

Heat Loss and Efficiency in the Stoddard Complex

Paul Shingleton (CS), Blayne Merchant (ME), Kinsey McNamara (ME), Kevin Pawlak (ME)
 Advisors: Prof. Geoff Pfeifer (HUA), Brian Savilonis (ME)

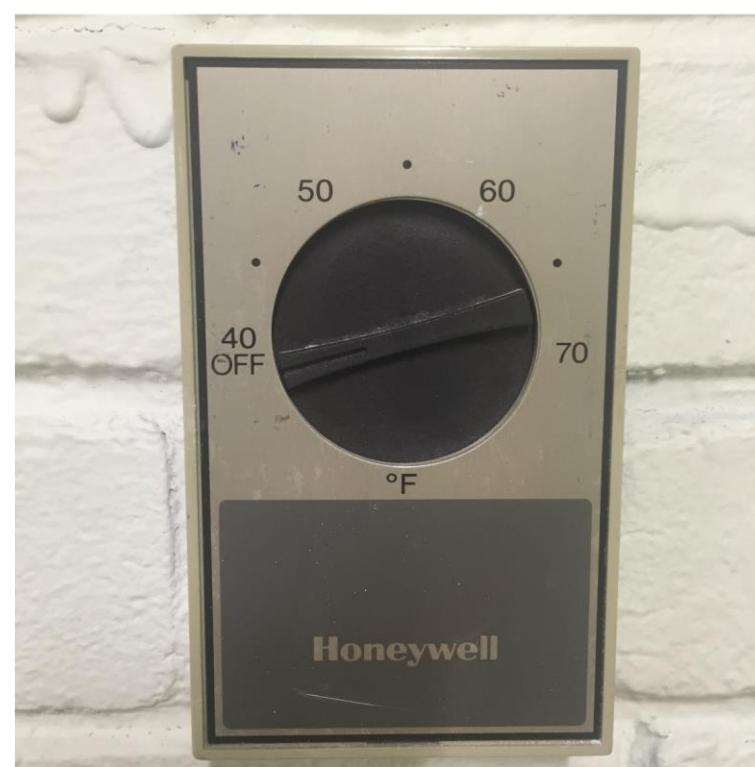


Abstract

There is an excessive amount of heat wasted in the Stoddard complex at WPI due to inefficient and outdated heating systems combined with wasteful behaviors from its residents. The current heating systems in place are outdated, yet to replace the system would be overly expensive and the savings would not be sufficient enough to justify the update (B.Grudzinski, 2016). Our group's goal is to promote the conservation of heat in Stoddard and update the heating system controls so that less heat is wasted.

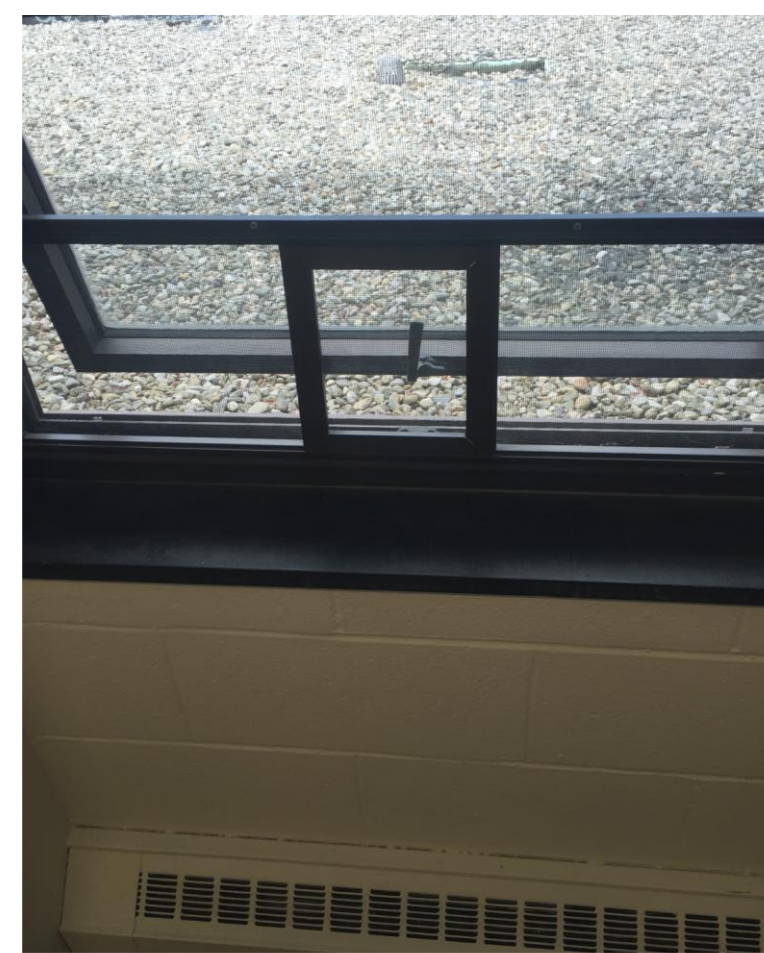
Mechanically, the goal is to implement the Automated Logic System. According to Bill Grudzinski, Chief Engineer of Heating Systems, the Automated Logic System would help control the range of temperatures and allow the facilities department to monitor heat being used by each room. Behaviorally, we plan to educate students on saving heat through NSO programs, posters on campus, and residential services involvement. The mechanical improvements in conjunction with the behavioral changes would greatly reduce the amount of heat lost in Stoddard.

Background



Line Voltage Thermostats used are inconsistent and outdated

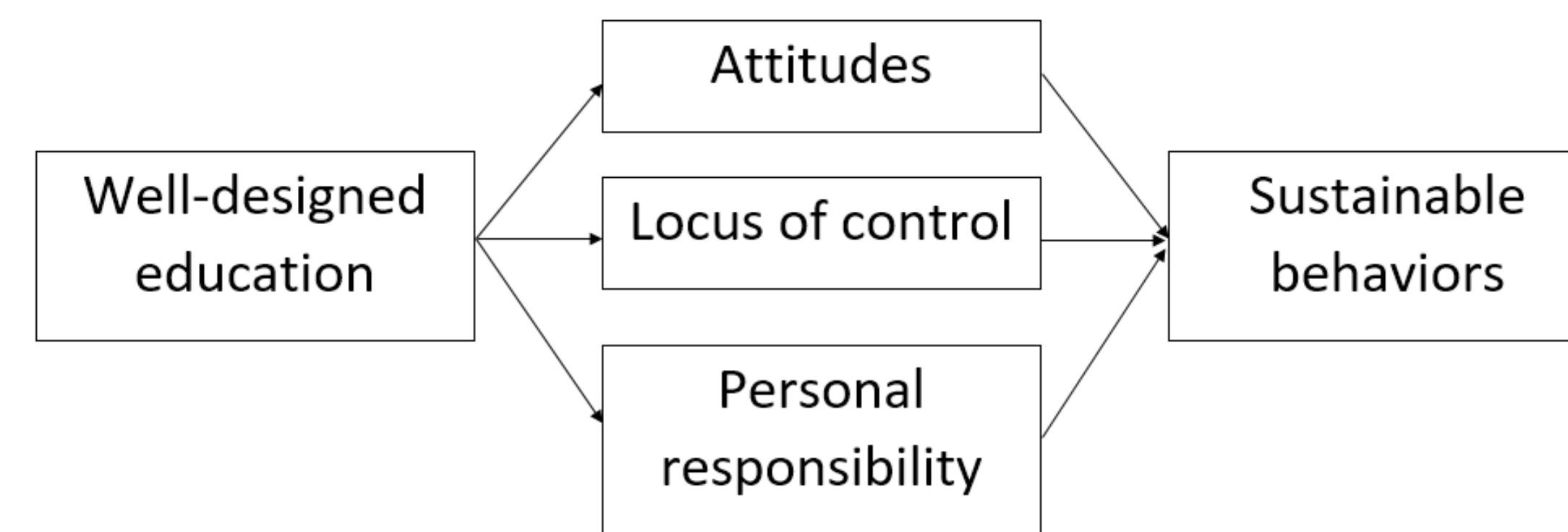
Structure consists of cinder-block walls, bricks, and concrete, with single pane windows



Students have the mentality that the heat waste is not their problem because they don't pay for it.

Methods

Encouraging Sustainable Behavior (SB)



Automated Logic System

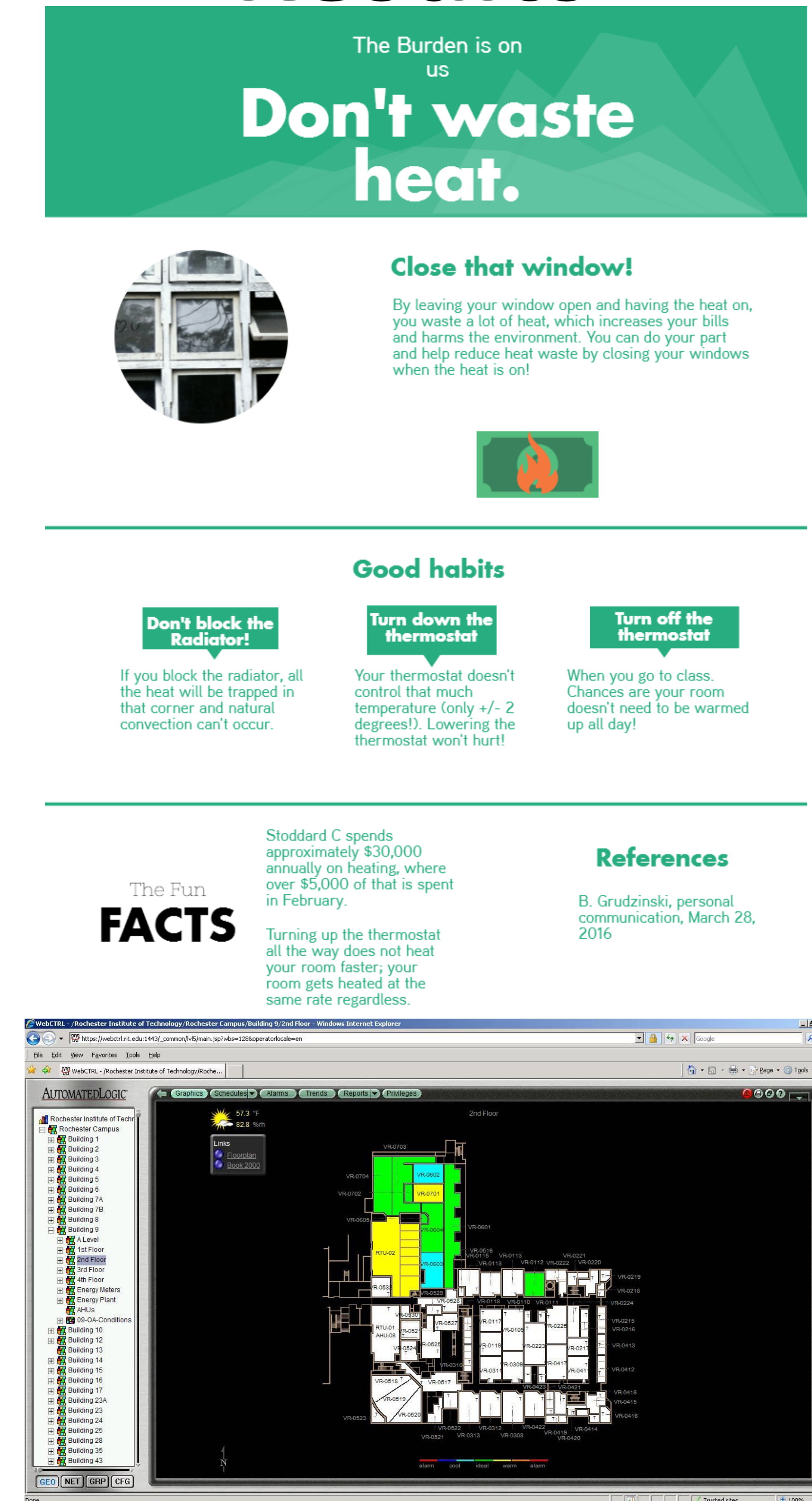
- Upon surveying the students and taking temperatures in multiple rooms, we found that the heat is inconsistent and the thermostat does not set to a specific temperature
- After reviewing the heating control systems we concluded that the Automated Logic System would best fit the situation
- Connecting the baseboard of the Stoddard Heating System to the Automated Logic System will allow the heat to be controlled by the Facilities Department.
- Allowing the Facilities Department to control the heat to minimize the heat that is wasted by the current system.

Cost Analysis

	Cost Per Year (\$)	Cost of Just Feb (\$)
2015	30713	5418
2014	30832	5368
2013	31140	5487
2012	29493	3877

- The table above outlines the cost of Stoddard B's electricity usage for the past four years.
- A pilot program of 6 sample rooms using ALS will give an estimate for how much less it would cost to heat the buildings using the ALS system.

Results



Don't waste heat.
 The Burden is on us

Close that window!
 By leaving your window open and having the heat on, you waste a lot of heat, which increases your bills and harms the environment. You can do your part and help reduce heat waste by closing your windows when the heat is on!


Don't block the Radiator!
 If you block the radiator, all the heat will be trapped in that corner and natural convection can't occur.

Turn down the thermostat!
 Your thermostat doesn't control that much temperature (only +/- 2 degrees!). Lowering the thermostat won't hurt!

Turn off the thermostat!
 When you go to class, chances are your room doesn't need to be warmed up all day!

References
 B. Grudzinski, personal communication, March 28, 2016

The Fun FACTS
 Stoddard C spends approximately \$30,000 annually on heating, where over \$5,000 of that is spent in February.
 Turning up the thermostat all the way does not heat your room faster; your room gets heated at the same rate regardless.



Acknowledgements

We would like to thank Ms.Rebecca Ziino for helping with our sources in the paper and citing sources. Also, Mr.William Grudzinski for giving the technical information of Stoddard and helping with our proposed solutions. Thank you to Professor O'Brien for helping guide our behavioral study and advising how to change human behavior. Also, Mr. Ryan Cooney for introducing us to the green team and pushing the idea to connect with Residential Services. Finally, Dean Wobbe for helping implement the idea to install a program into NSO.

References

U.S. Energy Information Administration - EIA - Independent Statistics and Analysis. (n.d.). Retrieved April 12, 2016, from <https://www.eia.gov/totalenergy/datas/annual/showtext.cfm?i=ptb0303>
 Corral Venegas, V. (2013). The positive psychology of sustainability. *Environment, Development and Sustainability*, 14(5), 453-466. doi:10.1007/s10668-012-9346-8
 Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. *Journal of Environmental Education*, 21(3), 8-21. doi:10.1080/00958964.1990.10753743
 B. Grudzinski, personal communication, March 28, 2016
 O'Brien, Med. PhD., personal communication, March 24, 2016
 Electric Resistance Heating. (n.d.). Retrieved April 14, 2016, from <http://energy.gov/energysaves/electric-resistance-heating>
 Fire background (2016) <http://bgwall.net/fire-background-wallpapers-and-backgrounds-16wall.html>
 [Turning down the heat]. <http://www.landmark8.edu/library/citation-guides/landmark-college-citation-guides/lapa-citation-style-guide/#images>
 Color-coded overview of CAST building climate [Digital Image]. (2010, April 18). Retrieved April 19, 2016, from <http://edge.nyu.edu/edge/R10008/public/Photo Gallery>