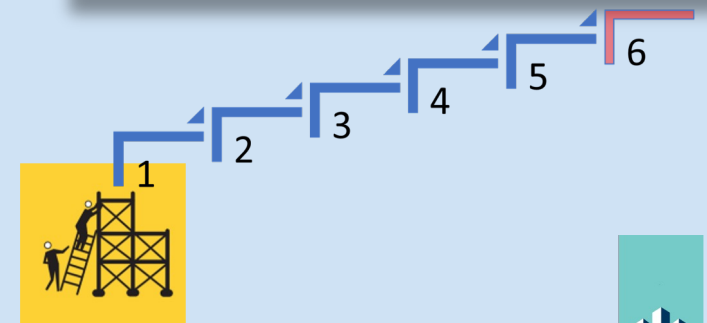


# Case study 1: Wind Energy



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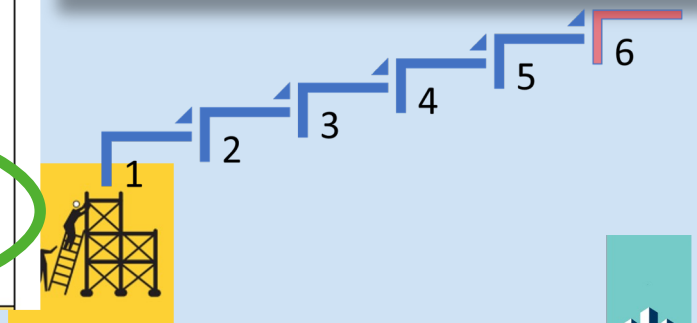
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# Case study 1: Wind Energy

## CASE STUDY/ VIGNETTE - WIND ENERGY

Step	Identify a topic / story that is going to be told / explored using GIS	Other
	Teaching with GIS	
	Wind energy	
	Context / place in SoW: Sustainable development, energy transition (in K11-12 compulsory education topic)	
	Target age group: K11-12 = 17-18 y	100 min
LOs	Learning objectives	
	<ul style="list-style-type: none"> <li>Define alternative energy</li> <li>Describe evaluate the possible impact of wind mills</li> <li>Understand the nimby-syndrome</li> <li>Interpreting maps</li> <li>Explain</li> <li>Describe, explain and evaluate possible influences on this location and distribution.</li> </ul> <p>Link to SDGs.</p>	
	   	



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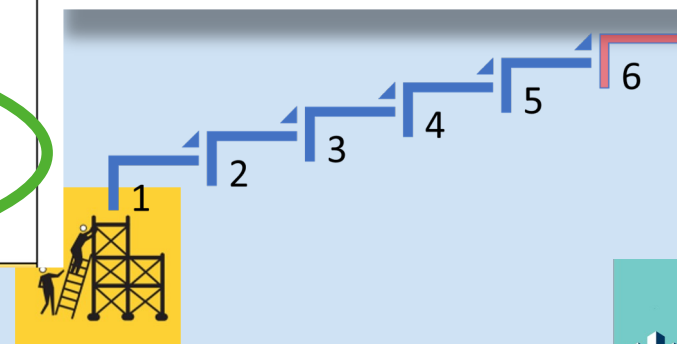


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# Case study: Wind Energy

Step	Identify a topic / story that is going to be told / explored using GIS	Other
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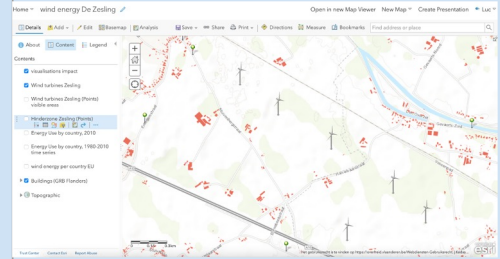
euro  
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„DIMITRIE CANTEMIR”  
IASI







Res	Key resources and embedded hyperlinks if appropriate
	<p>ArcGIS online map  <a href="https://arcg.is/1zqLrX0">https://arcg.is/1zqLrX0</a></p> <p>other websites:  <a href="https://ourworldindata.org/renewable-energy">https://ourworldindata.org/renewable-energy</a>  <a href="https://globalwindatlas.info">https://globalwindatlas.info</a></p> 



# LEARNING PHASES\*



		Timing
0	<i>Step 0: Retrieval (e.g. quiz to check prior learning)</i>	5 min
	<b>Review</b> Retrieval of prior learning about energy consumption and sustainable energy production Why is sustainable or renewable energy production essential? How is the evolution in renewable energy production: use <a href="https://ourworldindata.org/renewable-energy">https://ourworldindata.org/renewable-energy</a>	
	<b>Check student understanding</b> Name three major renewable energy sources. List the top 5 countries with the highest % of renewable energy.	



<https://ourworldindata.org/renewable-energy>



**Check student understanding**

**Name three major renewable energy sources.**

**List the top 5 countries with the highest % of renewable energy.**

# Renewable Energy

[Home](#) > [Energy](#) > Renewables

by Hannah Ritchie and Max Roser




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[Energy](#) > [By country](#) [Data explorer](#) [Energy access](#) [Production & Consumption](#) [Energy mix](#) [Electricity mix](#) [Fossil fuels](#) [Renewables](#) [Nuclear](#) [Transport](#)

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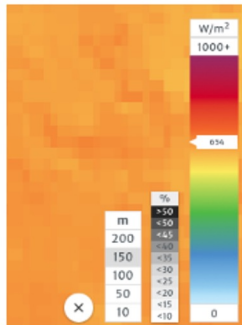
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1	<b>Step 1: Direct instruction / teacher facilitated - schema building begins</b>	<b>20 min</b>
	<p>Why renewable energy?</p> <p>What are the key elements of this resource? Build scheme from the start.</p> <p>Point pupils on what is on the website,</p> <p>Go to <a href="https://ourworldindata.org/renewable-energy">https://ourworldindata.org/renewable-energy</a></p>	
	<p><b>Ask questions (<u>klasleergesprek</u>):</b></p> <ul style="list-style-type: none"> <li>• Study the map 'How much of our primary energy comes from renewables? Which countries have the highest %, which countries are strong risers?</li> <li>• Why are investments made in building wind turbines? What are the advantages of wind energy? Looking up information on the internet is allowed, but think critically about the sources you use.</li> <li>• Are there any disadvantages to using wind energy? If so, which?</li> <li>• What does the term NIMBY mean?</li> <li>• Wind energy is not equally interesting everywhere; go to <a href="https://globalwindatlas.info">https://globalwindatlas.info</a> and study the mean power density layer at different altitudes (you can look at different altitudes via the menu).</li> </ul>	
	<p>Go to <a href="https://globalwindatlas.info">https://globalwindatlas.info</a></p> <p>Explain how to navigate in this website, pointing at how to get the info, sequence to make the most of this website</p>	

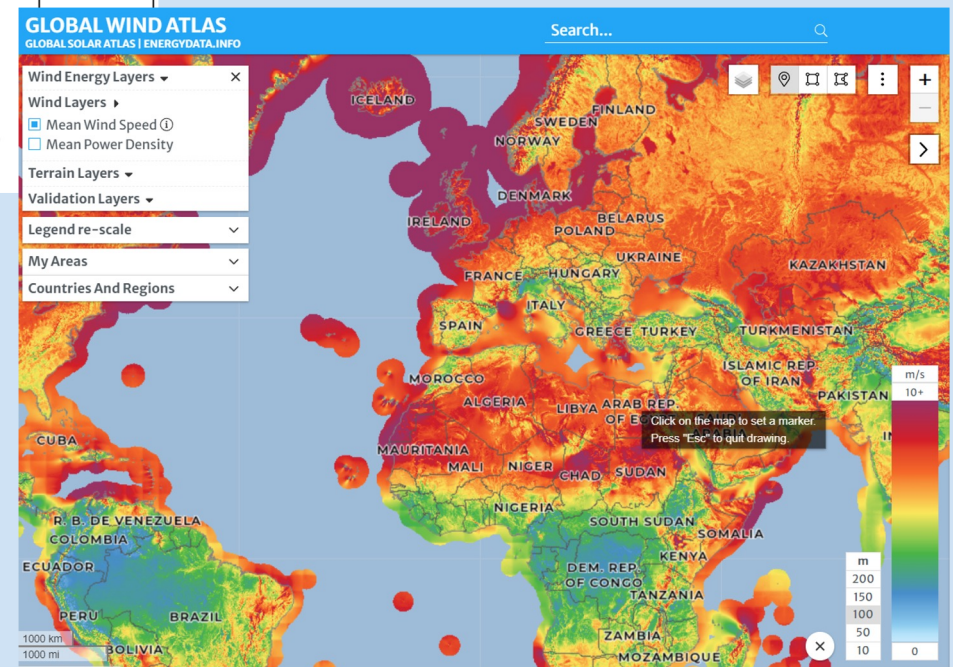


- Wind energy is not equally interesting everywhere; go to <https://globalwindatlas.info> and study the mean power density layer at different altitudes (you can look at different altitudes via the menu).



- Using the other layers, explain why one area is more interesting than another?

<https://globalwindatlas.info/>





Open the map <https://arcg.is/1zqLrX0>

- Click on Basemap and choose 'Topographic'



- Click on "Show legend":
- See how the percentage of wind energy and the amount of wind energy are represented.



- Click on 'Show table':



- The amount of wind energy is expressed in GWh. What does this stand for?
- Which country produces the highest amount of wind energy?
- Which country produces the highest percentage of wind energy?
- What is the difference between the amount of wind energy and percentage of wind energy?
- Why did you not fill in the same country for questions 3.6 and 3.7?
- How does Belgium score in terms of percentage of wind energy compared to Europe?

**2**

***Step 2: Modelling /  
Scaffolding Review and Questioning – what data are needed?***



**Modelling**

**In the autumn of 2022. 6 windmills would be built in the region between Beernem and Oostkamp. These windmills were called 'The Zesling'. Through a public enquiry. the population was informed. and eventually the permit was withdrawn because of too much nuisance for the people living in the neighbourhood.**

**But was this decision correct?**

**You can use the web map to investigate. With the help of this step-by-step plan. you will investigate whether the siting of the windmills was disturbing for people living in the neighbourhood.**



**2**

## **Scaffolding**



**In the next exercise you will need these key terms: cast shadow. dB. visual impact>**

**1.e.g If you are responsible for the planting of a windmill. What factors would you take into account? In other words. where would you definitely not build a windmill and where would you?**

**1.Have a look at the (off-line) site of 'De Zesling': <https://bit.ly/de6ling> (in Dutch but the graphics are clear enough);**

**1.What criteria should the design of a wind farm meet?**

**2.What is meant by 'cast shadow'?**

**3.How loud can a wind turbine sound on the outside of a house? What can you compare this to?**

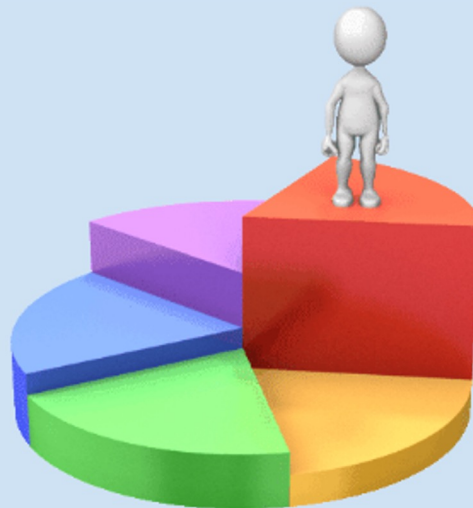



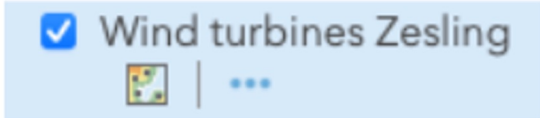






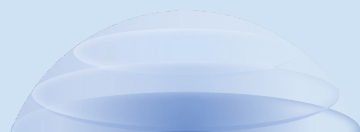
## Obtain high success rate


Write down all your information you retrieved as you will need it in the next steps



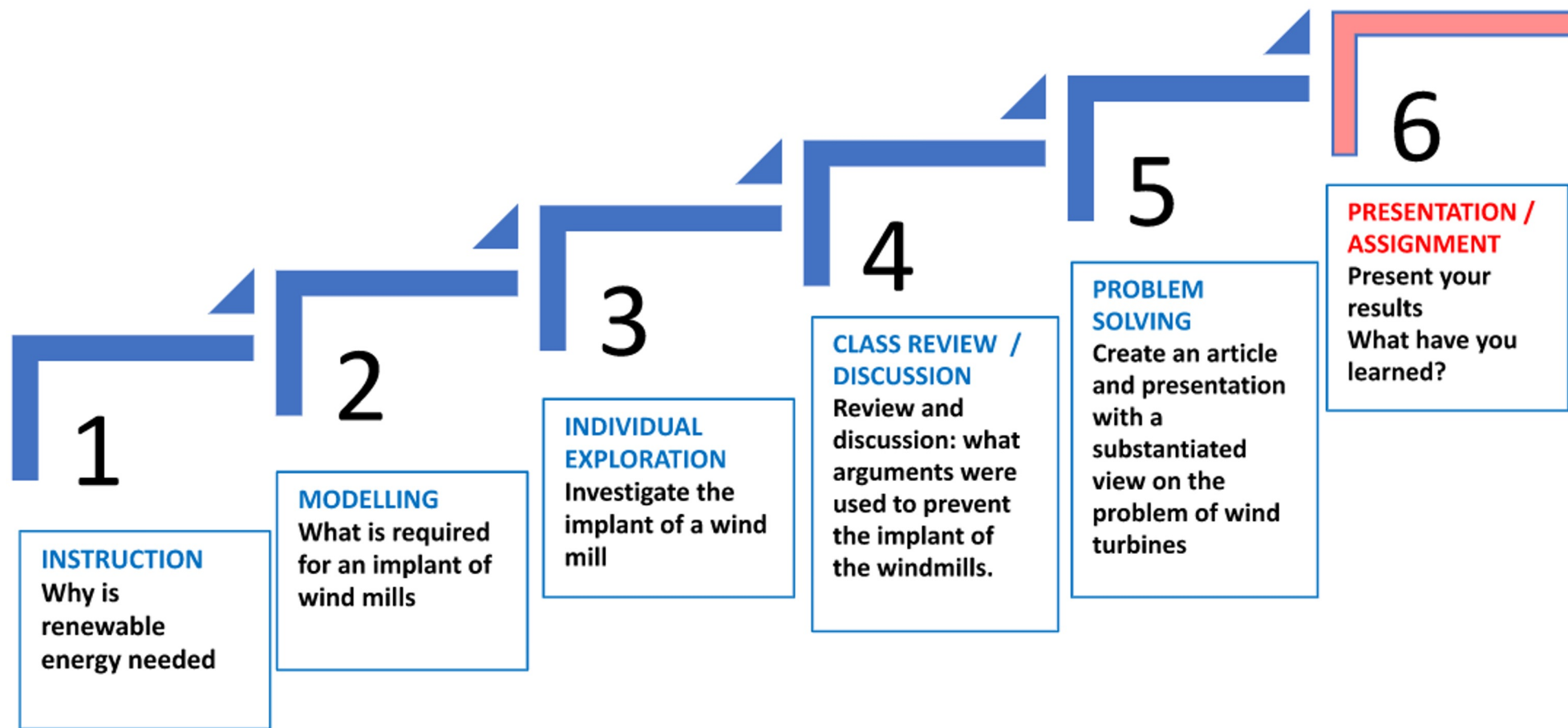
3	Step 3: Individual exploration	30 min
	<p><b>Guide student practice</b></p> <p>In this part of the task you will use GIS to plan the windmills of 'The Zesling' and see if they cause any nuisance. Follow the step-by-step plan:</p> <ol style="list-style-type: none"> <li>1. Return to ArcGIS to the map you have open.</li> <li>2. Uncheck 'Wind energy per country EU'. From now on we will concentrate on the region where 'De Zesling' will be built.</li> <li>3. Turn on the layer 'wind turbines Zesling'</li> <li>4. Describe what strikes you about these locations. Think about what you have answered in step 2: placing of windmills.</li> <li>5. What is the impact of the cast shadow?             <ol style="list-style-type: none"> <li>a. On the website of 'De Zesling' it is described how high the windmills are. Using the rules of trigonometry, determine the radius around the windmills that can cause cast <u>shadow</u> if you know that the sun makes an angle of <math>14.5^\circ</math> with the surface of the Earth during winter. For this problem, you may assume that the Earth is flat (which is certainly not the truth!)</li> <li>b. Click on the symbol under the layer 'wind turbines Zesling' for analysis</li> </ol> </li> </ol> <div data-bbox="517 1177 1055 1294">  </div> <ol style="list-style-type: none"> <li>c. Click on 'Use Proximity' and then on 'Create Buffers'</li> </ol>	

4	<b>Step 4: Review - discussion</b>	15 min
	<p><b>Check student understanding (onderwijsleergesprek):</b></p> <p>Think about your results for a moment. Do you think the people of Oostkamp and Beernem are happy with the arrival of the windmills? Does the NIMBY syndrome apply here? Why? Why not?</p>	
	<p>Review of <b>Step 3: Individual exploration</b></p> <ul style="list-style-type: none"> <li>● Feedback from students about their findings. Corrections discussed.</li> </ul>	
5	<b>Step 5: Problem-solving</b>	10 min
	<p><b>Independent practice</b></p> <p>Write a short newspaper article (text 0.5 - 1 page) based on your results in ArcGIS and your research in step 4:</p> <ul style="list-style-type: none"> <li>○ Give a substantiated view on the problem of wind turbines: what are the pro's and con's of their installation. Which issues are not (sufficiently) taken into account, ...</li> <li>○ Add at least one figure from your ArcGIS results. This figure does not count towards the length of the newspaper article.</li> <li>○ Indicate at the bottom of your article on which sources you have based your <u>research</u>, this also does not count towards the length of the newspaper article.</li> </ul>	



6	<b>Step 6: Presentation/Assessment (incl peer assessment) sharing of outcomes.</b>	<b>10 min</b>
	<p><b>Check student understanding (onderwijsleergesprek):</b></p> <ul style="list-style-type: none"><li>● Key question(s) to check student understanding...<ul style="list-style-type: none"><li>○ Why is renewable energy essential</li><li>○ Why is not everywhere the implant of wind mills possible</li><li>○ What about the NIMBY syndrome</li></ul></li><li>● Invite student suggestions (e.g. think-pair-share).<ul style="list-style-type: none"><li>○ What are your findings on this specific case?</li><li>○ How would you deal with it<ul style="list-style-type: none"><li>▪ As local inhabitant</li><li>▪ As government</li><li>▪ ...</li></ul></li></ul></li></ul>	





▲ Checking understanding

## Case study constructuio/ deconstruction



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# CASE STUDY DECONSTRUCTION

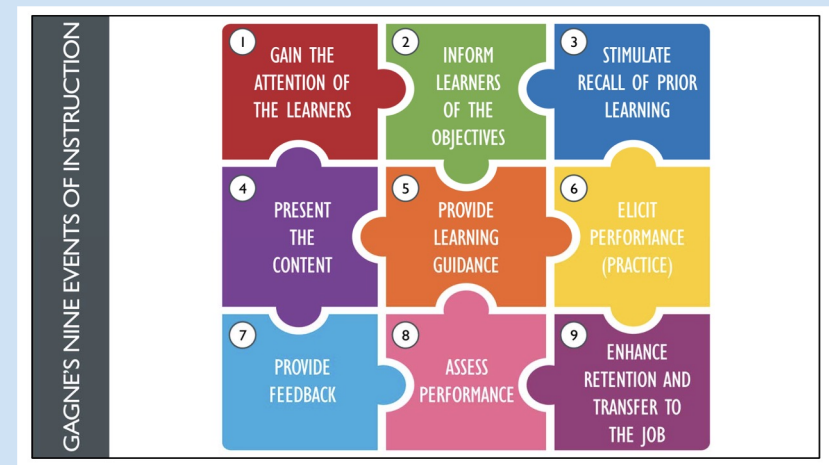


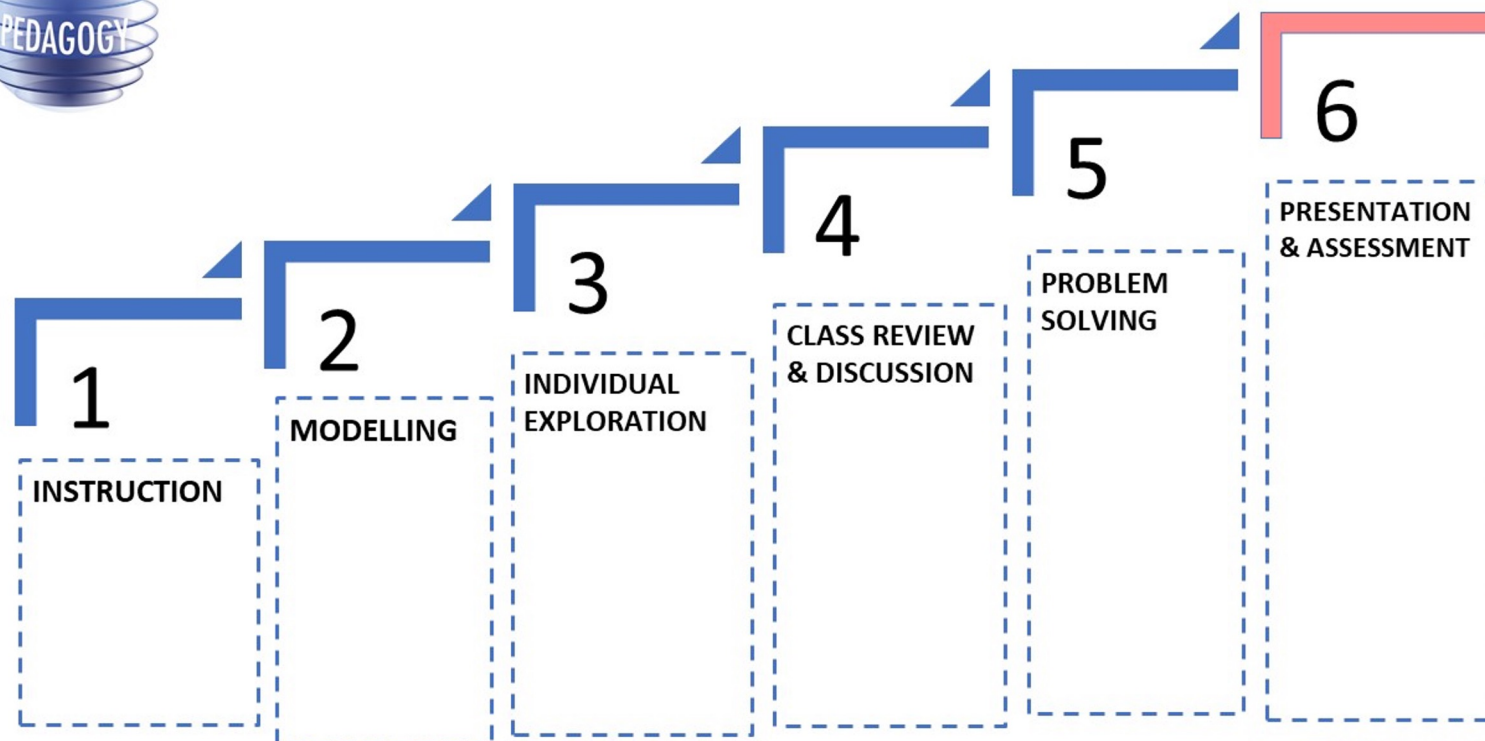
## Pedagogical approach:

- Analyze case studies components and steps;
- Critical understanding of **how to construct** a new similar case study based on your own pedagogical objectives

## Methodology:

- Present a complete case study model as it was created;
- Deconstruct the case study;
- Create new case studies;





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PEDAGOGY

## STEP 0



Instructional stages	Activities
<b>Beginning</b>	<ul style="list-style-type: none"><li>- Review of previous learning</li><li>- Q &amp; A</li></ul>



## STEP 1: Direct instruction

Instructional stages	Activities
<b>Introduce new material</b>	<ul style="list-style-type: none"><li>- Breaking down learning content into small steps;</li><li>- Practical exercises for each step;</li><li>- Start from very basic/simple tasks and smoothly pass to a higher level;</li><li>- Do not present new material at once;</li><li>- Assist students during their practice;</li></ul>
<b>Practice by asking a large number of questions</b>	<ul style="list-style-type: none"><li>- Permanent feedback;</li><li>- Use methods that engage all participants;</li><li>- Encourage active participation of learners;</li><li>- Provide explanation and give more examples if needed;</li></ul>



## STEP 2: Modeling



Instructional stages	Activities
<b>Provide models - show students how to do it</b>	<ul style="list-style-type: none"><li>- Provide cognitive support;</li><li>- Solve more difficult problems based on previous tasks;</li><li>- Help students become independent/ offer support for further Independent practice;</li><li>- Changing role: Students ask teachers;</li></ul>





Instructional stages	Activities
<b>Scaffolding</b>	<ul style="list-style-type: none"><li>- Provide instructional support. tools. checklists to help students;</li><li>- Help students organize materials: criteria and/or quality standards;</li><li>- Provide models of solving tasks and students can compare their work;</li><li>- Individual exploration;</li><li>- Remove gradually your support;</li></ul>
<b>Independent practice</b>	<ul style="list-style-type: none"><li>- Give students similar working task;</li><li>- Present the work;</li></ul>



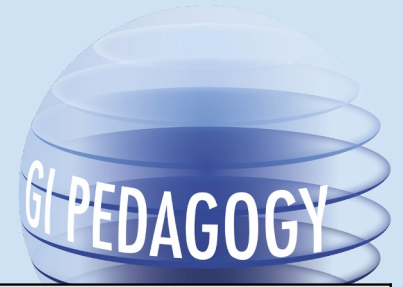
## STEP 3: Practice



Instructional stages	Activities
<b>Guide practice</b>	<ul style="list-style-type: none"><li>- Stimulate long term memory - e.g give students homeworks. working tasks;</li><li>- Facilitate rehearsal process;</li><li>- Correct errors;</li></ul>
<b>Check students understanding</b>	<ul style="list-style-type: none"><li>- Ask questions and analyze correct/wrong answers;</li><li>- Construct and reconstruct knowledge;</li></ul>
<b>Obtain high rate success</b>	<ul style="list-style-type: none"><li>- Check students materials</li><li>- Working on their own</li><li>- Challenging</li></ul>



## STEP 4 Review - discussions



Instructional stages	Activities
<b>Review</b>	<ul style="list-style-type: none"><li>- Correcting homework;</li><li>- Reviewing concept or skills utilised;</li><li>- Asking students where they struggled;</li><li>- Reviewing the material where errors were made;</li><li>- Reviewing material that needs overlearning (i.e. newly acquired skills or information);</li></ul>



## STEP 5: Individual exploration/ Problem solving



Instructional stages	Activities
<b>Problem-solving</b>	<ul style="list-style-type: none"><li>- Apply critical thinking. problem solving. and decision-making skills to (create games. write articles etc.);</li><li>- Analyze situations from multiple perspectives and viewpoints;</li><li>- Distinguish between facts. opinions. and solutions;</li><li>- Encourage global awareness. information literacy. communication. and collaboration;</li></ul>



## STEP 6: Assessment/ Evaluation



Instructional stages	Activities
<b>Reviews/ Assessments/ present outcomes</b>	<ul style="list-style-type: none"><li>- Clarify understanding: meanings of terms and processes;</li><li>- Conceptual model/maps for learning</li><li>- Q &amp; A</li><li>- Quizzes</li></ul>
<b>Weekly and monthly review</b>	<ul style="list-style-type: none"><li>- Connect topics</li></ul>



# An example of deconstruction



Detecting preconceptions  
Increased role of the teacher



Increased student ownership. student-centred learning



**Explain**



Is it understood?



Intelligent questions



**Modelling**



Show how it is done



Providing the necessary steps to ensure its realisation (scaffolding)



**Explore**



Guide the student's practice



Check for successful completion



**Check**



Detect errors



Feedback



**Solving a problem**



Monitor independent practice



Test deep/meaningful learning



**Assessment/  
presentation**



Checking learning



Shall we start again?





# Thank you for your attention!

*This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.*

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