



Module 10



LESSON PLANNING II FOCUS TO METHODS

Worksheets

This worksheet is based on the work within the project Environmental Socio-Scientific Issues in Initial Teacher Education (ENSITE). Coordination: Prof. Dr. Katja Maaß, UNIVERSITY OF EDUCATION FREIBURG, Germany. Partners: UNIVERSITEIT UTRECHT, Netherlands; ETHNIKO KAI KAPODISTRIAKO PANEPISTIMIO ATHINON, Greece; UNIVERSITÄT KLAGENFURT, Austria; UNIVERZITA KARLOVA, Czech Republic; UNIVERSITA TA MALTA, Malta; HACETTEPE UNIVERSITY, Turkey; NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET NTNU, Norway; UNIVERSITY OF NICOSIA, Cyprus; INSTITUTE OF MATHEMATICS AND INFORMATICS AT THE BULGARIAN ACADEMY OF SCIENCE, Bulgaria; UNIVERZITA KONSTANTINA FILOZOFA V NITRE, Slovakia.

The project Environmental Socio-Scientific Issues in Initial Teacher Education (ENSITE) has received co-funding by the Erasmus+ programme of the European Union (grant no. 2019-1-DE01-KA203-005046). Neither the European Union/European Commission nor the project's national funding agency DAAD are responsible for the content or liable for any losses or damage resulting of the use of these resources.

© ENSITE project (grant no. 2019-1-DE01-KA203-005046) 2019-2022, lead contributions by International Centre for STEM Education (ICSE) at the University of Education Freiburg, Germany. CC BY-NC-SA 4.0 license granted.





Activity 1.1: Reflection and critical analysis on specific designs on STEM lessons



Work in groups



30 min

Read lesson plan:




How much fuel needs the aircraft?

Flow of fluids

Share your experience with lesson plan with your schoolmates. Discuss answers on questions:

- What is the focus of the lesson?
- Which interdisciplinary issue did you find in the lesson plan?
- Is there some socio-scientific issue in the lesson plan?
- Which methods for teaching the lesson is designed?
- Which mathematics competences the lesson requires?
- Do you consider the lesson motivating? Yes/No? Explain.
- Which parts of the lesson plan would you like to keep or take out?
- How the lesson plan can be redesign to follow some socio-scientific issue?
- How strongly is the topic connected with (your) personal life?
- How strongly the topic evokes prospective science research?
- Can you imagine to add some more active pedagogies methods to the lesson? Which ones? Describe.



	Activity 1.2: Common and different feature of materials and methods	
	Plenary discussion	 10 min
<p>Reflect on the answers with the whole group. Active method of creating common poster or posting labels can be implemented.</p>		



	Activity 1.3: Two dimensions: citizenship and science dimensions of the two lessons	
	Plenary discussion	
10 min		
<p>Discuss more deeply the interdisciplinary dimension and STEM principles of two lessons.</p> <p>Give your answers to questions:</p> <ul style="list-style-type: none"> • How deeply the lesson fits to the interdisciplinary approach of mathematics lessons? • How you would redesign the lesson plan towards deeper motivation of socio-scientific issues? 		





Activity 1.4: How to adapt lesson?



Plenary discussion



30 min

Have again a look at the two examples and try to find some more provoking questions within the topics. Two open ended SSI problems:

- Massive aircraft transport over living areas massively hurts the environment and badly influences the quality of vegetables.
- Building small hydropower systems on small rivers is the ecological catastrophe!





Activity 1.5: Redesigning the lesson



Discussion and
homework



10 min + homework

Design your mathematics lesson with focus to ecology. Be creative and consider the appropriate mathematical competences of the age of pupils. In your designed lesson describe:

- Age of pupils
- Mathematics topic
- Ecological and environmental topic with socio-scientific issue
- Methods, which you plan to use during the lesson
- Tasks and/or problems

Hand out: PPT presentation





Activity 1.6: Redesigned STEM lessons plans: Homework presentations and discussion



Plenary presentation and discussion



45 min






Students present their redesigned lesson. The whole group discuss the presentations. The dominant questions of the discussion can be:

- Is the designed ecological topic organic part of the designed mathematics lesson or is it only superficial application of mathematical knowledge?
- Can the ecological topic evoke deeper socio-scientific feeling in pupils?
- Could pupils be motivated within the designed topic?
- Is the topic rich enough of finding mathematical facts for creating mathematical model?
- Are designed methods active and innovative?

Result of the activity should be choosing the best redesigned lesson(s).

The presentation of the redesigned lesson is one of the assessed pieces of the work of ITE student within the Module 10.



 Activity 2.1: Examples of lessons designs	
 Quiz. Topic: Tree	 10 min
<p>Students complete the quiz on their mobile phones or tablets. Quiz is available for sharing on application: b.socrative.com, student login, quiz code: SOC-52853951. Lecturer shows immediate results of the quiz.</p>	
 Quiz results discussion and mind mapping	 20 min
<p>Quiz results discussion in the whole group. Students can complete mind map of the topic: Tree with focus to „tree mathematics“. The application https://www.mindmup.com/#storage is recommended.</p>	



	Activity 2.2: Outdoor lesson introduction	
		Plenary
<p>MathCityMap portal and Generic tasks for outdoor education introduction. The rich online database of generic tasks is available for free using and can be exploited as an inspiration for new tasks design, the tasks about objects with SSI ecological context.</p>		





Activity 2.3: Outdoor lesson experience, Homework

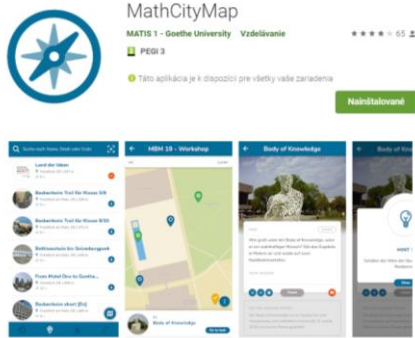


Individual work or
Work in groups



30 min

Download the free application MathCityMap to your mobile phone or tablet.



Students can work individually or in groups of 3-4 and run the MathCityMap trial prepared by lecturer. **Will be soon available in English**

The name of Slovak version of the trail: [MCM@home]Stromy okolo rieky Nitra, code of the trail: 174015.

After the trail students discuss the MathCityMap application potential for using on math lessons with SSI issues.



Homework

Prepare five tasks dealing with objects in real environment.

Tasks will be used for creating the new trial with focus to environmental socio-scientific issues by exploiting mathematical competences.



Activity 2.4: Outdoor mathematics lesson design



Individual work or
Work in groups



90 min

Create own outdoor trail in the real area. The trail consists of tasks with focus to ecological topic(s).

Lecturer assists in creating trails. The trails can be run during the lesson or after the lesson as individual or group homework.

The presentation of the designed trail (or pdf version of the trail retrieved from the MathCityMap portal) is one of the assessed pieces of the work of ITE student within the Module 10.





Activity 2.5: Example lesson: Carbon footprint



Work in groups



45 min

Carbon footprint calculation is available on links:

<https://footprint.wwf.org.uk/#/>

<https://footprintcalculator.henkel.com/en>

Answer questions:

- How the model of the calculation is constructed?
- Which data the particular model requires?
- Are the data mapping the reality of your life?
- Compare results of your groups and discuss how the calculation of the carbon footprint can be incorporated to mathematics lessons with SSI issue?





Activity 2.5: Example lesson: Carbon footprint



Work in groups



45 min

Design mathematics lesson with Carbon footprint topic. Prepare ppt presentation. Work in groups, experience the lesson study principles.

<https://footprint.wwf.org.uk/#/>

<https://footprintcalculator.henkel.com/en>

Answer questions:

- Which SSI issues does your lesson reflect or discuss?
- Which activating pedagogical methods do you use in your design?
- Are there some very sensitive SSI issues within the carbon footprint topic?

The presentation of the designed lesson with Carbon footprint topic is one of the assessed pieces of the work of ITE student within the Module 10.





Activity 3.1: Usefulness and effectiveness of mathematics lessons in relation to SSI



groups

Work in








45 min

Café sharing method: Circulating groups of four students (three plus one host). Each host ask the guests to participate in the poster of the particular table creating. Questions:

- What do students learn when dealing with lessons in intention of the Module 10?
- Should SSI be included mathematics lessons? How? Why?
- Brings the redesigning the lesson useful skills in preparing more motivating and active lessons?
- Which methods were the most activating? Why?
- Which parts of the Module 10 were useful for future mathematics teacher?
- Were some activities more interesting?
- Were some methods competely new for ITE student? Which ones?
-

The posters filled out during Café sharing method will be displayed publicly as the Module 10 poster gallery.



 Activity 3.2: Importance and usefulness of key competencies	
  Plenary	 20 min
<p>Give your personal feedback of the activities experienced in Module10.</p> <p>Posters created during Café can be completed by individual feedback (labels) and or written comments.</p> <p>Lecturer gives instructions to the final piece of assessment: Essay consists of one to three A4 pages. Topic: Personal feedback to the Module10. Essay is handed out in digital format.</p>	
	Homework
<p>Write the essay.</p>	

