

## Improving Classroom Environmental Conditions

Students will develop an action plan for improving classroom conditions based on their data analysis as well as collect, record, upload and download data about their modified classroom environment.

**Suggested Timing:** Science 40 - 60 min. plus time for data collection

### Success Criteria:

*Students will:*

- Develop an actionable Action Plan using SMART goals (specific, measurable, achievable, realistic, timely)
- Create graphs with appropriate titles, labels, scale/increments, legends/keys, dependent & independent variables on correct axes and are accurate and neat
- Correctly follow a data collection protocol
- Use tools and equipment appropriately
- Collect and upload accurate and complete data

### Student Prior Skills and Knowledge:

- Have completed the **Action 1** activities

### Materials:

- **BLM A1.1:** Data Collection Form (optional) [.doc] [.pdf] - 1
- **BLM A2:** Action Plan Templates [.doc] [.pdf] - 1 per small group
- Graphs from **Action 1**
- micro:bits and class sensor array
- Computers – PCs, chromebooks, laptops (recommend to not use ipads, tablets because app will need to be installed)
- Access to internet and MakeCode website (<https://MakeCode.microbit.org/>)

### Preparation:

- Print enough copies of **BLM A2.1** for groups of 3-4 students or have students use the Excel version in the Student Module online.
- Ensure that the micro:bit with sensor array is working properly before beginning the lesson.

### Computational Thinking

#### Concepts:

- Inputs
- Outputs (integers, strings)
- Data

#### Practices:

- Algorithmic Thinking
- Pattern Recognition
- Decomposition
- Abstraction
- Data Representation
- Data Collection & Analysis



## Action 2.1: Creating a Classroom Environment Improvement Action Plan

### Educators

### Students

#### Step 1

Students will brainstorm as a class (or in small groups) different ways to change each of the environmental conditions. Based on the level of student's prior knowledge, you may need to ask some guiding questions, such as:

- *What sort of devices do you know of that can increase or decrease the humidity in a room?*
- *How do plants and animals produce and use the carbon dioxide in the environment?*
- *What is a thermostat? What does it do?*
- *Who controls the temperature in our room?*
- *Can our windows open to let in fresh air?*

As a class, discuss the feasibility of the various solutions. Some may be very easy (e.g., opening a window) whereas others may be more difficult (e.g., adjusting the temperature if there is not a thermostat for the room).

#### Step 2

Based on the first week of data collection (baseline data) and their brainstorming, have the students as a class decide which environmental factor they wish to improve.

If you wish, students could use a learning strategy such as a [Consensus Mat](#) to assist them with deliberating and decision-making.

Brainstorm different ways to change each of the environmental conditions.

1. Increase temperature
2. Decrease temperature
3. Increase humidity
4. Decrease humidity
5. Decrease carbon dioxide

For more about **Brainstorming** see the **Additional Resources** section for a link to the learning strategy.

Based on the brainstorming, answer the following question:

- *How easy/difficult would it be to make the changes you suggested?*

As a class, decide which environmental factor to change: either temperature OR humidity OR carbon dioxide.

How will the students decide?

**Step 3**

Assign students to small groups (3-4) and provide each group with a copy of **BLM A2: Action Plan Template** or have them use the online Excel form.

In your group, follow along as the sections of the Action Plan template are explained.

Discuss the steps of setting up an Action Plan with the students. See the sample below. Breaking a big problem (how to improve classroom conditions) into smaller problems (e.g., how to increase humidity) is an example of using the Computational Thinking Practice of **Decomposition**.

Goals	Actions	Resources	Potential Roadblocks	Responsibilities
<p>Encourage the students to make the goals SMART goals (specific, measurable, achievable, realistic, timely)</p> <p><i>This could include an increase in the relative humidity if too dry, a decrease in the carbon dioxide if the levels are higher than the safe range, an increase in the temperature if too cold, etc.</i></p>	<p>Have students identify the activities that they want to try to meet their goal.</p> <p><i>This could include using a humidifier or space heaters, asking for the ventilation system to be checked, etc.</i></p>	<p>Have students think about what they will need in order to accomplish their goal.</p> <p><i>This can include physical things, such as humidifiers and weather stripping as well as human resource-related things such as assistance from parents to raise money or permission from the principal to adjust the thermostat in the room.</i></p>	<p>Have students consider what might affect their plans.</p> <p><i>This can include such things as weather, not receiving permission from the principal, insufficient funds, safety rules, etc.</i></p>	<p>Have students consider who (themselves included) will need to be involved in their plans.</p> <p><i>This may include the principal, teacher, parents, students, custodian, etc.</i></p>
<p><i>E.g., To make our classroom feel less dry.</i></p>	<p><i>E.g., Get a humidifier for the classroom.</i></p>	<p><i>E.g., Money to buy humidifier, permission from principal to use it.</i></p>	<p><i>E.g., Not enough money to buy a humidifier. We could try to borrow one.</i></p>	<p><i>E.g., Principal, teacher, parents</i></p>



Provide students with time to complete their group Action Plans either during class time or outside of class time.

Fill in all of the sections of your group Action Plan. Be prepared to share your plan with the class.

### Step 4

Have each group share its action plan. You may wish to assess the plans.

Afterwards, be prepared to talk about what YOU think the class should do and be prepared to give supporting reasons for your choice.

As a class, determine a **SINGLE** goal to be chosen as well as the key actions, resources, and responsibilities. This will form the **Class Action Plan**.

### Step 5

Either as a class or in small groups, have the students use the **Class Action Plan** to create an series of steps (an algorithm) for implementing the Class Action Plan. This is an example of the Computational Thinking Practice of **Algorithmic Thinking**.

Based on the **Class Action Plan**, create a series of steps for what needs to be done (plan the work). You may wish to use an organizer such as a flow chart to help organize the steps.

Students will need time, and potentially resources (equipment, access to the school custodian or principal, etc.) to implement the class action plan. Some of this could be done during class time, but other tasks may need to be done outside of class time.

Finally, list and gather materials and/or equipment that you will need, choose who will do the tasks, and talk to any people that will need to give their permission.



## Action 2.2: Action Plan Implementation

### Educators

#### Step 1

Have students implement the **Class Action Plan** and enter this new data into the [Living Space dataset](#) as they did for the first data collection period. You may wish to have students keep a journal during the implementation of the Action Plan to record observations, impressions, etc.

#### Step 2

Once the data has all been collected and inputted, students will need to go back to the [Living Space Dashboard](#) to download the new data.

Students will add this new data to the classroom conditions graphs they created in Action 1. This may be on paper, computer, or both.

### Students

After the change is made, collect data for as you did before and upload to the [Living Space dataset](#).

Click on the download icon for your class group on the Living Space Dashboard to download your new data.

Add this new data to the graphs you made earlier.

## Action 2.3: Extensions

### Language

- Students could develop a pitch to present to the principal about how the environmental conditions of the school could be improved.
- Students could use the Action Plan template for other school activities such as events, etc.

### Mathematics

- Students could compare the means, medians and modes of the first week and second week data sets.
- Students could determine a line of best fit for each week of data collection. How do the lines compare?



### Science

- Discuss with students some of the possible sources of error from the second week of data collection. Were new sources of error introduced?
- Students could participate in other citizen science projects by Let's Talk Science, such as the [Energy4Travel Action Project](#).

### Action 2.4: Additional Resources

#### Background Information

- [Brainstorming](#) (IdeaPark Learning Strategy)

#### Online Resources

- <https://www.youtube.com/watch?v=1-SvuFIQjK8&t=18s> (Accessed July 3, 2018)  
This YouTube video helps students understand how and why to set SMART goals.
- <https://www.youtube.com/watch?v=yA53yhiOe04> (Accessed July 3, 2018)  
This is another short YouTube video on setting SMART goals.

