



Curriculum Units by Fellows of the National Initiative  
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## **Harnessing the Wind Like William Kamkwamba: Building Model Windmills in a 4th Grade STEM Lab**

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This unit aligns with 4th grade Next Generation Science Standards (NGSS) related to the topic of energy. Students will learn the science behind how a windmill can be used to generate electricity. It is inspired by the story of William Kamkwamba, a 15-year-old farmer from Malawi who built a windmill in his village to bring power and water during a time of famine. Kamkwamba's story rose to fame in 2006, when a local newspaper wrote about the boy who created a windmill to power his home and irrigate his family farm. His story is featured in a memoir, a 2019 Netflix drama, and the adapted (and 4th grade appropriate) version of his autobiography, titled "The Boy Who Harnessed the Wind."

This curriculum unit is the result of my work in the 2019 Yale National Initiative seminar titled Energy Sciences. This two-week intensive, teacher-led summer institute was led by Dr. Gary Brudvig, Yale Professor of Chemistry, Molecular Biophysics and Biochemistry and director of the Yale Energy Sciences Institute. I have 18 years of experience as an elementary teacher at the time of this writing, and I have been developing and teaching K-4 STEM curriculum in New Haven, CT for the past five years.

The background knowledge section provides a summary of energy and energy resources. Then, like Kamkwamba, students will construct a scale model wind turbine and use an electrical generator to provide power to a light and a buzzer. They will learn the science behind and the engineering skills related to each step of the process. In addition to student models, instructions are also provided for building a more substantial, 7-foot tall model that can be used as a classroom demonstration piece.

(Developed for STEM Lab - Energy Science, grade 4; recommended for Energy Science, grades 3-5)

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