

*The Balanced Equation curriculum module was developed by The Keystone Center for Education (CfE) in partnership with The Dow Chemical Company to introduce teachers and their students to Dow's emphasis on global sustainability through the use of chemistry infused with the concept of the Human Element and catalyzed by discovery and knowledge. The module provides a hands-on inquiry-based unit in which high school students can explore this emerging approach to solving global sustainability problems.*

*The curriculum's goal is to spark students' interest in chemistry in general, and in doing so, introduce them to the new way of approaching chemical processes emphasizing the human factors of ingenuity, discovery, and knowledge. The unit will also give students the critical thinking skills and tools to evaluate possible actions and multiple points of view as they grow into informed, knowledgeable adults.*





## The Keystone CfE high school curriculum philosophy

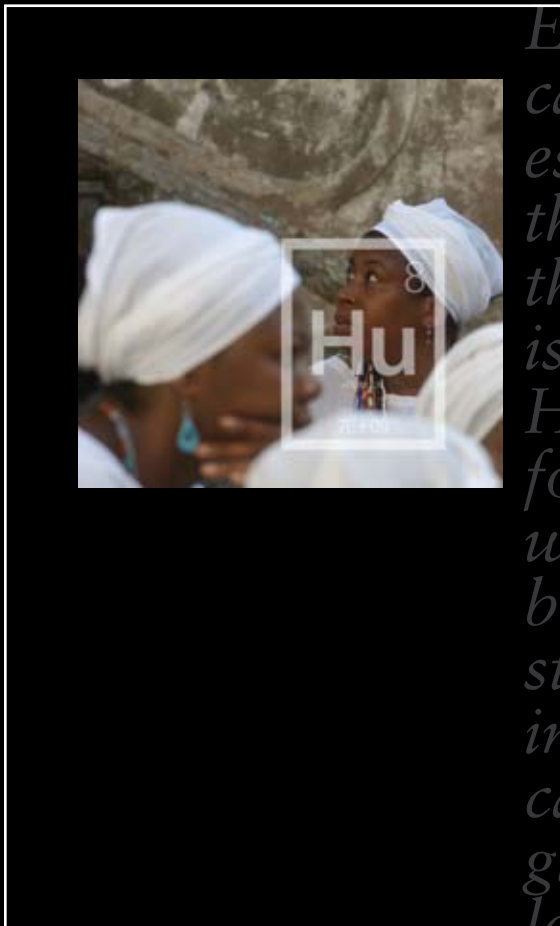
Through this curriculum module, students will come to a high school level understanding of the concepts of the human side of sustainable chemistry while immersed in a curriculum especially designed for inquiry. *The Balanced Equation* curriculum module is designed to capture the imagination for science in all students, especially those who have not yet been inspired by the wonders of science and do not necessarily think that science has relevance to their lives. This unit is designed to demystify chemistry by revealing its human side. It emphasizes the belief that in order for chemistry to provide sustainable solutions within our global society, the Human Element must be factored in. This Human Element shows all students how the world of chemistry, and science in general, relates to their world, and how they can become an active part of the solutions to the global problems that surround all of us.

The challenge in writing this curriculum is the span of content between an entry-level general science class and an AP chemistry group. The Keystone CfE believes that you as the teacher are the expert in what will work in your classroom. It is important that you take these lessons and modify them in a way that best suits your teaching style and learning community.

The Keystone CfE believes in true inquiry-based learning. This approach may feel uncomfortable at first to teachers and students. As teachers of science, we are used to having the answers and are proud of the scientific information we possess through years of training and education. However, in this unit you will be asked to open scientific inquiry to questions that may often be unanswerable for you and your students. This module will challenge you to use innovative techniques that encourage open-ended content instruction where the value of questions outweighs answers and hands-on inquiry leads students to innovative thinking.

Through The Keystone CfE non-biased pedagogy, scientific creativity will be celebrated and systems thinking in students will be reinforced. Within the unit, there are a number of non-lab based activities which are designed to help students make connections between science and society and to encourage teachers to break out of the mold of segregated content area teaching.

In designing curriculum, The Keystone CfE aligns all of its activities to National Standards. The intent of this module is not to make it another “add-on” to what is an already overburdening load of required materials that high school teachers must cover. Rather, *The Balanced Equation* is designed to allow teachers to cover the Standards required by their state or district in an innovative, relevant, and global context all within the theme of science and sustainability.



## Curriculum Organization

**The Balanced Equation** is composed of lesson plans that make up a three-week unit. Each lesson plan is divided into parts to make it easier for the teacher to navigate the information. We have included the following sections in each lesson plan – Background, Goals, Objectives, Materials (for class of 30), Time Required, Standards Met (National High School Standards), Procedures, Assessments, and Student Sheets and Teacher Answer Keys.

**The Balanced Equation** module is organized around a simulation. In order for your students to fully understand the concepts presented within this unit, it is strongly suggested that you follow the lesson plans in the order that they are presented on the Flow Chart. If time limitations prevent completion of the entire 15-day unit, several other options for implementation are provided below.

**Option 1** – Students do Opinion Activity, Defining Sustainability, Triangle Triage, Introduction to Simulation/Role Play, and The Sustainability Corps

Time Frame – five to six days

Advantages – Introduces students to the basis behind the unit and gives them an understanding of the concept of sustainability and the decision grid. The teacher can demonstrate possible action taking options for discussion.

Disadvantages – No labs for the students are involved in this option. Students are not allowed to examine the possible action taking strategies through experimentation, and they are not responsible to reach a sustainable solution or make a presentation.

**Option 2** – Students do Opinion Activity, Defining Sustainability, Triangle Triage, Introduction to Simulation/Role Play, The Sustainability Corps, and The Human Element

Time Frame – six to eight days

Advantages – Introduces students to the basis behind the unit and gives them an understanding of the concept of sustainability and the decision grid. The teacher can demonstrate possible action taking options for discussion. Students are allowed to be creative through designing their own water filtering system.

Disadvantages – Only one lab is involved in this option. Students are not allowed to examine the possible action taking strategies through experimentation, and they are not responsible to reach a sustainable solution and make a presentation.

**Option 3** – Students do Opinion Activity, Defining Sustainability, Triangle Triage, Introduction to Simulation/Role Play, The Sustainability Corps, The Human Element, and Examining Action Taking Strategies Day 1

Time Frame – eight to ten days

Advantages – Introduces students to the basis behind the unit and gives them an understanding of the concept of sustainability and the decision grid. The teacher can demonstrate possible action taking options for discussion and allow students one to two days to experiment with the strategies on their own. Students are allowed to be creative through designing their own water filtering system.

Disadvantages – Students are not allowed to examine all of the possible action taking strategies through experimentation, and they are not responsible to reach a sustainable solution or make a presentation.

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