



SPACE 
awareness

PLANET EARTH
THE EARTH'S ATMOSPHERE

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Information about the course

Brief description: In this activity, students learn what is meant by air and what the atmosphere is. They will work in groups to learn more about the composition of the atmosphere, its temperature and air circulation.

Curriculum topic:
Planet Earth

Education level:
Secondary

Didactical hours:
1

Category:
Our fragile planet

Language:
English

Keywords:
air, Earth, atmosphere,
oxygen, CO₂, sky,
atmospheric
temperature, greenhouse
effect, habitability

**Students' prior
knowledge:**
Planet Earth

Age range:
10-14

Educational Objectives:

Learn what the atmosphere is, its composition and layers

Learn about the atmospheric temperature and greenhouse effect

Discover air circulation

Define Earth as a habitable planet and the role of the atmosphere in this

TABLE OF CONTENTS

ORIENTATION	3
CONCEPTUALISATION.....	5
INVESTIGATION.....	7
Exploration	7
Data interpretation	8
CONCLUSION	9
DISCUSSION	10
Communication	10
Reflection	10

ORIENTATION

To start this activity, you can ask some more introductory questions.

“Did you ever wonder where is the air come from? Or what is the weather? I am sure you have heard about the atmosphere or the greenhouse effect. Do you know what these mean? Today we will try to answer some of these questions.”

Start by showing students a video to spark their interest in Earth’s atmosphere:
<https://youtu.be/CsWp25SAPg4>

Tell them to write down the elements they notice (e.g. the Earth’s atmosphere, clouds, sky, weather, etc.). In this way, they will already start identifying some key concepts that they will investigate in this lesson: the definition of the atmosphere, the composition of the atmosphere, etc.

After the activity is done, ask the students to give you some of the concepts they identified and write them on the board.

“Ok then, let’s see what are some key elements we’ve noticed in the video.”

To make for a neat design, as the students list their concepts, try to group them already by composition, temperature and circulation without actually defining the categories yet. Once this is done, point out the grouping to the students and ask them how they would define the category.

“That’s great, it looks like we have a lot of elements here. Let’s look closely at these areas here on the board. If we were to put all of these words in a bigger category, what would it be?”

Together with the students, the categories of atmosphere composition, temperature and circulation are outlined.

Open a Padlet wall and then guide the students with questions so as to shape these three categories: for example, for the composition category, you can ask them “This is what we saw in the video, but what else do we know about the atmosphere’s composition?”, “What else do we know about the atmospheric gases?”, “Why is the atmosphere’s composition so important for life?”

Write their answers in the Padlet, using the pictures as references.

As this exercise progresses, frame it into a larger picture by explaining to them how important the Earth's atmosphere is for our day-to-day life

"So you see, you already know or have a hunch about these things. Now let's have a closer look at this!"

EXTRA GUIDELINES

Use of ICT tools and materials

Tools:

- A text editor for students to write down their observations from the video (Google Document, Microsoft Word, Evernote <https://evernote.com/>, etc.). For consistency, try to keep the same instrument throughout the lesson, at least per group (see later phases).
- Padlet to gather the student's ideas; <https://padlet.com/>

Other materials: photos of the atmospheric layers to insert in the Padlet wall and to connect the concepts you discuss with students:

https://commons.wikimedia.org/wiki/File%3AAtmospheric_Layers.svg

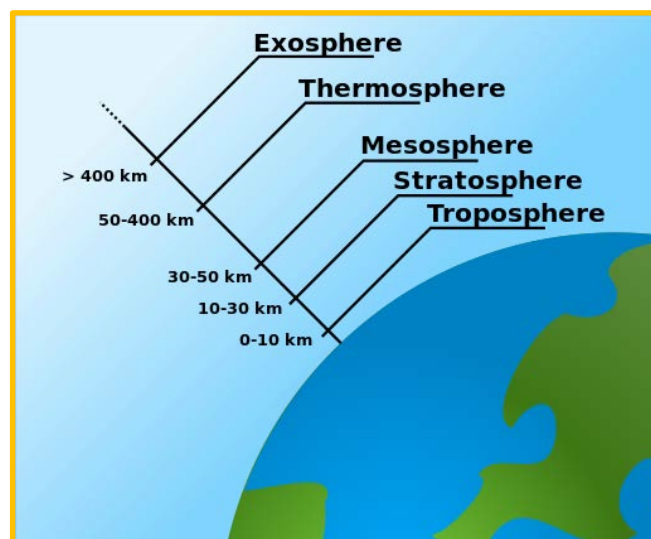


Figure 1. Atmospheric layers. By Bredk, converted to SVG by tiZom, globe borrowed from Earth clip art.svg, CC-BY-SA-3.0.

Tips for a diverse classroom

It's possible that in this type of open-ended exercise, some students may be hesitant to contribute (either they are shy or are afraid of being criticised) so be sure to indicate you are paying attention to them and convey to them that all answers are important and valuable.

CONCEPTUALISATION

Now that you've explored the lesson topics the ground is set to start refining the concepts that may have been touched upon in the students' answers earlier and also to develop research questions for them to explore and investigate.

Explain to the students that now they will have to refine their concepts and also identify relationships between them. They will have to split into three groups (which will remain the same throughout the lesson), each of them investigating one of the three topics identified before (atmosphere's composition, temperature, or air circulation), always keeping in mind how they are related to one another. To do this easily, have one student from each group draw a slip of paper with either atmosphere's composition, temperature, or air circulation.

"We will now split into three research groups and each group will take up either the atmosphere's composition, temperature or air circulation and research more about their effects on Earth and also, how they are related to one another. To be able to do this, we first need to understand what exactly we need to investigate. Let's split into our groups and we'll see what our next steps are."

You can ask them the following questions to have a starting point for the structure they need in formulating their research questions:

"What is the atmosphere?"
"What are the layers of the atmosphere?"
"When the Earth is closest to the Sun, is the temperature higher on Earth?"
"Why does the air move and how?"
"How does the Sun affect our lives on Earth?"
"How come we are able to live on Earth, but not on other planets? What makes Earth different?"

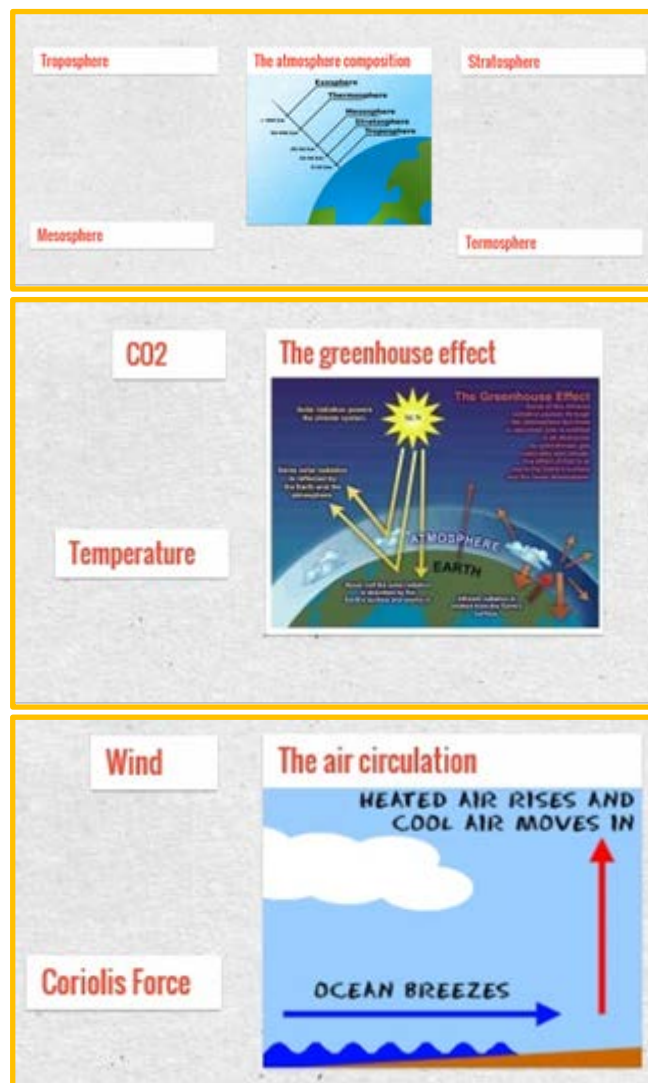
If they miss any concepts or relationships, you can return to them later on in the lesson and supplement the concept map. Also, make sure that they also address the questions posted above. Students will have a lot of questions and ideas, so make sure that each group investigates at least one of the questions proposed by you. It may happen that their investigations overlap, so encourage them to investigate further and approach this at a later stage in the lesson, when you reflect on the activity.

As a group, students will use GoLab's Question Scratchpad tool to come up with questions regarding the relationship between the concepts they've identified and

write them in a shared Google Doc, or any other online editor they may decide to use, per group.

When they have finished their group discussion, invite them to list their questions. This is an opportunity to help them refine their questions and also to write them down in the Padlet to keep the storyline of the lesson.

These are images from Padlet:



EXTRA GUIDELINES

Suggested ICT tools and other resources

Students can use the Question Scratchpad (<http://www.qolabz.eu/apps/question-scratchpad>) from GoLab (www.qolabz.eu) to identify their research questions and then create a common text in Google Docs or another editor, where they write them down.

Tips for a diverse classroom

- Make sure the groups are random, with as little gender or social groupings as possible.
- Make sure you offer them support in formulating questions, but not necessarily correct questions. Part of the process is the fact that even a false hypothesis will lead to learning. Later on in the lesson, you can go back to this stage and ask them to reflect on their initial questions and see how these have changed after their investigation.

INVESTIGATION

Exploration

Now that the students have identified their research questions, at this stage ask them to come up with ideas of how they will research their questions further. This includes making use of online search engines, educational websites (e.g. Wikipedia), etc.

“Now that we’ve decided what to research, we need to start finding some answers. What could be some ways to explore these questions?”

Students will come up with some ideas.

“Seems that we have quite a few ideas. That’s great! Now we just have to start to explore and retrieve more information.”

When they have several proposals, give them also a series of resources they can investigate if they choose to (see ICT tools & materials).

EXTRA GUIDELINES

Suggested ICT tools and materials

Research tools and search engines: Google search, Wikipedia.

About:

- Composition of the atmosphere:

<http://www.space.com/17683-earth-atmosphere.html>

- Air temperature and greenhouse effect:

http://www.geography4kids.com/files/atm_temp.html

http://www.geography4kids.com/files/atm_temp2.html

- Air circulation:

http://www.geography4kids.com/files/atm_circ.html

- The Sun: Seasons and temperatures:

http://www.artescapesonline.com/movies/Module%20IV_V15.swf

Data interpretation

In this stage, students will have to synthesise the data they have collected and extract meaning from their research.

Ask them for ideas on how they can summarise their findings. They can use simple diagrams, graphs and even mind maps to synthesise what they have learned.

Another example would be to formulate their findings the same way they did with their research questions (not as questions, but as statements). In this way, it will be easier for them to draw the conclusions in the next phase.

“Now that we’ve concluded our research, we have a lot of raw data on our hands – data that needs to be processed just a bit more to be able to draw conclusions from it. Let’s see some ways in which we can get some simple ideas out of our research. What instruments would you use to summarise the research you’ve just done?”

EXTRA GUIDELINES

Suggested ICT tools and materials

Students can use the Question Scratchpad (<http://www.golabz.eu/apps/question-scratchpad>) from GoLab (www.golabz.eu) to synthesise their findings and then create a common Google Doc where they write them down.

They can also use Excel, or Google Sheets.

Tips for a diverse classroom

- Develop a positive climate in the class that promotes learning. Encourage your students (as a group or individually) to consult you if they have problems during their inquiry. This is also an indirect way to get to know your students and thus be able to tackle assumptions you might have about their learning behaviour and capacities based on their gender or cultural background.
- Have high expectations for all your students. Keep an eye on teams and make sure you spot cases where a student underperforms.
- Make sure the same students do not always put themselves in the position of leadership. Assigning roles (deliberately or randomly) may assist here in ensuring that all students get a chance to take on different responsibilities (manipulating equipment, recording results, reporting back etc.).
- Create a cooperative instead of a competitive environment within each group and among groups.

CONCLUSION

Based on the data interpretation that the students made in the previous phases, ask them to compare their findings with their initial questions.

“Let’s go back to our initial questions now and see what has changed. Did we make a correct assumption? What new insights have we gained?”

Redirect them to the Padlet wall and ask them to fill it in with their new conclusions and insights on how the variables they studied actually tie together.

“Take your interpretation from your group’s worksheet (Google Doc, etc.) and fill in the Padlet wall with your new findings. Note down any mistakes you may have found in your previous assumptions.”

Bring to the students’ attention any mistakes they made in the previous phase and which they failed to figure out, so as to correct them.

An example for coding this is A for their ‘answers’ or conclusions and M for any mistakes they might have made in their initial questions or assumptions.

EXTRA GUIDELINES

Suggested ICT tools and materials

- Padlet
- Google Doc, other editor

Tips for a diverse classroom

- Encourage students to include multiple perspectives and consider alternative explanations.
- Don’t allow students to be interrupted or intimidated.
- Give students time to draw their conclusions and be sure that you are paying attention to all of them equally.
- Give credit and attention to hesitant, shy or quiet students.
- Ask all students to take turns in making conclusions.

DISCUSSION

Communication

Now that the students have a clear view of their conclusions and have corrected their initial assumptions, they can present their findings to the rest of the class.

Ask your students to incorporate their inquiry process into a group poster and ask them to be as creative as possible.

“Our research is now complete and at the end of the lesson it’s important that we share our work with the rest of class and reflect on what went well and what can be improved.

“When scientists and researchers do their work, they don’t keep it to themselves - they think: *Woah, the world needs to know about this! This could help a lot of people, even revolutionise the way we think about this!*”

“They also know that research isn’t always perfect and that you always need to improve and tinker with the way you research to be able to do it better next time.”

After each group has chosen its way of working, write down on the board the steps through which they have to go in their discussion and reflection.

“Please make sure you incorporate these steps into your presentation. In this way we can maximise all that we’ve learned and also help our colleagues to better understand what each group did”

Make sure to offer them guidance in presenting their findings and using a scientific approach as much as possible by addressing all of the steps of their inquiry process, regardless of their chosen way of presenting.

Reflection

In their presentation, make sure that they include a reflection section. You can give them the following questions to answer for this sub-phase:

- Did you complete all activities correctly? Be honest about your work.
- What went well and what went wrong through all of the phases that you went through in this lesson? Reflect on your actions and approach to the scientific process (avoid placing the blame on something or someone else);
- List a series of things that you will change and do differently next time to have an even more successful inquiry process;

At the end, have each group present their poster.

“Taking turns, each group will come up and present their work today.”

They picture it and add the photo on the Padlet.

EXTRA GUIDELINES

Suggested ICT tools and other resources

PowerPoint or Prezi can also be used instead of posters.

- Materials for posters
- Padlet Presentation tools (MS PowerPoint, Open Office Impress, Prezi)

Tips for a diverse classroom and ensuring gender balance

- Be encouraging with students to use their creativity
- Support students in being honest with themselves and correct in the reflection process; don't allow bullying, teasing or blaming
- Allow the presentation of multiple opinions and perspectives.
- Use examples from multiple backgrounds and perspectives. The same groups should not always be used for demonstrating positive or negative examples.
- Be sensitive to cultural differences in writing styles, recognising that many standards apply to the evaluation of good writing and presenting.
- Be explicit about what is expected and show examples of good writing done by other students.
- Be sensitive to the experiences of visibly underrepresented students in your class.

Main Skills involved

- Active Listening – Giving full attention to class mates and to what other teams are presenting. Taking time to understand what other teams did. Asking questions on their work and results.
- Reading and Comprehension – Be able to understand the written reports of other teams and assess them. Be able to read relevant theory and reflect on new knowledge.

- Speaking – Be able to communicate the work of the team as well as the results derived, using scientific terms properly and scientifically valid arguments.
- Active Learning – Giving full attention to classmates, taking time to understand their point of view and compare different points of view.
- Time Management – Be able to prepare the team’s work on time and make it fit the time frame allowed for presentation.
- Social Perceptiveness - Being aware of team mates’ reactions and understanding why they react as they do while making the final presentation. Being aware of other teams’ reactions during the presentation and understand why they react as they do.



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