



WHAT WEEE ARE

2015 – 2016

PRESENTATION

During the last decades, natural resources have been thinning while extraction technologies have grown more complex and expensive. Metals, precious metals in particular, are at the base of the economy and are necessary in the production of most of our commodities, from cars to ICT, from medicine to art.

Waste Electric and Electronic Equipment (WEEE) yields higher percentages of precious metals compared to remaining natural deposits. However, separating such complex materials, which are fully assembled and capillary-distributed around the planet, poses challenging logistic, technological, social as well as environmental issues. Among other issues, which have emerged during the COBALT dialogue held in Brussels on June 6th and in Copenhagen on October 8th, 2014 (www.cobalt-fp7.eu), information and education were highlighted as key players. It is therefore necessary for new generations to open up to a wider vision of technology, not only as means of communication, but for its true material value of Electric and Electronic Equipment (EEE). Thus, understanding where things come from and where they will go and discovering different aspects of the economic cycle, from production to urban mining and consumer awareness, is fundamental.

General Objectives

The project objective is to implement a cycle of interactive workshops in high schools. The meetings will offer an overall view on the origins of materials, a few notions on physical and chemical characteristics and what happens after disposal. There will be an interactive class assignment in which students will dismantle a technological product (e.g. phone, toy, pc) highlighting through group analysis the various issues concerning collection, disassembly, refurbishing as well as recovery of materials.

Finally the class, divided into smaller groups, will create some designs specifically addressing one of these topics: production, consumption or recycling.

Target Group

One class of the Liceo Artistico "A. Passoni"- diploma in Industrial Design (www.lapassoni.it)

Instructors

Alessio De Marchi, expert in waste electronics and green design held the meetings.

The presence of the teacher was recommended.

Cost

As pilot project participation was free.

Cost evaluation for future implementation: EUR 1000 per Module (3 two-hour lessons)

Evaluation

The students will be asked to fill in two survey questionnaires, one at the beginning of the workshop and one at the end of the last day. The goal is to evaluate the level of general awareness over the issues treated during the activities and the level of appreciation of the workshop in general. One year later a follow up survey will be conducted on the same sample in order to evaluate the effectiveness of the workshop.



RESEARCH

This section explains in detail the methodologies used during the three encounters and the topics analyzed in class. The approach was split into three focus areas: 1-Theory, 2-Disassembly and 3-Design, aimed at raising student's awareness over responsible use of raw materials throughout the value chain and in our day-to-day lives.

Methodologies

The workshop was organized in 3 two-hour meetings focusing respectively on theory, dismantling and design. The pilot project was proposed in one class of the Liceo Artistico "A. Passoni".

The project was successfully implemented in one class of the State High School of Arts "A. Passoni" in Torino Italy (<http://www.lapassoni.gov.it>). Students average age is 16 and they have just chosen their specialization in Industrial Design.

1 – Theory

The first meeting was a frontal lesson on metals. The arguments covered an array of topics ranging from a brief introduction on physical, chemical and mechanical properties of materials in general to the specific characteristics and importance of precious metals. Following, the lesson focused on mineral extraction methods, from traditional mining to bio mining and the new perspectives offered by urban mining and space mining.

The red string connecting the dissertation was the importance of raw materials such as Precious Metals, Conflict Minerals and Rare Earth Elements, highlighting the important role they cover in our day-to-day lives. Efforts were made to bring a holistic approach to the subject specifically addressing the critical issues arising throughout the entire value chain from extraction to production to consumption and the role of consumers.

2 – Disassembly

The second part was a hands-on activity. The students were provided with gloves, masks and some common hand tools (screwdrivers and pliers). They were asked to disassemble some random pieces of Waste Electronic Equipment as fast as possible, precisely separating the different materials. Then they had to complete a report marking weight and type of waste retrieved. The students were then encouraged to form discussion groups on the arising issues concerning raw materials in general connected to their on-hand experience, raising discussion topics over design, dismantling and waste management of Electronic Equipment in particular.

Disassembly operations were recorded in a stop-motion animation video which will be published on YouTube and Vimeo and will be presented at International Film Festivals in order to disseminate the results of the workshop and raise widespread awareness over the issues regarding responsible use of raw materials and e-waste in general.

3 – Design

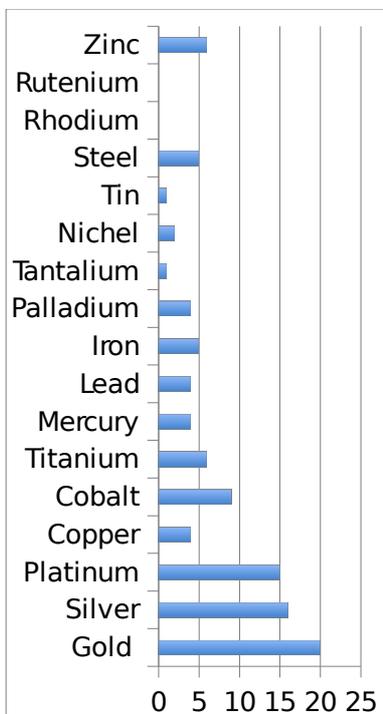
The third part was dedicated to creativity. The students were asked to graphically elaborate the information acquired during the activities and design the world they imagine, taking into consideration the issues discussed in the previous meetings. Finally the students filled in an evaluation of the questionnaire regarding their degree of interest and satisfaction.



RESULTS

This section analyzes the results of the research work done in class highlighting aspects in general knowledge and consumer awareness, focusing on how design can influence and improve to reduce the impact of human activities. Following the research objectives also this part is divided into three sections (1-Theory, 2-Disassembly and 3-Design) focusing on the respective target issues.

1 - Theory



Prior to beginning the workshop, the students were asked to complete a questionnaire in order to assess the level of general awareness ranging from basic notions on raw materials and Waste Electric and Electronic Equipment. The class was composed by 21 students of which 20 recognized Gold as a precious metal, followed straight after by Silver and Platinum, counting 16 and 15. However, other Platinum Group Metals were not considered particularly valuable. Unexpected interest was shown for Cobalt, surprisingly copper was considered to be less valuable than steel.

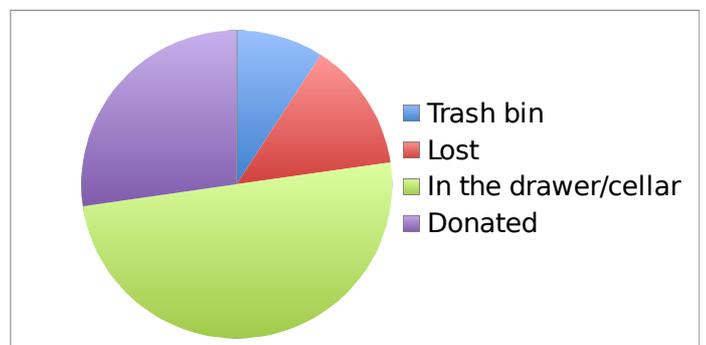
About 2/3 of the class knew that precious metals are valuable due to their particular properties, while few considered beauty and optical properties to be particularly characterizing.

95% identified mines as the main source of raw materials from mining, while none considered waste streams to be a potential source. Only 14% of the class was aware that the WEEE acronym (RAEE in Italian) indicates a special typology of waste. About 86% gave a wrong definition to the acronym, yet 43% in particular declared it is referred to metals.

20 students out of 21 have a computer and eight (38%) declare to possess more than one computing device in their household. All except one have cell phones, yet only 9,5% were ware that their devices contains a proportion of several elements available on the planet.

Half of the participants currently stock WEEE in their households, while 29% declare having donated their obsolete devices to be reused by others. Only 2 students admit having disposed of their Waste Electronics throwing them in a regular trash bin. None of the students was aware of the free Municipal door-to-door WEEE collection service and 3 declare having lost their old device.

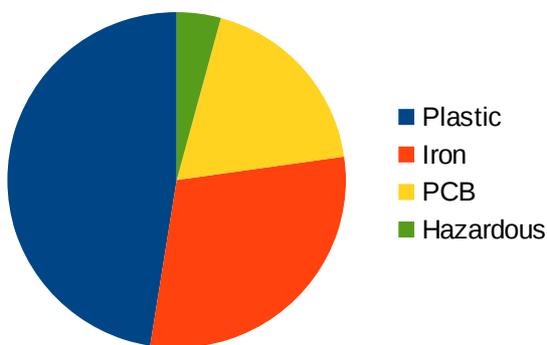
The final survey questionnaire shows that 95% of the participants highly appreciated the workshop and would suggest it to others and the majority (80%) of the students declared having learned something new. ¾ of the class had





fun dismantling the Waste Electronics and discovering the variety of materials inside. In addition also the theory was highly appreciated for the holistic approach and for the references to global economy and geopolitics which was positively evaluated by 45% of the sample who felt like the workshop brought them to have a broader perspective on global issues concerning raw materials and their role in the design industry and our day-to-day lives.

Cross referencing the survey results it turned out that the majority of students mainly use their technology for entertainment purposes, apps and games, others use it as their personal phone book. Only 1/6 of the sample recognized that technologies are composed by a vast quantity of chemical elements, metals in particular.



2 – Disassembly

Students were provided with masks and protective ware and common hand tools such as screw drivers, pliers and hammers, to conduct the dismantling operations. The teacher supplied various obsolete devices and the students were the asked to dismantle and separate the materials as quickly as possible and separate the different materials the best they could.

Comments forwarded by the students regarding their experience in the disassembly operations mainly addressed the number and different types of screws found, click joints, use of glues, grease and ink and the quantity and variety of different materials found. A total of 6735g of WEEE were disassembled and the mining yield featured 3,2Kg of plastics, 1250g of Printed Circuit Boards (PCB), 2Kg of ferromagnetic steel and 285g of hazardous waste such as batteries, toner and LCDs.

3 – Design

During the last meeting the students were asked to re-elaborate the information acquired during the first two sessions. The main objective for the students of the design course was to create designs on three different topics:

a) Green Design – Design for Disassembly

The task was to conceive a new product design aiming at resolving the problems observed during the disassembly phase and highlighting the issues regarding responsible use of raw materials and precious metals in particular. Two students wrote a poem entitled “New Design” (Attachment 1) framed by drawings symbolizing the circular economy of metals in particular.

b) Networking and communication – Consumer Awareness

The idea was create a design to raise awareness among consumers for a responsible use of raw materials. Two students produced drawings representing the concept of Urban Mining with the sentence “*Precious treasures are closer than you expect*” (Attachment 2 and 3).

c) Recycling/Reuse

The majority of students chose to address this topic and they produced some prototypes using the materials obtained from dismantling WEEE and giving new life to waste. Objects designed were: a photo frame, a coin purse, a hot pad and a lamp (Attachment 4 and 5).



Conclusions

19 out of 20 students really appreciated the workshop and 17 would suggest it to others. 80% thought they learned something new while 95% found the workshop's subjects interesting and would place them at 7,85 on a scale 1-10. Also the way the lessons were exposed and the preparation of the activities were highly appreciated averaging 8,7 on a 1-10 scale.

9 participants preferred the theory involving basic information on metals, precious metals, mining and technology furthering into concepts regarding conflict minerals and sustainable and responsible use of raw materials.

15 participants (75%) really enjoyed the dismantling activity and learning how electric and electronic is made on the inside, all were stunned by the amounts and variety of materials employed. Many observed how complex and hard to separate certain materials and objects are compared to others. In addition 6 students enjoyed learning about the stop-motion animation video techniques.

Finally the students were asked what was their take home message from this experience . 50% felt more responsible for their recycling habits and the importance of dividing their household waste. One student was fascinated by the Green Design concept, while 4 students understood the importance of using responsibly the raw materials available on the planet and the wide spectrum implications of day to day consumer behaviors.

