4	4
Group 2	11	2013-01-22 16:22:22	2000	Yes	2	Elec	3	No	N/A	1	No	1	LP/RS	2	Yes	2	2	2
	12	2013-01-24 07:10:11	1997	No	2	Elec	3	No	N/A	1	No	3	LP	2	Yes	4	3	3
	13	2013-02-11 10:12:26	1950	No	5	Gas	4	No	N/A	3	No	3	Booth at event	1	Yes	4	1	1
Group 3	14	2013-04-11 11:03:05	1980	Yes	2	Elec	1	No	N/A	1	No	1	LP	3	Yes	N/A	N/A	N/A
	15	2013-04-14 20:27:06	1973	Yes	3	Gas	1	No	N/A	1	No	2	Child/RS	N/A	N/A	N/A	N/A	N/A
	16	2013-04-14 20:30:42	1973	Yes	3	Gas	3	No	N/A	1	No	2	Child/RS	1	Yes	2	2	2
Group 4	17	2013-05-22 18:26:31	1970	Yes	4	Elec	4	No	N/A	1	No	1	LP/Child	2	Yes	3	3	1
	18	2013-05-22 20:40:59	1971	Yes	5	Elec/Wood	5	Yes	3	4	Yes	4	CW/RS	1	Yes	3	3	3
Elec- Electricity Wood- Wood/pellet stove LP- local paper Rad-Radio Coverage CW- City of Colwood Website SCW- Solar Colwood Website Word- word of mouth RS- road sign N/A- Not Available		Additional Comments: 1- We have little or no information other than any grant money is not available or used up. 3- I think it is great. We would love to be a part of the program and its incentives, but we live in Metchosin 9- I hope that people will participate in this initiative and for this plan to become a successful project. Also hoping that the rest of the westshore communities will have the opportunity to participate in the same program. 10- I would, but we don't live in Colwood 13- We appreciate the program. As we are already concerned about energy efficiency our marking #1 for the question has you child changed your thinking is not a negative 18- If we were staying longer than 5 years in this house, we would be looking into solar heating/hot water. But as of right now, it is too expensive initially to do.																

Observations made at each session in both groups

<p align="center"><b>Session Type: Solar Colwood Home (1)</b>  <b>Teacher: Susan Kerr</b>  <b>Others present: Gladis, Tortson, Chris Burchill and Tim May</b>  <b>Attendance: 26</b></p>			
<b>Date: 3/26/2013</b>	<b>Evaluator: Shaun</b>	<b>Evaluator: Steph &amp; Lindsey</b>	<b>Evaluator: Brent</b>
<b>1. How many kids participated?</b>			
Number of questions asked	6 relevant - 1 non relevant	only questions at car station: 4	6
Common themes of questions	Most questions based at the car station		electric car
Number of comments made	24 and 1 non relevant	total of all stations: 29, most at hot water, 1 irrelevant	30 relevant/ 1 not
Common themes of comments	Most of the comments were answers to facilitator questions		Answered questions. Ideas on how to reduce energy use in home
<b>2. Approximately how long did the kids pay attention for?</b> Car/kindle Station	Whole time - cat distracted kids briefly	entirety	Lost attention right away when cat was around. They paid more attention to the kindle/ energy use
Pathfinder/hot water tank/computer Station	~7 min - 4 kids lost focus at the end - ran out of time to see computer	entirety	8 minutes some students lost interest. Shuffled feet and played with leaves
Door Fan/Thermal Camera Station	entirety	entirety	Entirely. More participation with thermal camera
<b>3. Did the kids appear to get bored with any of the concepts or activities?</b> How many children participated? (Same individuals or whole class)	4 of 8 Didn't seem to understand the blower at the door at first, could maybe start with the thermal camera to help them understand what the fan is doing.	6 out of 8	Pathfinder- all participated. few kept on answering
<b>4. Was the learning too challenging or not challenging ?</b>	Perfect level of content - based on interaction level from students, answers to questions,	Perfect level of content - types of questions showed current knowledge as well as show critical thinking eg. What impacts would electricity have on the environ.	students followed materials
<b>5. What were the kids attitudes towards the lessons?</b>	Seemed to have fun and enjoy a field trip and hands on activities	enthusiastic, except door fan	enthusiastic, lost some at pathfinder and door

<b>6. Were there smooth and quick transitions between topics/media?</b> Details : how, why	Yes, however there was a tight time schedule and it was hard to move the groups around without disturbing the other groups.	groups were on a tight time schedule and were moved quickly to the next, seemed unorganized	Switching between presenter had to wait a little.
<b>7. Are the resources and media used well suited for the class?</b>	Yes - all the materials were hands on , the kindle gained a great response when the dryer was turned on.	yes - each station included hands on activity	Yes.
<b>8. Were there any major barriers in the curriculum?</b>	Time, and the cat distracted several students	time constraints; cat was distracting	time, and cat was distracting
<b>Student Feedback</b>			
<b>1. What was your favorite activity (Number of hands)?</b> a) Solar hot water system b) Electric vehicle charging station c) Insulation and air sealing	C) Car station seemed to be the most involved and popular. The computer station showing the spikes was not covered with this group and would likely be beneficial for them after seeing the solar panels.	C) Car charging station had most participation, however thermal camera and pathfinder stations also generated good responses	Thermal camera had the student's attention. Few students danced for the thermal camera. They were really impressed with Torsten touching the wall for a second and that their nose s were cold.
<b>2. What was your least favorite activity (Number of hands)?</b> a) Solar hot water system b) Electric vehicle charging station c) Insulation and air sealing	A)	A)	A)
<b>General comments on the session</b>	Seemed shy with Torston at the door fan, but I felt it was due to their lack of understanding of what was being explained, recommend starting with the thermal camera then moving to the door fan. Judith seemed to involve the children the most out of all the presenters and the most questions and comments were made at this station. Overall the session as a whole was very good, lots of hands on activities engaging the students and seemed to get a lot of participation.	Session with Torsten kids seemed shy	Comments made most were positive. Students answered questions ask by presenters. One student said they felt didn't learn anything new. At the electric car 2 students wanted to plug in the car and 3 wanted to unplug it. Girls in the group had to be asked to participate. They were unimpressed with the shower head and aerator

<b>Session Type: Greenhouse Gases (2)</b> <b>Teacher: Susan Kerr, Chris Burchill</b> <b>Others present: Tim May</b> <b>Attendance: 27</b>		
<b>Date: 4/2/2013                      PART 1</b>		
<b>Evaluator:</b>	<b>Shaun</b>	<b>Steph</b>
<b>1. How many kids participated?</b>		
Number of questions asked	3 - (+1 not relevant) all positive	4 (1 not relevant)
Common themes of questions	Beginning of class - some based on the electric car	what GHGs are (good/bad)
Number of comments made	10 comments (+ 3 not relevant)	5 ( 1 negative/relevant) all from different students
Common themes of comments	Answers to questions asked - most about field trip	answering questions
<b>2. Approximately how long did the kids pay attention for?</b>	Majority of lesson - This section of the lesson had the most attention as it was the beginning	majority of lesson; after 15 mins up to 10 students were not focused on lesson; b/w videos students were talking amongst themselves & during 3rd video shown, students were not attentive
<b>3. Did the kids appear to get bored with any of the concepts or activities?</b> How many children participated? (Same individuals or whole class)	5 kids participated in this section  Transitions between videos kids all lost attention	5 kids participated  during third video shown

<p><b>4. Was the learning too challenging or not challenging ?</b></p>	<p>Seemed great, Quiz marks reflected this , all seemed to be above 10 marks</p>	<p>Appropriate level. some students were above providing comments that they already learned about it or offered new info</p>
<p><b>5. What were the kid's attitudes towards the lessons?</b></p>	<p>Very positive compared to last semesters children, seemed to pay attention and have good answers to questions asked</p>	<p>Enthusiastic, positive and engaged. some students were not interested</p>
<p><b>6. Were there smooth and quick transitions between topics/media?</b> Details : how, why</p>	<p>Better than last classroom session, but should have videos ready to go and blinds and lights on off to prevent talking during transitions. Three videos in a row could be broken up with some more questions or comments between.</p>	<p>Topics covered flowed well to each other, however attention lost between videos shown</p>
<p><b>7. Are the resources and media used well suited for the class?</b></p>	<p>Yes I felt they were suited for the class, the scene in the energy efficiency video where the two are showering together might be a bit inappropriate as it did create a distraction and lots of talking about it, however the attention paid to the videos was fairly good with the exception of the last one as there may have been too many videos in a row with very little breaks, Maybe break up the videos with a few questions or facts/ summary.</p>	<p>Appropriate level of media used, however too many videos shown consecutively lost some students</p>
<p><b>8. Were there any major barriers in the curriculum?</b></p>	<p>Time - getting the right amount of material seems to be a challenge, should have backup material ready in case class goes faster or slower etc. Keeping transition times between sections quick to keep the students attention.</p>	

<b>Date: 4/2/2013      PART 2: Field Trip Review</b>		
<b>Evaluator:</b>	<b>Shaun</b>	<b>Steph</b>
<b>1. How many kids participated?</b>	9 kids participated in this section	13 different students participated
Number of questions asked	2	1
Common themes of questions	Field trip, electric car	electric car
Number of comments made	22 (+1 not relevant) all positive	30 (+1 not relevant) all positive
Common themes of comments	Answers to questions of field trip.	answered questions asked related to field trip
<b>Date: 4/2/2013      PART 3</b>		
<b>Evaluator:</b>	<b>Shaun</b>	<b>Steph</b>
<b>1. How many kids participated?</b>	2	
Number of comments made	2 (all positive)	3 (positive)
<b>2. Approximately how long did the kids pay attention for?</b>	Seemed to start to lose them in this part of the lesson - lots of handouts that they were playing with and talking to each other about.	
<b>General comments on the session</b>	Transitions between sections should be kept as low as possible to keep the students attention. Breaking up the videos and or summarizing videos after each one a bit while setting up the next one may help with this. Lots of materials handed out, maybe the solar Colwood energy packages could be handed out in the next session - created a distraction for the kids as they were	This group of students seem interested in energy saving activities (all requested to have form to take home to parents for home energy savings kit) and are easily engaged. Attention was lost a few times as noted above (after watching three consecutive videos) and may be reduced if videos were split up by asking questions/ comments from students between each. The same students were participating

	playing with all the materials. Overall this session went very well in my opinion, this may be due to the different students and a few of the hiccups of the first classroom session were ironed out.	in each section, but for the most part all of them were paying attention to the lesson.
<b>Session Type: Greenhouse Gases (2)</b> <b>Teacher: Susan Kerr, Chris Burchill</b> <b>Others present: Tim May</b> <b>Attendance: 27</b>		
<b>Date: 4/2/2013</b> <b>PART 1</b>		
<b>Evaluator:</b>	<b>Brent</b>	<b>Lindsey</b>
<b>1. How many kids participated?</b>		
Number of questions asked	3 (+ 1 not relevant)	3(+1 not relevant)
Common themes of questions	ask about greenhouse gases + if greenhouses were bad for the environment	Greenhouse gases, what they are and how their impacts
Number of comments made	7 positive comments ( + 2 not relevant/ )	5 (1 negative)
Common themes of comments	answered question	Answering questions
<b>2. Approximately how long did the kids pay attention for?</b>	lost attention at third video and during transition between videos	Students lost attention approximately 15-20 minutes into class. Transition times between video clips had a lot of students talking. Bored looks around the 3rd clip in a row.
<b>3. Did the kids appear to get bored with any of the concepts or activities?</b> How many children participated? (Same individuals or whole class)	5	5

<b>4. Was the learning too challenging or not challenging?</b>	Students seemed to understand the lessons. Had lots of ideas for saving energy and what produces greenhouse gases	Learning was at an appropriate level. Students were able to express their knowledge on the subject but still asked questions indicating it wasn't too easy.
<b>5. What were the kid's attitudes towards the lessons?</b>	Few students were excited to show how much they knew about renewable energy and climate change. Some students had their heads on their desk most of the time.	The majority of the students were enthusiastic and happy to participate. Others look bored, but the majority of the class was engaged.
<b>6. Were there smooth and quick transitions between topics/media?</b> Details : how, why	Attention was lost between videos. There was not recap or questions asked after the videos. Not a lot of questions were asked about the videos.	The transition between video clips was alright. Videos could already be up and blinds could be kept shut to avoid losing time and attention between the clips.
<b>7. Are the resources and media used well suited for the class?</b>	3 videos in a row seemed to lose the attention of the students. Also the family video with parents showering together seemed a little inappropriate for the age group. After the family video the students only talked about that shower scene.	The videos were relevant to the topic, the students especially liked the animated clip of the family saving power. The videos were at an appropriate level and were well suited to Grade 7 students.
<b>8. Were there any major barriers in the curriculum?</b>	Not a lot of time for students to ask questions. There are only visual used to teach. One take-home assignment for the students to work on.	Getting the video clips set up and playing appeared to be the only barrier/challenge.
<b>Date: 4/2/2013                      PART 2: Field Trip Review</b>		
<b>Evaluator:</b>	<b>Brent</b>	<b>Lindsey</b>
<b>1. How many kids participated?</b>	10 kids participated in this section	15 students participated
Number of questions asked	2	1
Common themes of questions	asked questions about electric car	Electric car
Number of comments made	30 positive comments/1 negative/ 1 not related to subject	30 positive comments, 1 unrelated
Common themes of comments	mainly answered questions and comments made about the field trip and the electric car	Field trip related



<b>Date: 4/2/2013</b>		
		<b>PART 3</b>
<b>Evaluator:</b>	<b>Brent</b>	<b>Lindsey</b>
<b>1. How many kids participated?</b>		
Number of questions asked:	1 relevant question	0
Common themes of questions:	asked about the take home shower assignment (size of shower head)	NA
Number of comments made:	2 positive/ relevant comments	4 relevant comments, 1 negative
<b>2. Approximately how long did the kids pay attention for?</b>	Handout distracted the students and the attention was lost. Less participation in this section.	Students appeared bored when talking about the shower head in energy efficiency bag. The handouts caused a distraction (Could they all be hand out at once?)
<b>General comments on the session</b>	5 students mentioned that they talked to their parents about the field trip. During the third video, students connected with the polar bear on the melting ice cap (few laughed). Quizzes showed that the students understand most of the lesson. 3 students had their heads on binders most of the time.	Class was enthusiastic and actively participated. The majority of the class appeared to enjoy the videos shown; however 3 in a row might've been too many. Breaking up the movies and asking for questions and feedback could force them to think about the topic more in depth. The students were excited about the previous week's field trip and students spoke to their guardians about the technology seen. Changing the way the handouts are given could save time and avoid disruption. The class was generally well behaved and paid attention to the class.

**Session Type: Water Conservation (3)**

**Teacher: Susan Kerr**

**Others present: Tim May**

**Attendance: 27**

**Date: 4/9/2013**

**PART 1**

<b>Evaluator:</b>	<b>Shaun</b>	<b>Steph</b>
<b>1. How many kids participated?</b>		
Number of questions asked	1 + (2 not relevant)	6
Common themes of questions	shower head flow clarification	take home shower assignment
Number of comments made	35	28 relevant and positive 1 negative
Common themes of comments		answers to questions asked
<b>2. Approximately how long did the kids pay attention for?</b>	Whole time - power point may have lost a bit of attention but still very good engagement	the majority of the session the students paid attention; during the PowerPoint presentation about the shower flow and water use calculations there were a few students that were lost; during the take home assignment results, after grouping students were talking amongst themselves
<b>3. Did the kids appear to get bored with any of the concepts or activities?</b> How many children participated? (Same individuals or whole class)	10	10 same individuals

<p><b>4. Was the learning too challenging or not challenging?</b></p>	<p>Perfect level, one student seemed to know most of it but that is it.</p>	<p>the level of information was appropriate. the students who participated seemed to understand most concepts. the types of energy seemed to be unclear when ranking which had the greatest GHG emissions and why</p>
<p><b>5. What were the kid's attitudes towards the lessons?</b></p>		<p>Most were engaged. 14 students completed the take home assignment</p>
<p><b>6. Were there smooth and quick transitions between topics/media?</b> Details : how, why</p>	<p>There were good transitions, when problems arose with setting up the PowerPoint Susan came up with questions and things to ask the students which worked well.</p>	<p>Transitions were smooth between topics. PowerPoint usage was the only aspect that could be improved/discarded - turning on/off lights, lifting screen etc takes away time however periods where this happened were dealt with appropriately with interaction and discussion</p>
<p><b>7. Are the resources and media used well suited for the class?</b></p>	<p>Yes, the "fake shower" example was good , all the kids laughed, maybe come up with a visual for showing how much water (450L) liters is and talk about less fortunate people who have to walk to get drinking water ... could include where we get out water from in Victoria ? Sooke Reservoir</p>	<p>The resources were well suited. Interaction with students was appreciated and encouraged attention from others. Pictures of different types of energy posted on the board; PowerPoint presentation of water flow and shower flow calculations; liter cup to demonstrate L/min seemed not as effective as hoped; poster boards and sticky notes were used to demonstrate students 'connection and action' to community/environment</p>
<p><b>8. Were there any major barriers in the curriculum?</b></p>	<p>One student wanted to get the prizes handed out and was slightly distracted by the thought of them being handed out but overall I did not see many barriers except TIME (as usual)</p>	<p>The overall curriculum was well planned and went well. Tim has a high influence on participation and attention span of the students. Time was a barrier.</p>

<b>Date: 4/9/2013</b>		
<b>PART 2</b>		
<b>Evaluator:</b>	<b>Shaun</b>	<b>Steph</b>
<b>1. How many kids participated?</b>		
Number of questions asked	1	1
Common themes of questions	-	relating to activity
Number of comments made	6 (all positive)	
Common themes of comments	Mostly about the "post it note" activity	
<b>2. Approximately how long did the kids pay attention for?</b>	Seemed to have a bit of a lull right before part two, but seemed to be engaged the whole class for the most part. Could incorporate a mid class stretch or something active?	The beginning of the session seemed to be distracting but didn't last long. most of the kids were engaged throughout through great activity (post it notes to poster board)
<b>General comments on the session</b>	Mid class stretch or activity to get them moving and keep them awake in between sessions. The second part of the session had a lot of information and learning (but the kids seemed to pay attention) so that may account for the reduced amount of comments and questions. Sticky note assignment was very good and had some good responses- could come up with something to do while the rest of the class is finishing up their answers (but not a huge issue - it might distract the other students trying to finish up too). It was good that Susan went around and helped the remaining students finish up their answers - probably save a lot of time by doing that. Instead of Susan reading out a few examples of the sticky notes to the kids after, maybe get the kids to read a few of each other's notes out ? Sticky note assignment did consume a lot of time and the kids did not really get anything in return except to sit and reflect on what they had learned or express their feelings. Quiz was rushed - should read out questions and explain then to the kids if time permits	Susan did a great job of facilitating the entire session; she encouraged participation and asked many questions that received anticipated answers. Water use section could really use something to put the amounts into perspective and imagine the impact outside to the environment. Energy types could be explained slightly. Quiz was rushed due to time constraints and the last activity running longer.

<b>Session Type: Water Conservation (3)</b> <b>Teacher: Susan Kerr</b> <b>Others present: Tim May</b> <b>Attendance: 27</b>		
<b>Date: 4/9/2013</b> <b>PART 1</b>		
<b>Evaluator:</b>	<b>Brent</b>	<b>Lindsey</b>
<b>1. How many kids participated?</b>	9	17
Number of questions asked	1 relevant/ 2 not relevant (math mistake and time taken)	0
Common themes of questions	shower head flow	0
Number of comments made	31 relevant and positive/ 1 non relevant	37 (2 not relevant, 1 negative)
Common themes of comments	answers to questions asked/ water heating	GHG's, water conservation
<b>2. Approximately how long did the kids pay attention for?</b>	students paid attention, talking while assignment was being discussed	Talking during PowerPoint
<b>3. Did the kids appear to get bored with any of the concepts or activities?</b> How many children participated? (Same individuals or whole class)	9 participated	Whole class participated, interactive learning required participation. Approximately 3-4 kids answered the majority of questions.
<b>4. Was the learning too challenging or not challenging?</b>	level was appropriate	At an appropriate level.
<b>5. What were the kid's attitudes towards the lessons?</b>	most students participated for the take home assignment, students paid attention and found mistakes	Enthusiastic, willing to participate.

<b>6. Were there smooth and quick transitions between topics/media?</b> Details : how, why	PowerPoint transitions could be better, but understandable since Susan relied on Tim for transitions. Well suited for the topics discussed	PowerPoint media difficult to use. Had to ask for slide change or reach over the desk to switch. Smooth transition on whiteboard and posters.
<b>7. Are the resources and media used well suited for the class?</b>	Students seemed to enjoy the participation parts, i.e. shower head flows demo.	The media and resources were well suited. The poster board required the students to think and participate. The measuring cup gave a good visual for water usage in the home.
<b>8. Were there any major barriers in the curriculum?</b>	When students seemed not interested in the lesson the teacher spoke up and took over the class to try and get the student more involved.	PowerPoint slide transition, the numbers for water conservation were good and surprising to the students but a little dry.

**Date: 4/9/2013                      PART 2**

<b>Evaluator:</b>	<b>Brent</b>	<b>Lindsey</b>
<b>1. How many kids participated?</b>		Whole class
Number of questions asked	2	0
Common themes of questions	-	-
Number of comments made	0	1
Common themes of comments		What concerns the students and actions they can make.
<b>2. Approximately how long did the kids pay attention for?</b>	Less questions and less participation in the second part of the class resulted in less enthusiasm from the students. Most of the students attention was lost during the action challenge part where they were given time to write their actions down. Most students spent time talking to others. This consumed time in the lesson. Susan going around helping students increased participation	Distracted at the beginning of the section, too much talking. Collection of homework was disrupting.

<b>General comments on the session</b>		<p>The class participated throughout the whole class and didn't appear to get bored or distracted. The lights off during the class could make them sleepy or more prone to be distracted. One student commented that there wasn't been any previous education on water conservation and environmental issues. The PowerPoint appeared difficult to use as there is no remote to switch slides. The visuals were well received (measuring cup) and make it easier for the students to understand the concepts. The poster boards and post-it notes worked well as it got the whole class participating and regurgitating information from class. The PowerPoint for the flow rate numbers could be made more appealing or a video could be used. The students didn't participate much when it came to the homework questions, this could be partially due to the lack of completion.</p>
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**Session Type: Solar Colwood Home (1)**  
**Teacher: Susan Kerr, Glanys, Torsten, Judith**  
**Others present: Tim May**  
**Attendance: 28**  
**Date: 5/7/2013**

<b>Evaluator:</b>	<b>Steph</b>	<b>Lindsey</b>
<b>1. How many kids participated?</b>	same 3-4 answering questions	Majority of group (approximately 8)
Number of questions asked	many questions asked - electric car	Questions asked at each station, electric car got the most participation
Common themes of questions	comments on thermal camera-where they have seen the technology before (movies)	Car: How fast can it go, how long does the battery last
<b>2. Approximately how long did the kids pay attention for?</b>	most were engaged and listening intently, seemed eager to learn about technology	Kids were engaged the whole time, the groups were alternating quickly not leaving time for kids to get too distracted
<b>3. Did the kids appear to get bored with any of the concepts or activities?</b> How many children participated? (Same individuals or whole class)	2 kids in the class - learning disorders with TA present, couldn't hold their attention long	Students appeared interested in all the technology, especially the thermal imagery camera and electric car. 2-3 students asking the most questions.
<b>4. Was the learning too challenging or not challenging?</b>	existing knowledge among the kids that participated, and involvement of others demonstrated good level	At an appropriate level, the students were able to answer the questions asked but learning new technology
<b>5. What were the kid's attitudes towards the lessons?</b>	engaged and interested	Excited, engaged
<b>6. Were there smooth and quick transitions between topics/media? Details : how, why</b>	when the groups were switching stations, there was some confusion as to where to go, time was an issue	Confusion switching groups and how much time the presenters had. One hour period is too short for this field trip.

<p><b>7. Are the resources and media used well suited for the class?</b></p>	<p>interactive field trip very well-suited</p>	<p>The technology used was great. Allows the kids to touch and see the technology out there instead of just hearing about it.</p>
<p><b>8. Were there any major barriers in the curriculum?</b></p>	<p>facilitation by team - we were unaware that we were leading the class at this session</p>	<p>Confusion when changing groups, limited time.</p>
<p><b>General comments on the session</b></p> <p>The facilitators of the tour have asked for feedback on their delivery of the program. Torsten seemed to generate more interest with this group than the last. Material was the same. Generating involvement by asking lots of questions and getting them to come close to see insulation. Glanys is very enthusiastic and tries hard to get everyone to say something by calling for kids who haven't qs yet. Judith's car always has the most interest, its great that she lets the kids touch and use the technology she has available to her. Overall, the field trip is a great success. The kids really seem to enjoy it. Next, collect answers and comments from the kids to give them.</p>	<p>Overall, it seemed that the kids enjoyed the trip and learned new things while demonstrating current knowledge. There is a teaching assistant present in this class supervising 3 children in the class - she helps keep them involved, also involves herself by asking questions and expressing interest in SC program for herself. As a team, we would have benefitted from knowing that we were facilitating the session, as far as organizing teams and keeping track of time. Also, we need to engage with the kids as Susan does (improvement we can make) and become more comfortable in speaking to them.</p>	<p>The students enjoyed the field trip as always. Electric car got the most participation and enthusiasm. It is recommended to have the field trip in the morning if possible to allow for more time. The rush of getting the students back to school to catch buses can lead to the sessions getting cut short. Planning the changing of groups would allow for smoother transitions and less wasted time. Engaging the students and being more clear with what the agenda for the day would've been helpful (field trip could've been introduced better the previous week).</p>

<b>Session Type: Solar Colwood Home (1)</b> <b>Teacher: Steph &amp; Lindsey</b> <b>Others present: Tim May, Susan Kerr</b> <b>Attendance: 28</b>		
<b>Date: 5/14/2013 Part 1</b>		
<b>Evaluator:</b>	<b>Shaun</b>	<b>Brent</b>
<b>1. How many kids participated?</b>	7	9
Number of questions asked	0	1
Common themes of questions	n/a	n/a
Number of comments made:	8 (all positive)	12
Common themes of comments:	answers to questions asked	mainly answer questions
<b>2. Approximately how long did the kids pay attention for?</b>	whole section	some students lost attention right away
<b>3. Did the kids appear to get bored with any of the concepts or activities?</b> How many children participated? (Same individuals or whole class)	Waiting for projector and internet to load video even though it was pre-loaded?	video loading, the second video 5 students had their head on the desks
<b>4. Was the learning too challenging or not challenging?</b>	seemed to be about the right level , but some students above the level, and some were below	level was appropriate but some students knew more than others
<b>5. What were the kid's attitudes towards the lessons?</b>		
<b>6. Were there smooth and quick transitions between topics/media? Details : how, why</b>	Transitions were slightly rushed; more questions could have been asked and recapped.	transitions were a little rough, the students spent the time between talking to each other, recap could have helped after the videos more
<b>7. Are the resources and media used well suited for the class?</b>	Media seemed good the students, they all knew Bill Nye the science guy and cheered when it came up. Seemed to pay attention the whole time the videos were on.	students were enthusiastic about Bill Nye video on greenhouse gases, the second video on renewable energy some students got bored and laid their heard on the desks

<b>8. Were there any major barriers in the curriculum?</b>	School internet is slow... Framing the questions right	how to frame questions, some students were confused about nuclear and biomass--> needed to be explain better
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<b>Date: 5/14/2013</b>	<b>PART 2</b>
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<b>Evaluator:</b>	<b>Shaun</b>	<b>Brent</b>
<b>1. How many kids participated?</b>	7	transition between sections was so smooth didn't even notice...data was incorporated in part 1
Number of questions asked	0	
Common themes of questions	n/a	
Number of comments made	8 (all positive)	
Common themes of comments	Answers to questions	Answers to questions

<b>Date: 5/14/2013</b>	<b>PART 3</b>
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<b>Evaluator:</b>	<b>Shaun</b>	<b>Brent</b>
<b>1. How many kids participated?</b>		
Number of questions asked:	1	5
Common themes of questions:	Regarding assignment	asked about biomass and nuclear
Number of comments made:	1 (all positive)	0
<b>2. Approximately how long did the kids pay attention for?</b>	Papers seemed to affect attention -	majority of the time
<b>General comments on the session</b>	The first two parts of the session went very smoothly - facilitators (Steph and Lindsey) were very good and calm to begin with (especially being their first time seeing a session), and quiz results seem to reflect that they learned the main points of the session. Once Lindsey and Steph realised they had run out of material things seemed to get disorganised and they became more nervous. The students seemed to be less comfortable answering questions, this is most likely due to the way	First time Steph and Linds were teaching in front of class, no sign of nerves were shown from the two of them. Students showed less interest in the material this class than previous. The back table played with the air conditioner and talked. Groups on the left side of the room seemed to pay attention more, there was less talking and more questions from that side. During the quiz students talked to each other and this was evident in the answers to the quiz with many of the same answers

	<p>questions were asked - need to guide the questions more or have rephrased questions lined up. This class in general seemed ("older"?) to be less attentive and more affective by peer pressure from each other (some quizzes had no answers to questions - and others had the exact same answers) Our data collection form did not capture quiet students who were actually really engaged, some were sitting quietly and answering questions and doing activities but were not involved in directly answering questions. The fact that we had extra time for doing the action challenge may provide some good results - several groups of 4 students (3 ?) left the class to go take pictures and participate in the action challenge - this may be something to consider in the future. Overall framing questions right, having fun and preparing backup material is key.</p>	
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**Session Type: Solar Colwood Home (1)**  
**Teacher: Shaun & Brent**  
**Others present: Tim May, Susan Kerr**  
**Attendance: 25**

**Date: 5/21/2013 Part 1**

<b>Evaluator:</b>	<b>Steph</b>	<b>Lindsey</b>
<b>1. How many kids participated?</b>	All kids participated in classroom activities made for the whole class	1/3 of class participated. Same students answering the majority of questions. Type of questions elicited information from whole class.
Number of questions asked	1 - which source of energy is the worst	
Common themes of questions	n/a	n/a
Number of comments made:	32 counted however many more probably	
Common themes of comments:	answers to questions asked by Shaun and Brent	
<b>2. Approximately how long did the kids pay attention for?</b>	some lost during shower flow discussion but overall seemed to be thinking about this topic or participating; whispering during sharing of calculations	Students got distracted during PowerPoint. Lots of talking during flow rate assignment.
<b>3. Did the kids appear to get bored with any of the concepts or activities?</b> How many children participated? (Same individuals or whole class)	students seemed involved throughout the entire class  majority of questions answered by same 10 ish students	Students seemed involved throughout entire lesson. Majority of questions asked were answered by a couple of students.
<b>4. Was the learning too challenging or not challenging?</b>	Appropriate level - interesting information pertaining to Shaun's CRD experience and where water comes from	Learning was at an appropriate level; kids were able to answer questions but still learned new concepts.

<b>5. What were the kid's attitudes towards the lessons?</b>	most kids seemed very interested, no negative comments were made	Kids appeared interested about what they were learning.
<b>6. Were there smooth and quick transitions between topics/media?</b> Details : how, why	smooth transitions between both parts; some kids lost while changing videos and PP	Transitions between power points and videos were fairly smooth. Hard to keep the students attention once they were lost.
<b>7. Are the resources and media used well suited for the class?</b>	Well suited. 1st video had kids laughing; calculations were well done - some needed clarification on last component in equation	Resources were well suited. At an appropriate level and the visuals were appealing and got the concepts across well.
<b>8. Were there any major barriers in the curriculum?</b>	no	Clarification on power point slides which were being used. Some confusion on which slide was supposed to be up.
<b>Date: 5/21/2013</b>		
<b>PART 2</b>		
<b>Evaluator:</b>	<b>Steph</b>	<b>Lindsey</b>
<b>1. How many kids participated?</b>	everyone participated in sticky note and quiz	
<b>2. Approximately how long did the kids pay attention for?</b>	entire time	
<b>General comments on the session</b>	Went very well. Seemed that there are groups of kids that were more interested than others, as expected. Brent and Shaun did a great job at facilitating - perfect amount of information and participation from class. Questions asked got good responses.	The lesson went smoothly. The students participated and appeared engaged throughout the whole class. The facilitators were able to get the students to participate. A visual to go along with the shower flow rate assignment would be helpful. It was hard to recapture the student's attention once it was lost, Tim was helpful. Explaining the assignment prior to handing out the sheets might've avoided some confusion. Links were made between all the concepts and brought everything together. Greenhouse gases were covered well, and the students were able to answer the questions asked.

Classroom Quiz Themes: Group 1 Quiz 1

<b>List how you or your family produces GHG.</b>	<b>Tally</b>	<b>List some examples of renewable energy.</b>	<b>Tally</b>	<b>List some examples of non-renewable energy.</b>	<b>Tally</b>
Heating water	5	Wind	19	Natural gas	11
Running water	8	Solar	18	Oil	19
Leaving lights on	7	Geothermal	4	Coal	19
Heating home	8	Trees	4	Fossil fuels	11
Gas cars	9	Hydro	10	CO <sub>2</sub>	4
Use of fossil fuels	2	Plants/Oxygen	5	CO	1
No lid on pots	1	Electricity	2	Gasoline	8
Fires	1	Energy	1	Water	4
Phantom power	4	Grass	2	Wood	2
Using electricity	2	Rocks	2	Charcoal	1
Bad insulation	1	Gas	1	Nuclear energy	1
Use heater less	1	Turbine	1	Non-solar energy	1
Electronics (TV, chargers etc.)	6			Some non-renewable energy	1
Turn off lights	1			Oxygen	1
Turn off water when brushing teeth	1				
Appliances	6				
Leaving windows open when heat is on	2				
Non-efficient light bulbs	1				
Tar	1				
Breathing/animal breathing	1				
Products	1				

Group 1 Quiz 1 Themes

<b>List some ways to save energy in your home.</b>	<b>Tally</b>
Turn off lights	10
Short showers	12
Ride bus	1
Bike	4
Use cold water	9
Clothes line	10
Home garden	6
Electric car	5
Solar panels	5
Low flow shower	4
Low flow toilet	1
Lower thermostat	11
Car pool	1
Wind power energy	1
Unplug electronics	14
Have less showers	1
Turn off water when brushing teeth	5
Aerator	1
Energy efficient light bulbs	4
Buy local food	2
Walking	1
Sew old clothes	1
Open windows	1
Turn off AC	1
Wear sweaters	1
Energy efficient appliances	3
Alternative transportation	1
Reduce energy use	1
Solar Colwood kit (low-flow shower head/aerator)	1
Power bar	2

Group 1 Quiz 2 Themes

What would increase water consumption in your home?	Tally	What would decrease water consumption in your home?	Tally	How can you get your family/and or community to decrease their energy use and greenhouse gas emissions?	Tally
A special tap	1	No special tap	1	<b>Solar panels</b>	<b>10</b>
Running the water while brushing your teeth	6	Low flow shower head	11	Bike	4
Old shower heads	7	<b>Short showers</b>	<b>14</b>	Jog	2
<b>Long showers</b>	<b>18</b>	Turn off the tap	5	Car-pool/transit	4
Watering your lawn lots	2	Efficient toilets	1	Electric/solar car	2
Two or more showers	2	Solar panels	3	Talk to them	8
Leaving taps running	3	Not use too much water	2	Wash clothes in cold water	1
Turn roof into shower head	1	Rain barrels	1	Buy local food	1
Natural gas	1	Use rain water in the garden	1	Grow your own food	1
Dishwasher	1	Wind	1	Heating oil	1
Ridiculous amounts of water use	1	Heating water	1	Natural gas	1
Low flow showers	1	Powered heating	2	Get stores to stop selling incandescent and halogen light bulbs	1
Other	1	Fewer showers	1	Turn heat down	1
		Small spray shower cups	1	Shorter showers	1
		Long showers	1	Turn off light	3
		Close windows	1	Drive less	1
		Wear a sweater	1	Charcoal, coal, oil, gas, electricity	1
		Natural power	1		

Group 1 Quiz 2 Themes

Put in order which energy source emits the lowest greenhouse gases to the highest. (Solar, hydro electricity, natural gas, heating oil, coal)	Tally	What concerns you about the environment?	Tally
Heating oil, natural gas, coal, electricity, hydro, solar	1	When people pollute	3
Solar, hydro, coal, natural gas, heating oil	1	Global warming	1
<b>Solar, hydro, natural gas, heating oil, coal</b>	<b>4</b>	<b>Deforestation</b>	<b>6</b>
Heating oil, natural gas	1	Killing habitats/environment	2
Solar, hydro	3	Not enough people caring	2
Heating oil, natural gas, hydro, coal, solar	2	Not saving energy	1
Solar	3	Car use	2
Solar, hydro, heating oil, coal, natural gas	1	Development	1
Heating oil, natural gas, hydro, solar, coal	1	Water use	1
Solar, hydro, coal, heating oil, natural gas	1	GHG	1
Natural gas, coal, gas, solar, hydro	2	Using too much resources	1
Solar, hydro, coal, electricity, natural gas, heating oil	2		

Group 2 Quiz 1 Themes

List how you or your family produces GHG.	Tally	List some examples of renewable energy.	Tally	List some examples of non-renewable energy.	Tally	List some ways to save energy in your home.	Tally
Lights	12	<b>Hydro</b>	<b>23</b>	<b>Oil</b>	<b>24</b>	Unplug electronics	15
<b>Cars</b>	<b>19</b>	Solar	18	Natural gas	14	Turn down heat	3
Heating	9	<b>Wind</b>	<b>26</b>	<b>Coal</b>	<b>24</b>	<b>Turn off lights</b>	<b>22</b>
Electronics	9	Geothermal	11	Nuclear	13	Put lids on pots and pans	1
Stove/BBQ	6	Biomass	9	Fossil fuels	5	Grow Food	1
Hot water use	12			Gas	8	Use Less hot water	15
Washer /dryer/ appliances	3					Electric car	3
Recycle	1					Open Windows instead of A/C	2
Take shorter showers	1					Don't leave doors/window open	1
I don't know	1					Bike or Walk	6
						Go outside	1
						Car pool	1
						Old fashioned lawnmower	1
						Install solar panels	4

Group 2 Quiz 2 Themes

What would increase water consumption in your home?	Tally	What would decrease water consumption in your home?	Tally	How can you get your family/and or community to decrease their energy use and greenhouse gas emissions?	Tally
<b>Longer showers</b>	<b>20</b>	<b>Short showers</b>	<b>20</b>	<b>Walk/bike/bus/carpool</b>	<b>10</b>
Leaving tap on	8	Turn tap off	7	<b>Turn off lights/unplug</b>	<b>10</b>
Watering garden/lawn	5	Rain water for garden/not water/morning water	6	Garden	8
Shower head	4	Shower head/appliances: efficient	6	Solar panel	6
Having baths/bathing pets	3	Full dishwasher/washing machine	5	Spread awareness/contests/ACTION	4
Washing machine	3	Unplug/AC	3	Electric car	3
Dishes by hand/half full dishwasher	3	# of showers/sinks	2	Wear a sweater/Less heat	2
Number of sinks/showers	2	Drip irrigation	1	Energy efficient light bulbs/appliances	2
Washing car	2	# of people	1	Less showers/shorter	2
Leave lights/computers on	2	Cold water washing	1	Recycle/compost	2
# of People in the house	1	Flush less	1	Use electricity to heat water/house	1
		Not washing car	1	Cold water use	1
		Drinking	1	Don't idle	1
		Dishes by hand	1		
		Fix leaks	1		

Group 2 Quiz 2 Themes

<b>Put in order which energy source emits the lowest greenhouse gases to the highest. (Solar, hydro electricity, natural gas, heating oil, coal)</b>	<b>Tally</b>	<b>What concerns you about the environment?</b>	<b>Tally</b>
<b>solar, hydro, natural gas, heating oil, coal</b>	<b>4</b>	<b>Littering/garbage/landfill</b>	<b>16</b>
Solar, solar with natural gas, hydro, natural gas, heating oil, coal	3	GHG emissions/cars/air pollution/global warming/ice caps, sea levels	10
Solar, natural gas, hydro, heating oil, coal	2	Water use	7
Solar, hydro, natural gas, coal, heating oil	1	Clear-cutting/forests	6
Oil, coal, natural gas, hydro, solar	1	Wasted energy	4
Heating oil, coal, hydro, natural gas, solar	1	Pipelines	2
Coal, heating oil, natural gas, hydro, solar	1	Electronics kids are addicted to	1
Solar, electricity, heating oil, coal	1	Everything	1
Solar, natural gas, heating oil, hydro, coal	1	Wildlife	1
Hydro, solar, natural gas, coal, heating oil	1		
Solar, electricity, natural gas, heating oil, coal	1		
Solar, hydro, natural gas, coal, heating oil	1		

Team 5: Energy Transformation Consulting  
Lindsey Martini, Shaun Chadburn, Brent Steven,  
Steph James

## **Appendix O: Terms of Reference**

### **Project Agreement**

#### **Introduction**

**Project Title: The Role of Youth Environmental Stewardship in Generating Awareness about Energy Efficiency**

This major project is part of the Pacific Institute for Climate Solutions funded project “Understanding the public uptake and acceptance of municipal green energy incentives program” and in partnership with the Solar Colwood program. This project will be a continuation of an environmental education and outreach Action Research project that is presently focusing on:

- Developing and implementing an educational program for students and staff at a Colwood middle school about energy efficiency and renewable technologies
- Exploring ways to encourage Colwood families to participate in the Solar Colwood program

The project will further investigate the effect of youth environmental education in correlation with an increased knowledge about the Solar Colwood program in the parents, or guardians.

#### **Team Name, list of team members, other relevant information**

Team 5, Energy Transformation Consulting, is composed of:

- Brent Steven, [brent.1steven@royalroads.ca](mailto:brent.1steven@royalroads.ca)
- Lindsey Martini, [lindsey.martini@royalroads.ca](mailto:lindsey.martini@royalroads.ca)
- Shaun Chadburn and, [shaun.chadburn@royalroads.ca](mailto:shaun.chadburn@royalroads.ca)
- Steph James, [steph.1james@royalroads.ca](mailto:steph.1james@royalroads.ca)

## **Research Questions**

The research questions to be investigated are:

- Does an environmental education and outreach program conducted by the RRU PICS research team encourage youth in talking with their parents or guardians about the Solar Colwood program?
- How does increased environmental education in middle school children affect parent's level of education and awareness, specifically with participation in projects relating to renewable energy practices in the home (Solar Colwood)?

## **Underlying objectives to support the research question**

1. Develop recommendations, make a presentation and report the results to the project sponsor, Dunsmuir Middle School, and Solar Colwood partners.
2. Gain experience assisting in workshop facilitation in a Middle School classroom and field trips.
3. Develop an understanding of environmental education and outreach learning theory and community engagement.
4. Develop an understanding and practice of Action Research.

## **General approach to conducting project**

### **Phase 1 - Observation of Classroom Sessions**

In class observation of the current curriculum will be done to gather data to aid with the research teams understanding of the topics covered and revision of the curriculum. This will involve using a standardized evaluation sheet developed by the team based off similar case studies. The evaluation will be done with a mixed methods approach using interviews and surveys in combination with the observations made by the research team.

## **Phase 2 - Revision of curriculum and reimplementation**

From the data collected during Phase 1 classroom sessions a revised curriculum will be developed. The research team will then facilitate the next sessions of the school program with the revised curriculum while evaluating it in the same manner as phase 1.

## **Phase 3 - Analysis of data and Creation of Research Report**

From the data collected in Phases 1 and 2 a report can be created to highlight the effects of the revised curriculum and assesses both the students' knowledge of the topics as well as their parent or guardians. From this report the research team can draw further recommendations for future sessions.

\*Note: An extracurricular activity will be developed and implemented by the research team to incorporate the school and/or community.

## **Explanation of the proposed methodology**

The use of in-class quizzes will be used to assess the students' understanding on materials covered in the classroom. Personal observations will be noted for the revision of the curriculum. Surveys will be used to assess how much of the classroom material is transferred from the students to the parent(s) or guardian(s). The surveys can also help to determine the parent(s) or guardian(s) willingness to participate in the Solar Colwood Program. Data collected under the Solar Colwood Program will be used in addition to data collected to assess people willingness to participate in the Solar Colwood program.

## **Ethical Review (including timeline)**

Approval from Sooke School District 62 Board under Ethical Review conducted by Solar Colwood for Action Research to include research assistants  
Ethical Review submitted January 23, 2013 to the Research Ethics Board at Royal Roads University for clearance and approval.

## **Analysis methods to be used**

Condensing, grouping and organizing data will be used to develop themes. Recurring themes can provide supporting rationale for improving the current curriculum. The review of similar case studies will be done to develop appropriate methods for action research, including a review and analysis of pre-existing data that has been collected by Solar Colwood.

## **Communication Plan (team, sponsor, faculty advisor)**

RRU Research Team members meet every Tuesday at 9 am to discuss project. All other correspondence between team members is conducted through email and/or personal interactions.

Communication between the research team and project sponsors and faculty advisor is primarily performed with the use of email through the designated spokesperson of the team. Meetings are scheduled when necessary to discuss important items, provide status updates and receive feedback on progress.

Budget meetings with Heather Wanke will occur on the first Tuesday of every month.

## **Deliverables to Department**

Deliverables to the department include a draft and final budget and financial statement, peer evaluations, code of conduct and terms of reference and a final report. Presentations on project progress will also be delivered quarterly.

## **Deliverables to Sponsor – specific**

Deliverables to the sponsor include a final report (hardcopy and electronic version) including raw data and background literature. A revised curriculum, including the rationale for the changes, for the environmental education and outreach program will be provided.

## **Team's expectations of sponsor**

We expect the sponsor to respond in a timely fashion and professional manner and provide us with the necessary information required to complete the project. Request permission for the use

of our personal information including, photographs and names. We expect the sponsors to meet with us on a monthly basis to communicate ideas and project progress.

### **Lab Requirements**

There are no requirements for laboratory equipment or analysis in this project.

### **Request for Approval (sponsor and faculty advisor)**

Dr. Chris Ling (project sponsor)

\_\_\_\_\_

(Date)

Dr. Alison Moran (project supervisor)

\_\_\_\_\_

(Date)

## ETC

*Major Project Budget Proposal*



Date	Description			Expenses	Funding
01-Dec-11	Admin Fee (billed at start of project)			Royal Roads University	\$500.00
22-Feb-12	Total Project Funding			Royal Roads University	\$1,220.00
Expenses:		Mileage	0.45/km	Projected Quantity	
	Project Expenses				<b>\$720.00</b>
	Milage	600km	0.45		\$270.00
	Criminal Record Checks			4	\$200.00
	Final Report Printing			2 Copies at \$50.00 each	\$100.00
	Miscellaneous printing			50 colour 300 B&W	\$50.00
	Promotional materials (green team, sunfest materials)				\$100.00
					\$0.00
					\$0.00
					\$0.00
				<b>Total Expenses:</b>	<b>\$720.00</b>
Estimated Billable Hours					
Date	Description	Hours	Qty	Notes	Amount
16-Mar-12	2nd Quarter Billable Hours	82	4		328.00
08-Jun-12	3rd Quarter Billable Hours	82	4		328.00
31-Aug-12	4th Quarter Billable Hours	88	4		352.00
				<b>Total Estimated Billable Hours:</b>	<b>1008.00</b>

### ETC Signatures

\_\_\_\_\_  
 Shaun Chadburn      Date

\_\_\_\_\_  
 Steph James      Date

\_\_\_\_\_  
 Brent Steven      Date

\_\_\_\_\_  
 Lindsey Martini      Date

### RRU Major Project Advisor:

\_\_\_\_\_  
 Dr. Allison Moran      Date

### Major Project Sponsor:

\_\_\_\_\_  
 Dr. Chris Ling      Date  
 Royal Roads University

**CALENDAR FOR THE MONTH OF: February 2013**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5 Budget Check-in	6	7	8	9
10 Draft Project Agreement Due 11:55 pm	11	12 Data Review Literature Review Research Design	13	14	15 Major Project Presentation planning 2:30 pm	16
17	18	19 Data Review Literature Review Research Design	20	21	22	23
24	25	26 Data Review Literature Review Research Design	27	28		

**CALENDAR FOR THE MONTH OF: March 2013**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 Project Agreement & Budget signed off	2
3	4	5 Budget Check-in  Table of Contents Observation Prep. Research Design  Presentation	6	7	8	9
10 Annotated Table of Contents Due 11:55 pm	11 Exam Week	12 Exam Week	13 Exam Week	14 Exam Week	15 Major Project Presentation	16
17	18 Reading Break	19 Reading Break	20 Reading Break	21 Reading Break	22 Reading Break	23
24	25	26 Brainstorm curriculum  First classroom observation at Dunsmuir Middle School	27	28	29 Peer Evaluations Due	30

**CALENDAR FOR THE MONTH OF: April 2013**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2 Budget Check-in  Observation Review & Revisions Second Classroom Observation	3	4	5	6
7	8	9 Observation Review & Revisions  Third Classroom Observation	10	12	13	14
15	16	17 Observation Review & Revisions  Curriculum Design	18	19	20	21
22	23	24 Curriculum Design  Data Review	25	26	27	28
29	30					

**CALENDAR FOR THE MONTH OF: May 2013**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 Budget Check-in Data Review & Curriculum Design Draft Report Possible classroom implementation	2	3	4	5
6	7	8 Data Review & Curriculum Design Draft Report  Possible classroom implementation	9	10	11	12
13	14	15 Data Review & Curriculum Design Draft Report  Possible classroom implementation	16	17	18	19
20	21	22 Data Review & Curriculum Design Draft Report  Possible classroom implementation	23	24	25	26
27	28	29 Conference Preparation Presentation preparation Possible classroom implementation	30	31		

**CALENDAR FOR THE MONTH OF: June 2013**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2 Interim Report & Progress Report & Financial Statement & Budget with billable hours Due 11:55 pm	3	4 UVic Conference - Solar Colwood  Presentation Preparation	5	6	7 Major Project Presentation	8
9	10	11 Literature Review  Draft Report	12	13	14	15
16	17	18 Literature Review  Draft Report	19	20	21 Peer Evaluations Due	22
23	24	25 Literature Review  Draft Report	26	27	28	29

**CALENDAR FOR THE MONTH OF: July 2013**

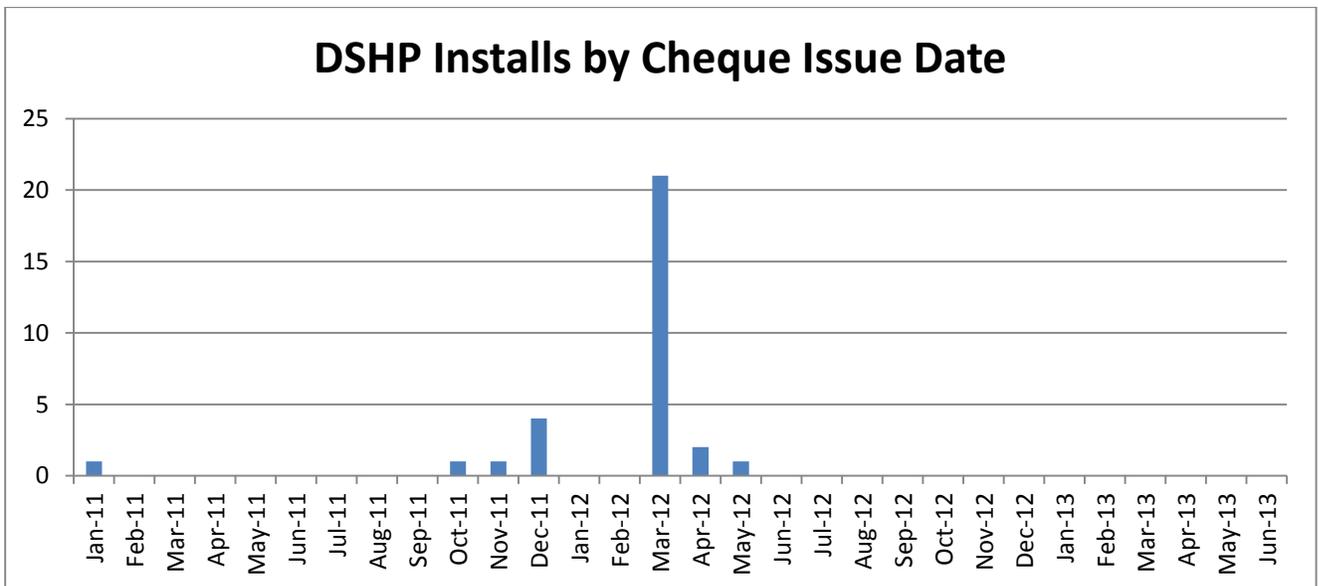
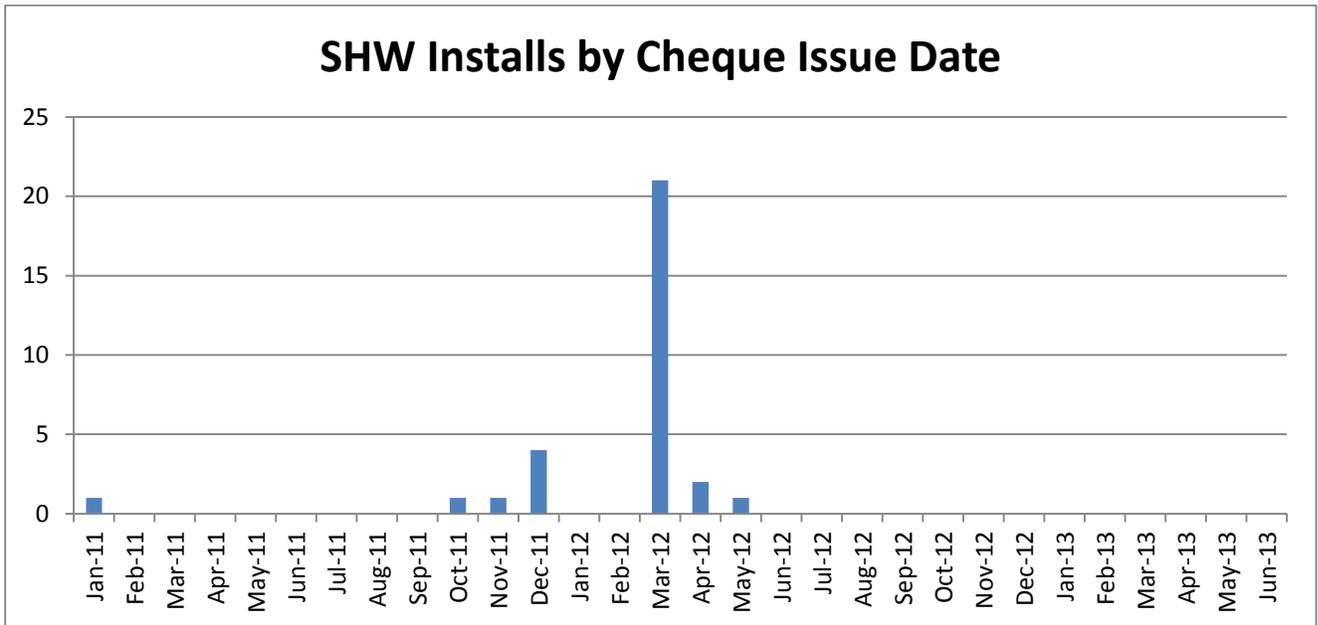
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2 Budget Check-in Draft Report	3	4	5	6
7	8	9 Draft Report Due	10	11	12	13
14	15	16 Final Report	17	18	19	20
21	22	23 Final Report	24	25	26	27
28	29	30 Final Report	31			

CALENDAR FOR THE MONTH OF: August 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6 Final Report Due Budget Check-in Presentation preparation	7	8	9 Electronic & Print Request Form	10
11	12	13 Presentation preparation	14	15	16 Final Budget Due	17
18	19	20 Presentation preparation	21	22 Presentation	23 Presentation Peer Evaluations Due	24
25	26	27	28	29	30	31

### Appendix P: Solar Colwood Data

Solar Colwood Energy Saving Actions (as of June 30 2013)	Incentives Paid Out
Solar Hot Water Systems Installed	33
Ductless Split Heat Pumps Installed	88
Electric Vehicle Charging Stations (non-PV)	1
Electric Vehicle Charging Stations (PV)	5



\*SHW refers to Solar Hot Water Heating System; DSHP refers to Ductless Split Heat Pumps