Sustainable Electronics Initiative (SEI)

ILLINOIS SUSTAINABLE TECHNOLOGY CENTER
PRAIRIE RESEARCH INSTITUTE

TEACHING SUSTAINABILITY WITH ELECTRONICS

Changing perceptions about our place in, and relationship to, the rest of the natural world, is a crucial aspect of fostering sustainable behavior. Worldviews shape decisions. Lack of awareness, confusion, or apathy toward the effects of our actions on the greater system to which we belong, can be seen as the root causes of many of our collective environmental, social, and economic problems—in other words, as threats to sustainability. However, the concept of "sustainability" can seem abstract and complex without context to make it relatable to an individual's everyday experiences. Electronic devices permeate our society, and serve as a point of interest and familiarity in discussions of sustainability issues. Considering the impacts of the production, use, and disposal of your smartphone, for example, can be more engaging and comprehensible than out-of-context discussions of issues like rainforest destruction, climate change, etc. One of the goals of the **Sustainable Electronics Initiative (SEI)** at the Illinois Sustainable Technology Center on the campus of the University of Illinois at Urbana-Champaign is to use examination of the product lifecycles of electronic devices to teach concepts of sustainability and systems thinking.

IMPACTS THROUGHOUT THE PRODUCT LIFECYCLE

Electronic devices have a multitude of impacts to explore, from design to manufacture, through use and ultimately disposal, that relate to economic, social, and environmental aspects of sustainability. For example, mining is required to obtain minerals for manufacture, and design choices like securing batteries with glue or using non-standard screw shapes can affect the ability to replace parts or recycle components at their end-of-life. See the sidebar for further examples.

RELEVANT TO MULTIPLE FIELDS

While obviously relevant to fields like industrial design, computer science, and engineering, sustainable electronics issues may also be used in lessons related to business, human rights and welfare, occupational health and safety, environmental justice, consumer psychology, marketing, chemistry, history, journalism, film studies, technical writing, law and policy, materials science, human dimensions of environmental systems, economics, etc.

SEI is dedicated to the development and implementation of a more sustainable system for designing, producing, using, and managing electronic devices.

EXAMPLES OF IMPACTS BY LIFECYCLE PHASE

Design
- Materials selection
- Planned obsolescence
- Design for repair/recyclability

Manufacture
- Impacts of mining
- Occupational exposure to toxic materials
- Energy intensity

Use
- Social impacts of technology
- Energy efficiency
- Marketing and consumer behavior
- Copyright law

Disposal/Recovery
- Reuse
- Recycling
- Toxic materials
- Legislation

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SEI Sustainable Electronics Initiative

MVP² Award Winner

University of Illinois at Urbana-Champaign

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DID YOU KNOW?

Over 1,000 materials, including **chlorinated solvents, brominated flame retardants, PVC, heavy metals, plastics and gases**, are used to make electronic products and their components—semiconductor chips, circuit boards, display panels, and disk drives.- *Electronics TakeBack Coalition*

"…I have been using electronic devices for so long and I have never asked myself what they are made of. However I have discovered by reading some articles and watching videos how expensive are minerals like gold, tin, tantalum and tungsten. Of course I am not talking about money costs. The cost that I am referring to is the cost in human lives of mining these materials."

-Student in ENG 498, Spring 2014, regarding conflict minerals

Image source: www.conflictmineralsconsortium.com

EXAMPLES OF SEI EDUCATION PROJECTS

INTERNATIONAL SUSTAINABLE ELECTRONICS COMPETITION (ISEC)

What began in 2009 as a local competition, emerging from a UI industrial design class on e-waste issues, became an online challenge for college students and recent graduates throughout the world in 2010. Students developed concepts related either to the prevention of e-waste generation through modifications to product design, manufacture, and appeals to consumer behavior, or the reuse of electronic scrap for the development of new and useful products. Submissions included brief overview videos posted to YouTube. Through its final year in 2013, the competition engaged students from 13 different countries; involved numerous experts from industry, government, academia, and non-profits as jurors; resulted in thousands of dollars in prizes; and served as a class assignment or project at a variety of different universities throughout the US and beyond. See www.ewaste.illinois.edu for more information.

ENG 498: SUSTAINABLE TECH.: ENV. & SOCIAL IMPACTS, SPRING 2014

A collaboration of the UI College of Engineering Technology Entrepreneur Center and SEI, this course introduced environmental and social impacts associated with technology at each lifecycle stage (design, manufacture, consumption, and disposal/recovery). Electronic products were used as a case study and framework for discussion of complex legal, economic, social, and environmental considerations. Students were introduced to systems thinking, product lifecycle analysis, perspectives of various stakeholders, and the complexity and breadth of issues surrounding electronics. The class interacted with guest lecturers from industry and non-profit organizations. Final project options were the creation of a mock entry for the International Sustainable Electronics Competition, or to create a repair guide as part of the iFixit Technical Writing Program.

A NEW LIFE FOR LAPTOPS, SPRING 2012

Laptops used by government agencies and various industries typically have hard drives removed and destroyed prior to recycling as a data security measure. With funding from Dell, cross-disciplinary teams of students worked with Professors William Bullock (Industrial Design), Hong Yuan (Business Administration), Cliff Shin (Industrial Design), and Brian Lilly (Engineering) to create new or previously unexplored applications for these discarded laptops without the addition of new hard drives. The goal was to extend the useful life of valuable materials prior to recycling. For more information, see http://www.istc.illinois.edu/about/SustainabilitySeminar20120508.cfm.

www.sustainelectronics.illinois.edu