STE(A)M IT STORIES OF IMPLEMENTATION

Title of your Story

Energy resources in the household

Name of the Author(s)

Barbara Mandušić , Nikolina Bubica , Milana Gujinović

The Learning Scenario Implemented

Add below the link to the learning scenario you implemented in your class. The link must directly point to the resources on Scientix Repository and STE(A)M IT Website.

http://steamit.eun.org/energy-resources-in-the-household/

http://www.scientix.eu/resources/details?resourceId=28400

The Implementation Context

*Briefly describe the context of your implementation, specifying what subject(s) you chose to implement the learning scenario in, how those subjects relate to STEM careers, what was the students' age(s), the size of the group, previous familiarity with real life scenarios, what real-life questions did you choose to address, etc. We aim to gather stories of **classroom implementation**, so the context must appropriately reflect this. (maximum 300 words).*

The learning scenario on the topic "Energy sources in the household" was implemented in the context of the subjects of Chemistry, Physics, Mathematics and Informatics. The scenario was conducted with students aged 13 to 14 years. The classroom in which the learning scenario was implemented has 19 students. During the introductory class and the Chemistry class, the focus was on the following life questions: "What are energy sources?", "How much does energy cost?" and "How can we reduce electricity consumption?"

The students' answers were interesting. Some simple solutions were like turning off the lights in rooms where we do not stay, while some solutions were more complex like the use of solar energy through solar panels in households. Some students remembered that their parents often used their washing machine during the night. It was the beginning of the conversation how much electricity cost and why is electricity cheaper in night period. Using the bills of their household, students made comparison how much electricity is consumed at a lower tariff, and how much at a higher one.

Also, non-renewable energy sources (i.e., fossil fuels) and renewable energy sources were taught during the Chemistry class. During the Physics class, the emphasis was on renewable energy sources, i.e., solar energy. After watching the video, the students explained the

conversion of thermal energy into electricity. Students learned that a photovoltaic panel is used to generate electricity, while a heat collector is used to generate hot water. Also, students listed the advantages and disadvantages of using a solar system. Some examples of benefits are: "Once the equipment is purchased, the use of solar energy is free," "Solar collectors and panels do not emit harmful gases into the air, their operation is safe and quiet.", "The sun will not disappear!" among other.

Some examples of disadvantages are: "There is no sun at night!", "Equipment needed to use solar energy is expensive", "Although solar energy can be used for cloudy days, the amount of heat or electricity is much smaller.". During the Mathematics and Informatics class, students calculated the amount of electricity consumption per family member in their own household. They ruled the spreadsheet in Excel and singled out the month when the highest power consumption was. It was all about January. They concluded that the reason was heating. Also, they needed to investigate the costs of installing solar panels in your own household with the regulations of the Government of the Republic of Croatia (https://narodne-novine.nn.hr/clanci/sluzbeni/2015_05_56_1105.html).

The Narrative

What did you do? Describe how you used the selected learning scenario in your teaching. For example, what was the structure of the lesson activities; did you make any adaptations to the resources? Did you include any online activities in the implementation? (maximum 200 words).

We followed the steps suggested in the learning scenario. Thus, only in the introductory lesson, I.e., the preparation lesson, we encouraged students to think critically about how much electricity costs and how we can save. Also, students brought electricity bills from their own household. During the Chemistry class, students were introduced to renewable and non-renewable energy sources, which is also part of the Curriculum, with an emphasis on renewable energy sources.

During the Physics class, students learned the transformations of energy forms from one to another (e.g., the conversion of solar energy into electrical and mechanical). Also, they were supposed to make a house model with a solar panel connected to MicroBit. Finally in the class of Mathematics and Informatics, the students analysed the electricity bills from their own household, entered the data into the Excel table and made a calculation of the electricity consumption according to the higher tariff and the lower tariff.

PowerPoint presentations, Kahoot quiz, Forms quiz, smart maps created in Simple Mind + and Padlet tools were used for evaluation.

Some pages that students used for research:

- Renewable and non-renewable energy sources (Chemistry): https://edutorij.e-skole.hr/share/proxy/alfresco-noauth/edutorij/api/proxy-guest/da1ecddc-29e2-4f78-a455-8b527f26ff9a/html/2085_sints_Obnovljivi%20i%20neobnovljivi%20izvori%20energije.html

- Fossil fuels (Chemistry): https://edutorij.e-skole.hr/share/proxy/alfresco-noauth/edutorij/api/proxy-guest/7b5e1fe5-86e2-4142-af6c-5197c4a08148/kemija-8/m02/j03/index.html

- Energy (Physics): https://edutorij.e-skole.hr/share/proxy/alfresco-noauth/edutorij/api/proxy-guest/9fa73ce9-74d3-4c51-9a14-c976650188a6/html/25110_Energija.html

- Data representation (charts): https://edutorij.e-skole.hr/share/proxy/alfresco-noauth/edutorij/api/proxy-guest/5b6e84e4-98f0-45e9-8e29-ddccaa7f5f1f/html/4821_Prikazivanje_podataka.html

- Using spreadsheets for data representation and analysis: https://www.e-sfera.hr/prelistaj-udzbenik/6bba8935-8fc6-434a-a07b-8d3f10840e75

The Collaboration Process

How did the collaboration with other teachers go? *Please, describe how was working together with the other teachers and what was the approach to carry out the lesson(s). (maximum 150 words).*

The collaboration with colleagues was excellent. In the meetings before the implementation of the teaching scenario, each of them presented what they plan to do within their subject. Also, if any of the teaching scenarios were impossible to execute, she sought their advice. For example, our students did not use Simple Mind+, so Nikolina (CS and Math teacher) advised students who use technology well to make a smart map in Simple Mind+, and the others can use the Padlet tool. Also, we had to make a compromise because the school does not have the Engino Solar power KitMaking experiments. Instead, the idea was the students could made models of a house with a solar panel that contained a MicroBit. For each temperature value above 15 ° C within one hour, the MicroBit would show a positive sign to generate electricity. Therefore, we could not have done this part of a lesson due to online teaching.

Learning Outcomes

__What did you achieve?__ Describe the main learning outcomes you achieved with the implementation of the Learning Scenario. Tell your reader about anything that supports your case for achieving these learning outcomes. For example, students' view, or any other evidence[1] that illustrates the benefits and impact of using this Learning Scenario? (maximum 300 words)

After implementing this scenario, students can explain the difference between renewable and non-renewable energy sources, explain the ways of converting solar energy into electrical and mechanical energy, explain the conversion of kinetic energy of water into electricity at hydropower plants, analyse the electricity bill and calculate how much electricity is spent at a higher tariff and how much electricity is consumed at a lower tariff. Students discovered the practical application of data analysis and graphical representation of their relationship. They recognized the advantage of using digital applications, such as spreadsheets like MS Excel, for such purpose.

Teaching Outcomes

__What did you, as a teacher, get out of teaching with a STE(A)M IT Learning Scenario and resources?__ How did the usage of the STE(A)M IT Learning Scenario go? What should teachers and students watch out for to make effective use of a Learning Scenario created to support the integrated STEM approach? Please also describe your experience in collaborating with teachers of other subjects. What was different from traditional teaching? What advice would you give to another teacher planning to implement the same Learning Scenario about the achievement of the desired learning outcomes? (maximum 300 words).

With this learning scenario we realized that it is much easier to design our own learning scenario than to work with someone else's. It also allowed us to find solutions through teamwork for steps we were unable to implement. We had a hard time not having the "Engino Solar power Kit Making" so that our students could not make a solar robot. The collaboration with colleagues who are in the project was great so we came up with the idea to make a model house with a solar panel connected to MicroBit and so we found a solution for our that issue. We believe that it is through joint dialogue that we have managed to overcome obstacles. We consider this learning scenario extremely important to develop practical skills, but also economic skills for household management.

---

[1] Remember to refer to the point 6 of the guidelines.

Challenges

Did you face many challenges? *If yes, how did you address them? Tell us more about your implementation issues, obstacles (practical or in relation to your school's organization/resources/environment), communication and planning issues, lack of knowledge, attitude towards STEM, etc. What did you do to overcome these challenges? (max. 200 words)*
As we mentioned earlier, the biggest challenge was that our school didn't have a "Engino Solar power Kit Making" so we weren't able to make a solar robot. Also, one of the main challenges was the pandemic COVID-19. Our school followed classes online since the beginning of the second semester till the 15th May, except for two short periods (two weeks) when we started going to school. Due to the workload of the children, we tried to carry out all activities after returning to school but also, we noticed that students weren't so engaged as they were before the pandemic.

Thank you!