RESEARCH QUESTION

What is the impact of electronic waste in this electronic age, both globally and at Lafayette College, and how can we at Lafayette mitigate our “e-waste” on campus?

BACKGROUND CONTEXT

The crux of this issue is the extreme health hazards that are generated when electronics are not properly disposed of. Chemicals such as lead, mercury, cadmium, chromium, PBDEs (Polybrominated diphenyl ethers, used as flame retardants), PCBs (polychlorinated biphenyl, used as coolant in capacitors) and PCDDs and PCDFs (Polychlorinated dibenzo-dioxins and Polychlorinated dibenzo-furans, emitted during combustion) are released into the environment when end of life electronics are placed in landfills. These chemicals can cause extremely harmful neurodevelopmental problems in children, which affects a child’s cognitive function, attention span, executive and motor functions and behavioral development.

As our everyday lives become more and more entrenched with the electronics that we use to complete tasks, more and more electronic waste is generated by our society. Not only do these products end up in domestic landfills, but an increasing amount of this waste is being sent abroad. There are some efforts to recycle within the country, however even some of our best efforts do not completely solve the problem of e-waste. Some electronics are shipped abroad to be resold, but many of these end up in landfills abroad and are sifted through by poor citizens to be sold for scrap. To make matters worse, many of these electronics end up being burned to extract the trace amounts of precious metals that they contain. Fumes from this action are very carcinogenic, and typically the person doing the burning lives in an underdeveloped portion of India or China and does not have proper education to know the harm they are causing to their body. This practice further perpetuates the harmful effects of the waste. Even here at Lafayette, many students do not know of the efforts to recycle and have their old phones and iPods stashed somewhere in their rooms.

METHODS

In order to complete our research, our team did extensive searches on electronic databases and news archives. Through this research, we found the health hazards generated when electronics are not properly disposed, as discussed above.
In addition, we discussed the Lafayette efforts for recycling with Sustainability Coordinator George Xiques, who enlightened us on the current Earth Week electronics recycling efforts. Furthermore, George helped in completing one of our final products of the project, our E-Waste Receptacle. The E-Waste Receptacle’s last finishing touch was the old electronics glued to the top of the lid. The electronics used on the lid were obtained from Lafayette’s Earth Week.

Lastly, we conducted a campus wide survey to collect information about Lafayette students and electronics. The survey was completed by 346 students, and the results held true to the notion that the vast majority of students at Lafayette have their old electronics, iPods, cell phones, etc, stored somewhere in their rooms. We have partnered with Professor Nestor Gil of the Art Department in order to complete the project’s final product. Nestor assisted with the conceptual and physical creation of the e-waste receptacle, and his expertise in art and aesthetics helped give the receptacle the eye-catching appeal that it attained in the end.

**CONCLUSIONS AND OUTCOMES**

This aforementioned product will have three portions.

The first portion is a website with information about e-waste and its harmful effects. The website was actually created last semester by a group in EGRS 251, Engineering and Public Policy. The site suggested that an e-waste receptacle be implemented somewhere on Lafayette’s campus, and the updates include the information about the current receptacle that was made this semester. Other updates to the site include updated information about the Lafayette case study, along with improvements in the other sections.

The second portion is an e-waste receptacle, an art project formed with Nestor that will be available for daily e-recycling for Lafayette students. The receptacle will be placed in the basement of Farinon Student Center. As an art project, our hope is that the eye-catching receptacle will further promote e-waste on campus among the student body. The receptacle has on old, aluminum, beat-up body. Using a stencil that we made, we spray-painted “E-Waste” on the side of the can. We then fit a piece of wood and attached it to the can using a hinge, acting as the lid. On the surface of the wooden lid, we used old, beat up, end of life electronics to make the can even more eye-catching.

We went back and forth on designs for the receptacle, which we consider to be the main product of our project. After consultation with Nestor, this design seemed to work best, combining the arts and the functionality of the receptacle itself. One functionality aspect that we had to consider was how easily people could open the lid and dump their e-waste inside. We first considered cutting a slot in the lid, but people throwing regular garbage in the receptacle seemed to be a potential issue. Another aspect was how Plant Operations was going to open the receptacle in order
to empty it and deliver it to George Xiques. The hinged lid that automatically closed seemed to be the best fit for our functional needs.

Finally, the third prong of our project is a poster that will accompany the receptacle in order to tell the general public its purpose and promote the website, which pulls all three of the prongs together. In addition to the poster behind the e-waste receptacle, we plan on printing out fliers to be displayed around campus. Similar to the poster, these fliers will bring people’s attentions to the e-waste problem, point them in the direction of the receptacle in Farinon, and direct them further to visit our website and learn more about the repercussions of failing to recycle electronic waste correctly. Our flier may seem a little racy, but after discussion with Nestor the group decided that it is extremely effective in getting the attention of students, and will draw a large amount of attention to both the receptacle and the website.

**RECOMMENDED NEXT STEPS**

For anyone in future years to continue with this project, they could discuss with Professor Cohen, Professor Gil or George Xiques about how to advance the website, receptacle, and general awareness.

We feel that as more and more electronics are produced and more and more e-waste is generated, this issue is going to become more and more important. In future years, students can expand on our project, bringing e-waste receptacles to Easton and the Lehigh Valley, possibly starting in schools and supermarkets and branching out from there. Once receptacles are placed in places frequented often, the message will become easier to relay and more e-waste will be recycled as a result.

**APPENDICES**

Appendix A: Annotated Bibliography.
Appendix B: E-Waste Survey
Appendix C: E-Waste Survey Results
Appendix D: Copy of Flier
Appendix A: Annotated Bibliography


This article provides a summary of e-waste’s detrimental effects in India. It describes the policy initiatives that India is trying to apply to mitigate electronic waste. The article provides good background for initiatives to limit the amount of e-waste that is sent abroad, which the negative externality that our group wants to focus on. We can also reference the scale of initiatives, comparing a national initiative in India to our own suggestions at Lafayette.


“Certification for Electronic Waste Recycling Gathers Support” explains how the Natural Resources Defense Council recently announced its endorsement of the first certification program for electronics recycling. This show of support for the same objective that we have been working toward, and a link to the information presented in the endorsement could possibly be put onto the website. It is very pertinent to our particular situation as well as it is directed towards North America.


This source is a magazine article that is photograph intensive. Behring investigates the popular sites for dumping of the electronics waste that our society generates. The pictures serve as a fantastic visual to display the topics that Behring is discussing, and I hope that I will be able to use them to revamp the e-waste website. In addition, the article discusses the different materials that can be salvaged from electronics and what the poor in China, India and Nigeria are exposed to with electronic waste. This information can be used on the site to increase the factual impact of our articles.


This article illustrates the issue of irresponsible pollution of e-waste throughout the world. It talks about the motive behind illegal distribution of electronic waste. The topic of illegal treatment and trade of e-waste will be beneficial to our project because it will show another aspect of the issue that doesn’t directly affect the Lafayette campus. This article will add to our group’s overall knowledge of the topic, and be useful for the background contexts of the website.

Using pictures, graphs, tables, and other data, this article lists the noble metals that can be recovered from Waste Electrical Electronics Equipment (WEEE). This article provides a different angle on the issue of e-waste, showing how e-waste can be used for the good rather than just explaining the downside of incorrectly disposing of old electronics.


In this article, Ellison talks about her personal experience when she realized the enormous amount of used electronics were stored in closets in her house. I believe that we can site the article itself as a societal realization of how much electronic waste is simply in our homes, and we can pair this with our survey to increase the impact of our site. The article also talks about Jim Puckett, the founder of e-Stewards, which our group has already discussed in the site. We can use this new article to add to the current e-Stewards information on the site and other e-recycling efforts that Ellison discusses.


Recycling Electronic Waste, written by Flaris, Rhao, and Singh, tells the reader exactly what would be expected; the details of recycling electronic waste. It touches on the problems associated with e-waste, possible solutions, and specific examples of how e-waste affects certain areas, an even reveals some history on the subject. The information found in this article can be used to make changes to our website, informing the readers on everything e-waste related.


This article defines the path that most old, unwanted electronics take once they are incorrectly disposed of. Quoting Oladele A. Ogunseitan, an environmental health scientist, and his colleagues at the University of California, the article also points out some numbers, including how many cell phones have been discarded in the US alone. Again, this article will help us to inform the Lafayette community of the repercussions of failing to properly dispose of old electronics.

This article addresses a problem with cell phone recycling. Privacy of the personal information attached to a cell phone can be an issue with reusing discarded cell phones. The article cites a study on cell phones sold second hand and found that it was possible to extract data about the phone’s original owner even after the memory was cleared. In our suggestions, we can use this information as a simple warning for reselling old electronics as well as disposing of them improperly, because if they are correctly recycled then personal data will not be an issue.


This article discusses the electronic recycling methods of a firm called e-Scrap. This company, based in Islandia NY, developed a machine that demolishes all types of electronic components. The machine reduces the materials to a shredded state and then sends the conglomerate to Materials Selection and Recycling to be separated into base materials (glass, plastic, copper and steel) and is then re-sold. This article provides us with an example of a company who is, although profiting from it, practicing safe recycling of electronics.


This journal article discusses the different governmental taxes and subsidies that could possibly be imposed on the recycling of end of life (EOL) electronics. Primarily, it discusses advanced recycling fees for sellers of electronics and government subsidies that could be implemented for the users. After discussing the options, the article tries to find a solution that maximizes social welfare and at the same time maximizes profits for both electronics sales and recycling industries. The article provides potential for even more incentive to properly recycle electronics.


This journal article is a specific case study and statistical analysis for a town in China that has an electronics recycling plant. The authors of the article perform an analysis of blood lead levels of over 200 children in two different villages and found that the children in Guiyu, with the plant, were much higher than those in the village without the plant. In addition to the blood lead levels, the authors did statistical analysis of other standard health factors like hemoglobin levels. The authors not only analyzed the levels themselves but the development of the children and the levels in some of the adults in the town. I believe that this article could be helpful in legitimizing our scientific justification of the need for proper e-recycling.

This article explains that e-waste could be successfully used in the manufacture of expanded clay concrete and wall ceramic products. Again, we are shown how e-waste can be put to a good use, rather than just be disposed of improperly and forgotten about. Using the information from this article, which also uses data and experiments to portray it's message, will help us to further convince our website/flier readers that e-waste is a serious issue right now.


This article presents a perspective from 2007 shortly after the EPA started calling for e-waste to be considered under its own category of waste. At the time, recycling of materials used in electronics was possible but not widespread. Some recycling practices at that time included sending old computers to China and India where they would be dismantled by hand then burned in flames or acid to obtain bits of the metals used. This article just provides yet another angle looking into the repercussions of not recycling e-waste correctly, which can again be used to influence people to use our e-waste receptacle and recycle their old electronics properly.


This article will educate us on the different levels of quality of recycling e-waste, and the individual indicators that determine this quality. We can then inform citizens, Lafayette students in our case, providing a clear picture on the quality of various recycling systems. In addition to providing a bin for e-waste on campus, fliers will be sent around as well, briefing the Lafayette community on the benefits of e-waste recycling and the detriments of not recycling.

Schachter, R. (2009). Mobile devices in the classroom: phones, netbooks and ipods are finding a place in the curriculum and expanding student access to technology. *District Administration, 45(10)*, 31.

This school administration journal article discusses the use of electronic devices in elementary schools. It gives the benefits and possible draw backs of having this type of mobile technology in the class room. iPods and cell phones are the focus electronics in the article. This article is from a professional journal that targets district leaders in K-12 education, and I believe that we can use this fact to help solidify our stance that mobile devices are a trend among the younger generation. Since the article discusses education (although not at the college level) it pertains to
Lafayette in that mobile devices in the classroom will clearly affect the amount of mobile devices among students on campus, and devices being recycled.


This article discusses the logistics of electronics trade into Africa, and the actual trade of used electronics within African countries. Electronics trade in Africa is thriving due to the rising demand for electronics products and the inability of African countries to mass produce those products. In order to remedy this, the African countries import used electronic waste products from countries like the U.S. However, the products are bought on a by-weight basis, and much of what is bought by the African sellers is unsuitable for resale. This article provides another perspective on not only the environmental impacts of electronic waste, but also the economic impacts on developing countries.


This article discusses two specific case studies of cities that have employed tactics to reuse old electronics instead of the standard recycling process. Both the British town of Birmingham and the Brazilian city of Porto Algere have tested these ideas, and sell the used IT equipment to local training organizations or to low income families at a reduced cost. The article also discusses the regulations that govern electronics companies and their use of toxic components in their products. I believe that we can use this article to create a case study page on the website on alternative projects for electronics recycling.


This article addresses ways in which product manufacturers and super stores can make recycling more efficient. The article outlines three ways to make product recycling more efficient and include more products. These three initiatives include using product codes for efficient, automated sorting, using the product codes for “recycling innovations” including coupons, rebates and online paybacks. The article addresses the feasibility of these strategies and their implementation depending on the scales of the market. This article will provide information about best practices in the industry we can recommend to an institution with a demographic like Lafayette College.

This book discusses different case studies on how forms of contemporary art are used throughout different points in history. I think that we can employ this text in a more practical sense for the art portion of our project. Not only can we gain different ideas and perspectives from this text for our art portion of the project, but we can use the practical knowledge to advertise for our project on our website. In addition, we can use this text to increase the aesthetic appeal of our site itself by using what we will gain in knowledge of photography and what photos we place on our website.
Appendix B: E-Waste Survey
Appendix C: E-Waste Survey Results

How Many Electronics Devices Do You Own?

When Do You Replace Your Electronic Devices?

- When they break and are no longer usable: 288
- When my model becomes obsolete: 56
- I always get the brand new model, regardless of the status of my current model: 3
When you are finished with your electronic devices, how do you dispose of them?

- I don't, they are lost somewhere in my house: 223
- Recycle (specifically e-recycling): 53
- Donate: 48
- Trash: 26
WHAT THE F**K IS E-WASTE?

IN SHORT, IT IS ELECTRONIC WASTE ANY OLD CELL PHONES, CHARGERS, LAPTOPS, KEYBOARDS, IPODS, ETC.

STOP HARMING CHILDREN IN CHINA BY DISPOSING OF YOUR E-WASTE INCORRECTLY.

DISPOSE OF YOUR OLD ELECTRONICS IN THE E-WASTE RECEPTACLE LOCATED IN THE BASEMENT OF FARINON.

LEARN MORE ABOUT E-WASTE AT HTTP://SITES.LAFAYETTE.EDU/EGRS251-FALL-EWASTE/