

IMSA Fusion

IMSA Fusion is a teacher professional development and student STEM enrichment program for Illinois students who are talented, interested and motivated in mathematics and science. IMSA Fusion places a special emphasis on students who are historically underrepresented in those areas. Fusion works with teachers and students in grades 4-8.

In brief, the program goals are:

- Maintain or increase students interest, involvement and literacy in science and mathematics
- Enhance the knowledge and skills of teachers in science, mathematics, and technology; stimulate excellence in schools
- Stimulate excellence in schools' science and mathematics programs
- Help increase access to programming for students who are historically under-resourced in science, mathematics and technology and for all areas of the state

By design, the IMSA Fusion curriculum is inquiry based, problem centered and integrative. The learning experiences focus on helping students “learn how to learn” and emphasize logic, mathematical thinking and experimental scientific thinking. Topics relate to the students' lives, thereby arousing their curiosity and increasing their motivation to learn.. Teachers from each participating school are supported with on-going professional development for the delivery of the curriculum and use of appropriate pedagogy.

You be the Judge

Designed for Grades 4-5

You Be the Judge introduces students to some basic principles involved in chemistry, the application of chemistry as well as process skills required to create and carry out meaningful investigations. After students have experienced the concepts in a lab setting, they will have a chance to apply their knowledge and lab skills in a variety of simulations throughout the unit. Students will take the role of experts and identify problems, develop methods of testing, and conduct the tests. After gathering, analyzing, and interpreting results, students will make and share evidence based decisions in a variety of settings.

You Be the Judge

Unit Summaries

Density

Students begin by focusing on the physical property of density. They have the opportunity to work firsthand with two models that demonstrate the relationship between how tightly packed molecules are and the space left between them. They then move to calculating the density of a variety of regularly shaped objects.

Identity Crisis

The scope of physical properties is broadened. After examining a specific set of known materials, students encounter their first challenge. Through a simulation teams of students apply their knowledge to develop and carry out a testing plan, identify, and report their findings about a set of unknown materials

You Be the Judge

Unit Summaries

Changes

Changes introduces students to polymers. Through the exploration of polymers, the concepts of physical and chemical changes will be pursued. The production of slime and the examination of super absorbing polymers will provide needed background for the next challenge. The SBG Company has hired the FUSION students to determine which diaper is the best.

Thirsty?

Polyacrylamide is the super absorbent cross-linked polymer that students are first introduced to in **Thirsty**. After examining this ingredient in Soil Moist®, students then launch into answering the question of which disposable diaper is best. Three brands of disposable diapers are compared using student developed procedures. After developing procedures, carrying out testing, collecting and analyzing data, student groups share their findings and interpretations of data with the rest of the class.

You Be the Judge

Unit Summaries

Acid, Base, Neutral?

Characteristics associated with these topics are explored in this lesson. Students learn various methods of testing substances to determine their pH, including litmus paper, pH paper, and universal indicator.

Help!

Teams of students have the opportunity to observe and test known substances for their physical properties and chemical reactions. They then move to the simulation, Accident at the Bridge, which engages teams in attempting to determine the contents of a spill on a highway.

You Be the Judge

Unit Summaries

Nutrient Management

Crops don't appear out of thin air, or do they? In the unit *Nutrient Management*, students will critically examine the first recorded experiment in biology and learn about the sources of a growing plant's mass. Next they will examine pictures of crops which are experiencing nutrient deficiencies. After diagnosing the deficiencies, students will select the appropriate fertilizers to apply on their fields. Applying fertilizer is one thing, but keeping it in the soil is another challenge. Students will select an actual Illinois farm field and design for it a nutrient retention system.

Soil Science

The United States is one of the most productive agricultural countries in the world. However, according to the book *Know Soil, Know Life*, only about 18% of total land is available for producing crops. As the human population continues to grow, soils used to grow annual crops will be pressed to produce more food per acre. **Soil Science** introduces students to the importance of soil in agriculture. Through activities in this unit, students will assume the role of soil scientists and will analyze soil samples to determine the soil's texture. They will then debate which characteristics of the inorganic components of soil are best suited to growing crops. Furthermore, students will perform chemical tests on a soil sample to analyze the pH, nitrogen, phosphorus, and potassium levels in soil to determine its suitability for producing various crops such as corn, soybeans, wheat, and oats.

You Be the Judge

Unit Summaries

Amber Waves of Grain

By carefully observing images of traditional harvesting techniques, students will learn about the three basic phases of harvesting cereal crops in *Amber Waves of Grain*. Then students will design and build small machines capable of reaping, threshing, and winnowing. Next, students will explore the inner workings of modern combine harvesters. Finally, students will analyze data which highlight the dramatic effect of 200 years of agricultural mechanization.

So High, Silo

Following harvest, a farmer must store their grain. Depending on the intended use of the crop, time of year, and supply, a farmer may transfer the crop into a grain silo or grain bin. These large structures, typically cylindrical and made of cement staves and steel panels, house grain at an appropriate moisture level for a designated period of time until needed for feed or market distribution. In the unit *So High, Silo*, students will be presented with an engineering design challenge to develop a storage container that holds a grain sample. Students will exercise their knowledge of volumetric measurement and properties of three dimensional figures to construct their container, and then evaluate their design for efficiency and optimization level.

You Be the Judge

Culminating Activity

Oh My Aching Stomach!

Oh My Aching Stomach is the culminating activity for You Be the Judge. After being introduced to the large economic industry of antacids, student teams design a method of testing and assessing the efficiency of over the counter antacids. After conducting testing, research teams make their recommendations to a panel based on their findings.