



## Teacher/Viewing Guide

### Arab American Stories – Episode 105

Dr. Imad Mahawili

Co-Founder, WindTronics

**Grade Level** 9-12

#### **Episode Overview:**

In this episode we meet Imad Mahawili, co-founder of WindTronics. We learn how Imad first came to the United States from Iraq when he was chosen by the US Embassy to study in Petoskey, Michigan and later went on to earn a bachelor's degree in chemical engineering and then a Ph.D. In 1974, he was granted a visa to work in the United States, and accepted a job as a research chemical engineer. He was involved with several start-up companies over the next 16 years. He is both a researcher and an inventor and now holds 21 U.S. patents, with five more pending.

In December 2004, Imad Mahawili was vacationing with his family in Florida when an earthquake near Indonesia triggered a tsunami that killed more than 200,000 people. As he watched the devastation of homes and villages on television, he became determined to find a way to help the poor improve their living conditions by finding cheap energy alternatives for impoverished villages. At the time, Mahawili was working as a director of a green energy center. The tsunami became the catalyst to his efforts to build a small, inexpensive wind turbine that could provide electricity to rural communities. Three years later, he co-founded WindTronics to manufacture them. In this episode he not only shares his inspirational story and exuberant inventor's spirit, but also explains the physics behind his small wind turbines.

#### **Previewing Questions:**

1. What is "Green Energy"?
2. Why is finding alternative energy sources important?
3. How can one person's innovation lead to solving global problems?

#### **Vocabulary :**

1. Wind Power: The conversion of wind energy into a useful form of energy, such as using wind turbines to make electricity.
2. Wind Turbine: A device that converts kinetic energy from the wind, also called wind energy, into mechanical energy; a process known as wind power.
3. Kilowatt: A measure of 1,000 watts of electrical power.
4. Alternative Energy: Energy derived from sources that do not use up non-renewable natural resources or harm the environment.

**Lesson Overview/Review:** After viewing the segment about WindTronics, students should be prepared to discuss the concepts of alternative energy sources, and in particular wind power. Students should also think about how poverty and disaster can affect a population's access to traditional power sources.

**Post-viewing Class discussion:** After viewing the segment, consider the following questions:

1. In the segment, Dr. Imad Mahawili talks about how he was inspired to build small, affordable wind turbines by the devastation he saw during the 2004 tsunami. Have you ever been inspired to help in a crisis? What was the situation? What did you do? What are ways that individuals can help others in a crisis?
2. This segment deals with wind as an alternative energy source. What are traditional energy sources? Why is it important to find alternative energy sources?

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3. Have you ever seen a wind farm? How big are traditional wind turbines? Why might smaller wind turbines be a solution for small rural villages?
4. Some people argue that alternative energy sources are not a viable solution. What are those arguments? Is the argument against alternative solutions an example of short-term or long-term thinking?

**Journal option:** Have students take a moment to write a journal based on the following writing prompt: Finding alternative energy sources is important because:

**Activity:** In this episode students learned about new ideas regarding wind energy. They may have been surprised to see that not all wind power comes from large turbines. This activity will allow students to create a small-scale basic wind turbine to learn about the importance of creating blades with correct angles, degrees, pitch, materials, surface and shape in order to create a turbine that actually produces energy. Students will learn about the importance of wind as an alternative, sustainable energy source, as well as the science, math and technology behind the construction of wind turbines. There are detailed plans to complete the turbine and research at: [http://www1.eere.energy.gov/education/pdfs/wind\\_basicpvcwindturbine.pdf](http://www1.eere.energy.gov/education/pdfs/wind_basicpvcwindturbine.pdf). Students will:

- Understand the engineering design process (define the challenge, brainstorm and research solutions, choose a solution that fits within constraints, design and build a solution, test the solution, evaluate and redesign, if necessary.)
- Understand how wind power is harnessed to produce electrical power.
- Identify how windmills have changed as new technologies and materials have become available and describe the increasing viability of wind as an energy source.

**Explore online:** Use the following resources to allow your students to further explore the topic:

1. [http://www.windpoweringamerica.gov/schools\\_teaching\\_materials.asp](http://www.windpoweringamerica.gov/schools_teaching_materials.asp)
2. <http://www1.eere.energy.gov/education/lessonplans/default.aspx>
3. <http://www.efmr.org/edu/wind2009.pdf>
4. [http://www.businessweek.com/magazine/content/11\\_24/b4232046092420.htm](http://www.businessweek.com/magazine/content/11_24/b4232046092420.htm)
5. <http://www.popularmechanics.com/home/improvement/energy-efficient/4321836>
6. <http://hint.fm/wind/>

**Interdisciplinary Options** Math, Science, Technology, Environmental Science and Career Education

### Common Core Alignment

- National Science Education Standard 5b: Understand the principle of conservation as it applies to mass, charge, momentum, and energy.
- National Science Education Standard 6b: Understand the concepts and interrelationships of force (including gravity and friction), inertia, work, power, energy, and momentum.
- National Science Education Standard 6C. Understand the nature and properties of electricity and magnetism.