**Save A Life Build A Device! – Student Handout**

**Objectives:** Students will design a device that sustains health and homeostasis by facilitating the regulation of a physiologically important substance.

Working in a group of 4

How does your vitamin C level feel right now? What about your calcium? Can you feel these things right now?

We can feel thirst if our body feels water, we feel hunger (mostly) when our body needs more energy. We can directly experience our levels of some of the most pressing life requirements like food and water, but a healthy person needs so much more than this!

Our external environment is constantly changing but we need to keep a consistent internal environment, or homeostasis to maintain life and health. We can think of disease as a loss of the body’s ability to maintain homeostasis. All homeostatic mechanisms consist of three basic components: a receptor, a control center, and an effector. Disease and the loss of homeostasis can arise from the inability of one of these components to properly function. But what can we do to maintain our health when one of these homeostatic systems is broken if we can’t even sense that something is wrong!?

Medical innovation is developing solutions. If we cannot address a disorder with biology, we can address it with technology! In this project you will be filling the role of a biomedical researcher and develop the idea of a medical prosthesis that can allow us to better monitor an aspect of our physiological homeostasis!

One example of this would be diabetes. When the body has lost the ability to monitor and respond to circulating blood glucose levels an individual must use technology to measure and administer insulin made outside of the body. You will develop the concept of wearable device that would monitor and respond to a particular homeostatic requirement. Some examples might be:

* Hydration (water)
* Vitamins such as C, K, B12, Folic Acid, etc.
* Circulating Salt levels
* Stress hormones (such as cortisol)
* Etc.

For this project you will need to develop the following:

* **An illustration or model of the device.** Must include the following:
  + Show external casing/appearance.
  + How the device would be worn/implanted into the body.
  + Approximate size of the device in proportion to the body.
* **A schematic of the device.**
  + This should show how the device is built internally.
  + Power source (batteries, etc.)
  + Communication (Visual display, wireless transmission, etc.)
  + Sensor (receptor) location and description – Must find and identify an actual sensor that exist.
  + Outcome generator (effector)
* **A short description of the device.** Must include the following:
  + An explanation of how the device works.
  + What the device detects/monitors.
  + How the device can be adjusted/calibrated (how to control the control center)
  + How the device would cause an effect to maintain homeostasis (effector).

Note! The sensor used in your device must actually exist! You must identify a specific sensor that can detect the physiological aspect you are trying to measure.