

LESSON PLAN

Title

THE INVADED ARCTIC

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Subject

Biology (ecology, nature management)

Topic

- * Polar regions
- * climate change
- * human impact on nature
- * scientific research

Aim of the lesson

After finishing the tool kit, the goal is that the student

- 💡 knows what an ecological niche is
- 💡 grasps the main differences between native species and exotic species
- 💡 has an idea of factors that make an exotic species likely to become invasive
- 💡 understands why it is important to study species invasions

Pedagogical framework

- * STEAM learning (interdisciplinary tool kit combining a wide range of subject fields.
- * GAME-based learning and gamification

Age of students

- * 13-16 (basic material)
- * 17-19 (basic + advanced material)

Time

- * Preparation time: 30 minutes (teacher) + 1 hour for students who present lesson summary



- * Lesson duration: 1-2 school hours teaching, 2+ hours student exercises (or as homework)
- * Homework: 2+ hours (if not doing the exercises during lesson time at school)
- * Follow-up lesson: 1 school hour (after exercises)



Teaching materials and tools

Multiple links to sources online of background material plus suggested exercises are listed in the materials for teachers.



21st century skills

- * Critical thinking and problem solving
- * Global awareness
- * Environmental literacy



Activity plan

Activity		Explanation	Minimum time (minutes)	Resources available with the tool-kit
A BEFORE LESSON	1 Prepare	Do a quick brush-up of your own knowledge about invasive species using the Materials for teachers. It contains all you need to complete a full lesson, while you may have to check the additional resources to meet questions from particularly inquiring minds. Prepare your lesson by mixing the more light-hearted FUN FACTS and the more scientific powerpoint slides, depending on the level and interest of your students. Depending on how much teaching time you have available, you can split the topic into two lessons: start out with the basic ecology (exotic vs invasive and ecological niche). Then address consequences and actions in the next.	30	<ul style="list-style-type: none"> • Materials for teachers • Powerpoint • Webinar recording • Additional resources (listed under Materials for teachers, as well as under Worksheet, teacher's version)
	1 Kick-start	Students write down their individual answers to 2 questions before you start the lesson, to kick-start their curiosity. <ul style="list-style-type: none"> • Are all EXOTIC species bad news for nature? • Are there more INVASIVE species in the Arctic than in [insert name of school town/place]? If you can have two lessons, kick-start the next one with: <ul style="list-style-type: none"> • Can invasive species completely take over nature? 	5	NB: no googling allowed, students should use only their pre-knowledge and imagination
B DURING LESSON	2 Introduce	Lesson by teacher and/or webinar recording with Cornelya Klutsch (topic expert scientist). We recommend an interactive lesson rather than webinar at this point.	15	See A.1 Prepare
	3 Figure out	Students are divided into groups to work on the relevant part of the worksheet.	15	Worksheet for students (with teacher's version)
	4 Discuss	Discuss in-class questions that challenges the students in the worksheet. Wrap up the take-home messages from the lesson. We suggest the niche theory and why invasive species is a problem, and that humans are the ones causing the problem. Assign home-work (C.1-3 below)	10	Worksheet for students (with teacher's version)

C HOMEWORK	1 Basic	All students complete the worksheet, either individually or in groups. There are two levels on the final challenge in the worksheet, to meet different student levels.	60+	Worksheet for students
	2 Eager	Provide the more eager students with additional resources	60+	Additional resources (see above under A.1)
	3 Present	<p>3 groups of randomly selected students prepare a 2-min presentation of one each of the kick-start questions:</p> <ul style="list-style-type: none"> • Are all EXOTIC species bad news for nature? • Are there more INVASIVE species in the Arctic than in [insert name of school town/place]? • Can invasive species completely take over nature? <p>We encourage that students can feel very free to choose presentation form, for example acting instead of making a powerpoint, make an animation or write a poem.</p>	30+	
D AFTER LESSON	1 Present	Start lesson with the student presentations. After each presentation have a brief Q&A, keeping in mind also the worksheet that was used as part of the homework.	20+	
	2 Challenge	<p>Continue the discussion asking the students for solutions to the problem of invasive species. What can each and every person do? Are all means okay in the fight against invasive species? In the materials for the teacher, you find graphs, textbox etc that you can show in-class to challenge the students.</p> <p>Do the digital escape room either online or offline</p>	<p>10</p> <p>10</p>	<p>Materials for teacher</p> <p>Exercise for students (also available in offline PDF version)</p>
	3 Evaluate	<p>Wrap up again the take-home messages from the tool-kit. Invite student to share in-class their experiences during the learning. End with a reverse evaluation, where you let the students evaluate rather than being evaluated:</p> <p>3 jars are prepared, one marked: INTERESTING? the second UNDERSTANDABLE? the third one CHALLENGING?</p> <p>In the box next to the jar there are post-it note in 2 colours: RED- for NO, GREEN – for YES</p> <p>As students leave the lesson, they put one post-it note into each jar, that reflects their own experience.</p>	5+	