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| About this Lesson |
| In this lesson, students investigate the costs and benefits of using electric cars over gasoline-powered cars by comparing the cost and environmental impact of both types of vehicles. |

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| **Grade Level** | **Course(s)/subject(s)** | **Learning Goal(s)** | **Suggested**  **Timing** |
| 7 | Science and Technology, grades 1 to 8 (2007 revised)  Mathematics, grades 1–8 (2005) | At the end of this lesson, students will:   * gather information about the current cost of goods * compare prices of items in the community through comparison shopping exercises | 40–50 minutes |

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| Curriculum Links |
| Science and Technology, grades 1 to 8 (2007 revised)  Interactions in the environment  1.1 Assess the impacts of human activities and technologies on the environment and evaluate ways of controlling these impacts.  1.2 Analyze the costs and benefits of selected strategies for protecting the environment.  Mathematics, grades 1–8 (2005)  Number Sense and Numeration  Demonstrate an understanding of addition and subtraction of fractions and integers, and apply a variety of computational strategies to solve problems involving whole numbers and decimal numbers. |

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| Inquiry Question |
| Are the environmental benefits, if any, worth the potentially higher cost of purchasing an electric car? |

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| Materials List |
| * Computers with Internet access OR schedule a library session (it may help to pull some relevant books, articles, video clips, etc. for the class ahead of time) * Electric Vehicles: Cost vs. Benefits Worksheet (Appendix A) * Calculators * Prerequisite knowledge: Students should have been introduced to the carbon cycle |

| **Timing**  (Mins.) | **Lesson Sequence** | | **Assessment for and as Learning Opportunities** (self/peer/teacher) |
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| MINDS ON | | | |
| 5–10 minutes | WHOLE CLASS  Ask students the following question: “Many people believe that electric cars are better for the environment and will save you money in the long run. Do you believe this is correct? Does driving an electric vehicle really save you money over time, and is it truly better for the environment?”  Students share current knowledge of electric vehicles and their effects on the environment.  (Be sure to guide the discussion to encompass as many environmental effects as possible. For example, discuss the impact of electric power generation, both from renewable and non-renewable sources.) | |  |
|  | Context for Learning   * calculating with decimals * general knowledge of gasoline and electric cars * background knowledge on the environmental impact of cars |  | |

| **Timing**  (Mins.) | | **Lesson Sequence** | | **Assessment for and as Learning Opportunities** (self/peer/teacher) |
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| ACTION | | | | |
| 20–30 minutes | GROUP WORK  Co-operative group work   * Organize students into groups of two-three (depending on the number of accessible computers) and assign each group a computer workstation. * Distribute a copy of the Worksheet on Electric Cars: Cost vs. Benefit (Appendix A) to each student. * Explain that the purpose of this lesson is to assess the environmental and financial impacts of purchasing and using an electric car, as opposed to purchasing a traditional gas car. If possible, show a short video clip on the electric car and/or encourage students to share any knowledge they have about these kinds of cars. * Provide students with tips on how to perform research on the Internet about electric cars and provide some suggested websites. (It is assumed that students have a basic knowledge of Internet search skills. If they do not have these skills before engaging in this lesson, review these skills with the students.) * Ask students to work on section A in their groups. Explain that the class will move on to section B in approximately 20 minutes. * Once the class is ready to move on to the next section, have each group explain its position to the class on the impact of electric cars based on their research thus far (question 3). * Once complete, have students work on section B of the worksheet in their groups by leaving the computer workstation or turning off their computer screen. | | Observations/Worksheet on Electric Cars: Cost vs. Benefit (Appendix A) | |

| **Timing**  (Mins.) | | **Lesson Sequence** | | **Assessment for and as Learning Opportunities** (self/peer/teacher) |
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| CONSOLIDATION/DEBRIEF | | | | | |
| 5–10 minutes | | WHOLE CLASS  Groups share their findings regarding the cost effectiveness of the electric vehicles they researched. Discuss with the class the following questions:   1. According to your research, does driving an electric car (instead of another kind of car such as one that uses gasoline), help protect the environment?   Notes to keep in mind:  **Pollutants:** Students may not have thought of, or discovered, some of the potential pollutants from electric cars. Some pollutants they may have missed are power plants (particularly in the U.S. where a large amount of electricity comes from coal-powered plants, mining for battery materials, such as lithium, battery disposal).  **Economic impacts:** Many places have subsidies (tax breaks and other monetary incentives) for buying electric vehicles. If these are taken away, how much more expensive will these vehicles become? How much do these subsidies cost you as a taxpayer?   1. Think about the costs of owning and driving an electric car compared to other kinds of cars; what are the financial benefits and challenges of owning an electric car based on your family’s needs and activities?   Note to keep in mind: **Social impacts:** If families can’t afford to make the initial purchase of an electric car, and the long-term costs are more, how does this make it more difficult for those with lower incomes to save money over time?   1. Based on your findings, which kind of car would you purchase and why?   (Possible extension for a future class: Debate) Extension 2: Compare with Hybrid/hydrogen | | Observations/Notes | |

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| Electric Cars: Cost vs. Benefit |
| Electric vehicles are cars that run on electricity from a battery. Since they use electric power, they are widely believed to be better for the environment. In this worksheet, you will research electric cars and give your take on the environmental and financial benefits and drawbacks to driving these alternatives to gasoline vehicles.  Section A: The environment   1. Using the Internet and/or resources provided to you (and your knowledge of the carbon cycle), explain why an electric car could be better for the environment.   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   1. Electric cars use batteries as an energy source. What information can you find regarding the environmental effects of building, using and discarding batteries?   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   1. Consider your responses to questions 1 and 2. Overall, do you believe electric cars are helping the environment, hurting it or making no difference? Explain your answer.   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**APPENDIX A**

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| Electric Cars: Cost vs. Benefit (cont’d.) |
| **Section B: The financial considerations**   1. Consider the information below (the values are average numbers for an entry-level sedan by a major car manufacturer).  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Engine | Price | Average Main-tenance cost per year | Average L/100km | Gasoline price/L or price/ kw/hr | km driven per year | Litres used per year | $ spent on gas or electricity cost per year | | Gasoline  (model):  \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  |  |  | | Electric  (model):  \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  |  |  |   Given the information in the chart, calculate:   1. The difference in upfront cost between purchasing an electric vehicle and a gasoline vehicle (put in chart). 2. The price difference between buying an electric or gasoline vehicle (put in chart).  |  |  |  | | --- | --- | --- | | Purchase Cost Difference (electric vehicle (EV)-gasoline (G)) | | Difference | | Difference in cost of purchasing (EV - G) |  |  | | Yearly Operating Costs (electric vehicle (EV)-gasoline (G)) | | Difference | | Difference in cost of maintaining (EV - G) |  |  | | Difference in yearly power costs (EV - G) |  |  | | Total yearly cost difference (EV - G) |  |  | |

**APPENDIX A**

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| Electric Cars: Cost vs. Benefit (cont’d.) |
| Section B: The financial considerations (cont’d.)   1. How many years would it take to earn back the extra money paid upfront? Compare money spent on gas per year with extra cost for purchasing the electric car. 2. With your group, reflect on all questions in the worksheet. Discuss whether you feel electric cars are a smart financial investment, or if gasoline cars make more sense to purchase. What are some of the other variables not discussed here (e.g., government regulations, tax implications) that could weigh on your decision? |

**APPENDIX A**