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Making Insulation Sexy

This activity may be used as 2 stand-alone activities or as linked activities split across different subjects or different lessons.

a. 'Design-an-ad' campaign to promote the widespread adoption of extensive home insulation programmes. Any media may be selected, but young people should think about the respective reach and audience of their chosen media to maximise the effectiveness of the campaign.

Summary

In striving for sustainable living approaches that are based around 'sound science' I refer to a question myself and a group of young people were posed by Ms. Penney Poyzer at an event I attended run by Norfolk's Environment and Outdoor Learning team. Ms. Poyzer is described as a "self-styled queen of green" after a rise to celebrity status on the back of several successful TV shows in the UK which show her adapting to a sustainable lifestyle in a typical urban setting in the UK. The question she posed was this, "How can we make insulation sexy?"

Why, I hear you ask, would we bother? Well, we can adopt all the renewable technologies we like to generate our electricity but if most of the heat we generate in our homes is escaping through roofs, walls and windows, are we really making that much difference? And if we haven't switched to renewable sources of energy, what are we doing other than wasting the precious reserves of fossil fuels that remain. Interestingly President Obama used the same phrase in a CBS interview in December 2009, (<http://www.youtube.com/watch?v=y6S0dYkIN20>)

So one of the first actions we should all be thinking about is how to make our homes better insulated. As well the environmental benefits there are obvious money-savings to be made too, which can make an attractive hook to the wider public.

Procedure

These facts need to be moulded into a visual story that young people think would be eye-catching and habit changing. They need to consider their target audience (who in their household makes the decisions to make their home better insulated), which

advertising media reaches the most people in their target audience (newspapers, billboards, radio, TV, internet), and what would make an engaging storyline.

This activity clearly goes beyond science (covering performing arts, English, visual arts and media-studies) but a sound understanding of 'what makes a good insulator' would enrich the activity and provide a context.

b. Practical activities to investigate the most effective insulators

Summary

This activity allows a variety of scientific investigations to be carried out into the most suitable materials to use for home insulation, how these materials work and what are the best methods we can use to compare their effectiveness. The experiments can take on a real-life situation, related to climate change and maybe more significantly to the impact on people's pockets - their income.

Conventional insulation materials are made from petrochemicals and include fibreglass, mineral wool, polystyrene, polyurethane foam, and multi-foils. Natural insulation materials include flax, hemp, sheep's wool and cellulose (recycled from newsprint), and all are available commercially (eg. Thermafleece). Currently these natural materials are much more expensive than conventional materials but with increasing demand for natural materials, the cost differential is likely to decrease considerably.

Materials needed

100 ml beaker of hot¹ water

Thermometer or Data-logger with temperature probe or infrared heat sensor

Shoe box

Insulation materials needed: students may suggest everyday materials² to try

- Cardboard
- Newspaper
- Bubble Wrap
- Polystyrene
- Sheep's Wool
- Cellulose Pellets

¹ for health & safety reasons this should be 'hand-hot' tap water only, and not boiling water

² The young people may have their own ideas about what materials to trial and this exploration should be encouraged particularly if they can apply the reduce, reuse, recycle hierarchy and offer some scientific explanation as to why they think their material of choice would make a good roof insulator.

The beaker can be either glass or plastic, but if the whole class are comparing different insulation materials the beakers all need to be of the same material. Alternatively, an investigation can be carried out to see if there is a difference in their respective abilities to retain heat without insulation?

Procedure

The experiment will monitor the drop in temperature of the hot water inside the beaker and the increase in temperature outside the beaker as a result of heat radiation. The beaker should be placed inside a shoe box which will then allow students to insulate it with the different materials. The insulation material should be placed around and on top of the beaker. The idea is to mimick a house or more simply a hot-water tank in the home.

In mimicking a house, the box could have 'doors' and 'windows' added and thereby provide areas for greater heat loss.

The temperature of the water inside the beaker and of the air immediately surrounding the beaker should be measured every 5 minutes for a period of 20 - 30 minutes. Talk with the students about problems of heat generated in the home 'escaping' into the loft and discuss ways of reducing this heat loss.

Half of the class should continue to monitor the temperatures inside/outside the beaker in the absence of insulation (control group), while other groups should introduce a variety of insulation materials to see their effects on the inside and outside temperatures.

Pose the question 'Were any of the insulation materials effective at preventing heat loss? How did you know this?'

Talk about the problems of making the comparisons fair - ideally the same thickness of each material should be used, although this is difficult to achieve in practice (not least because different products are manufactured in different thicknesses).

Extension Activities

This very simplified investigation can be made more real by 'converting' a small dolls house (that may be purchased second-hand from online auction sites such as Ebay). This makes it considerably easier to create a loft space, and look at the effects of windows and doors!

Working in other subjects such as Design & Technology, some students may wish to design and build their own house for the investigations. In our kit developed for this purpose we converted a simple and cheap dolls house (purchased for £8 / 10 €) by fitting a small convection heater, under the control of a thermostat. The heater was fixed to the base of the doll's house and covered with protective mesh. An upper support allows the insulation materials to be placed at the base of the roof, leaving a loft space for temperature monitoring. The doors of the house can be draught-proofed (eg. using micropore tape), and the windows fitted with curtains (eg. pieces of fabric).

TSN's converted doll's house for insulation investigations:



From learning to action

Young people should now have an understanding of the need and benefits of insulation. Their ad-campaign should be promoted widely around the school to raise awareness around the whole school, along with the outcomes of their insulation investigation.

Your young people should be encouraged to look around their school for examples of heat escaping from the building and try to bring about change. For example, questioning why windows are open and yet the heating remains on.

They are now better equipped to discuss with their parents/guardians about the extent of insulation in their own homes. Is their roof space insulated, what material was used, could it be improved?

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