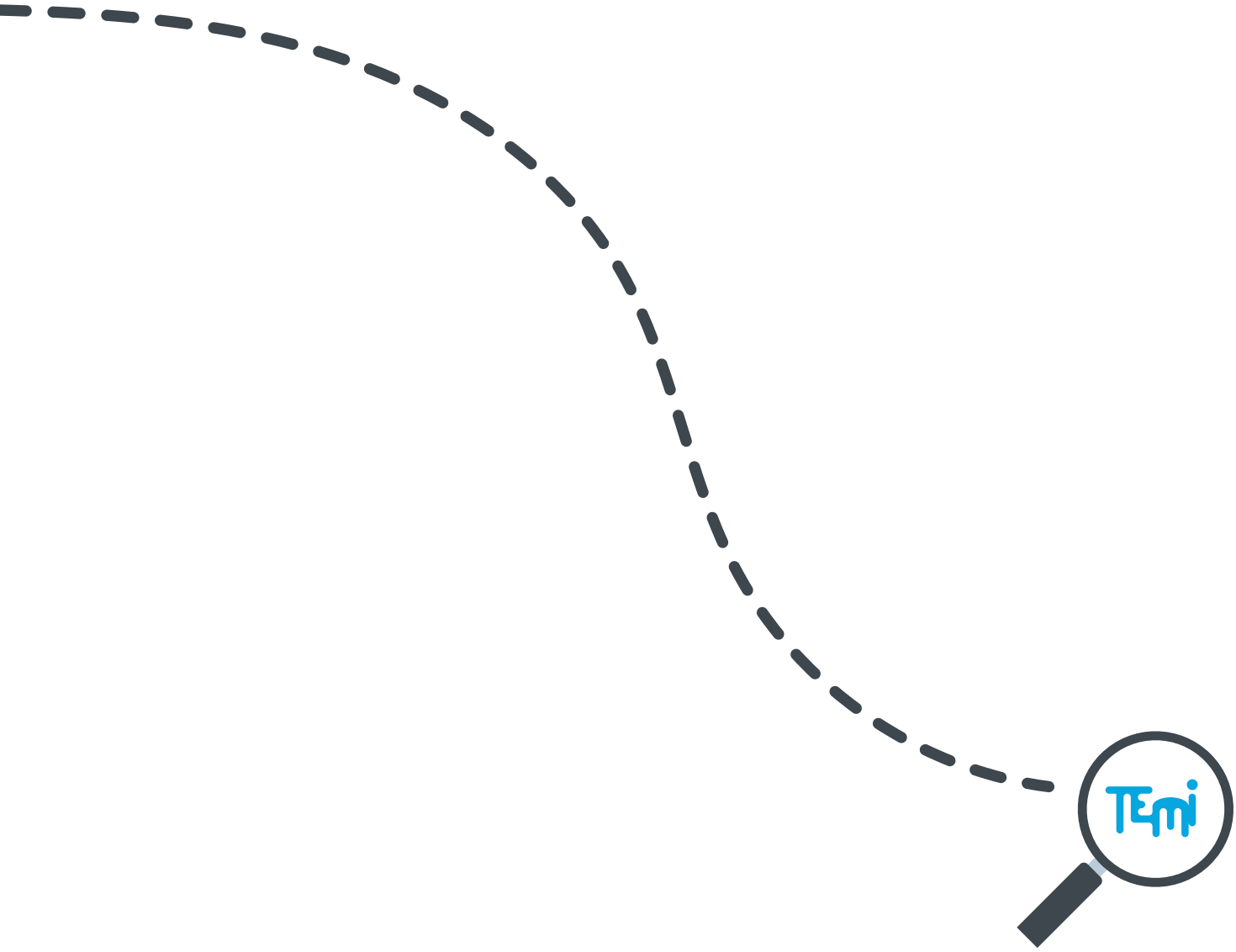
The Mentos-Cola fountain

CLASSROOM SCIENCE ACTIVITY TO
SUPPORT STUDENT ENQUIRY-BASED LEARNING



This classroom-tested teaching plan uses the four innovations of the TEMI project, as detailed in the Teaching the TEMI Way (TEMI, 2015).

You should read this companion book to get the most from your teaching. The **TEMI** techniques used in this teaching plan are: **1)** productive science mysteries, **2)** the **5E model** for engaged learning, **3)** the use of presentation skills to engage your students, and **4)** the apprenticeship model for learning through gradual release of responsibility. You might also wish to use the hypothesiser lifeline sheet (available on the **TEMI** website) to help your students document their ideas and discoveries as they work.

To know more about **TEMI** and find more resources **www.teachingmysteries.eu**

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teachingmysteries.eu

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The Mentos-Cola fountain

What's the mystery?

The Internet provides a large number of videos about the Mentos-Cola fountain. There are also several media available that present the phenomenon as a challenging show event. The challenge is to produce as high a fountain as possible. To do this, students need to enquire into the reasons and functioning behind the Mentos-Cola fountain trick.

DOMAIN(S)

Chemistry.

SUBDOMAIN KEYWORDS

Solubility, gases, carbon dioxide, fizzy drinks.

AGE GROUP

13 to **16** years old.

EXPECTED TIME FOR THE MYSTERY

Approximate time for teacher preparation: do not mention it.

Approximate time in classroom: **90 min. lesson.**

SAFETY/SUPERVISION

No hazards.

Disclaimer: the authors of this teaching material will not be held responsible for any injury or damage to persons or properties that might occur in its use.

PREPARATION AND LIST OF MATERIALS

- Beakers
- Soft drinks (apple juice, cola, diet cola (cola light), orange lemonade, sparkling water)
- Sweets (Mentos, fruit gum drops, sugar-free Mentos, sugar cubes)
- Spoons.

LEARNING OBJECTIVES

Students will learn about the solubility of gases.

Guidance notes for teachers

THE 5E MODEL

Engage

CAPTURE STUDENTS' ATTENTION

The teacher can present any video of the Mentos-Cola fountain from the Internet. The students might need to create a fountain by themselves. The students might do this experiment themselves outside of the classroom. The students will see that, normally, the fountain is not as high as in most Internet videos. This will provoke questions and engage the students. Potential questions might include: how does the fountain work? Which factors influence the size of the fountain? Does the experiment also work with other sweets or drinks?

Explore

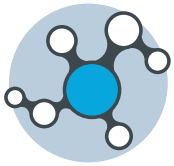
COLLECT DATA FROM EXPERIMENTS

The students can perform different experiments to find out how the fountain works. They should explore the experiment by varying the sweets, drinks, and other conditions. By comparing the different sweets and drinks, the students can exclude irrelevant variables. The causes for the fountain are the solved carbon dioxide as well as the rough surface of the Mentos sweets.

Explain

WHAT'S THE SCIENCE BEHIND THE MYSTERY?

It is the surface of the Mentos that causes the fountain. The rough surface structure leads to the very fast elusion of the dissolved carbon dioxide from the cola. Rough surfaces allow dissolved gases to elude much faster than they normally do. This process is so fast that the eluding gas carries large amounts of cola out of the bottle.



Extend

WHAT OTHER RELATED AREAS CAN BE EXPLORED?

After the students have worked intensively with the Mentos-Cola fountain, they will wonder what actually happens when you place cola and Mentos into the mouth at the same time. Here, various entries on Internet forums can be found which discuss such issues. The different contributions can be analysed, commented upon, and evaluated.

Evaluate

CHECK THE LEVEL OF STUDENT SCIENTIFIC UNDERSTANDING

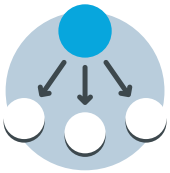
After the mystery has been solved, the students will want to carry out the experiment. Here, you can test the contents explored in the task to maximise the fountain. Thus, the task is a little more exciting, since you can make this a competition. A competition that focuses on the height of the fountains can be held outdoors.

THE 5E MODEL

Showmanship

TIPS ON HOW TO TEACH AND PRESENT THIS MYSTERY

A number of videos about the Mentos-Cola fountain can be found on the Internet. Thus, the most amazing videos of the phenomenon can be presented and the potential sizes of the fountains can be evaluated. A fountain can also be demonstrated by the teacher outdoors. Generally, the results will not be nearly as high as in the Internet videos. This observation regularly results in many questions; e.g., how the size of the fountain can be manipulated or how it works at all.



GRR

TEACHING SKILLS USING GRADUAL RELEASE OF RESPONSIBILITY

The mystery is presented as a guided enquiry (level 2). Generally, many students know about the phenomenon already. However, most students do not know why the fountain occurs. Learners should therefore make first guesses and formulate questions to find ideas to explore. Students can develop a lot of ideas about the phenomenon.

Solving the mystery: the students will consider that the fact that dissolved carbon dioxide plays a role. The different sweets make clear that a certain surface is required. Students will realise that the surfaces of the Mentos are responsible for the fountain.

Resources

There are a number of YouTube videos showing the extent of Mentos-Cola fountains. You can watch them on the TEMI Youtube Channel:
www.goo.gl/tUDaq5

playlist > Diet Coke + Mentos

playlist > Mentos küsst Cola Weltrekord mit EepyBird

The Mentos-Cola fountain

STUDENT WORKSHEET

On the Internet, there are many different videos presenting the Mentos-Cola fountain. The fountains generally reach heights that are difficult to achieve. The fountains are so high that world records are achieved; equally, artistic shows have been performed with cola-Mentos fountains. Solve the mystery and develop ideas about how to break the world record.

Engage

WHAT'S INTERESTING?

Task: Take a Mentos, a fruit sweet, and a fruit gum. Place each in a small beaker with cola. Compare the effects and describe the differences. Write down the questions that arise from your observations.

Explore

WHAT'S HAPPENING?

Task 1: Suggest ideas to solve the mystery of the Mentos-Cola fountain.

Task 2: Explore the behaviour of Mentos in small beakers with various drinks. You may use the following drinks: plain water, apple juice, cola, cola light, orange lemonade, sparkling water, tea, etc.

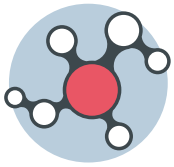
Task 3: Explore the behaviour of different sweets in cola. You may use the following sweets: full-sugar sweets, chewing gum, Mentos, sugar-free sweets, sour fruit sweets, chocolate, etc.

Explain

WHAT'S CAUSING IT?

Task 1: Explain which properties of Mentos and cola are responsible for the emergence of the fountain.

Task 2: Explain what is happening during the formation of the Mentos-Cola fountain.



Extend

WHAT'S SIMILAR?

Task: "Does one explode if one eats Mentos, drinks cola, and is shaking the body heavily?"

On an Internet forum, a user asked the question above and wanted to get an answer. It is probable that he or she does not really believe the body will explode because of the reaction. However, it seems as if he or she is uncertain; after all, a cola bottle can be exploded with a Mentos.

Discuss the question with regards to the physical and physiological aspects of the issue and suggest an answer.

Evaluate

WHAT'S MY UNDERSTANDING?

Task: As can be seen in many videos on the Internet, it is the goal of some people to generate a Mentos-Cola fountain that is as high as possible.

Suggest potential factors that will influence the size of the Mentos-Cola fountain. Describe further experiments to potentially check whether your suggestions would be helpful in producing the highest fountain ever.