TECHNOLOGY - LESSON PLAN

Grade:	7th- 8th grade (age 13-14)
Subject:	United in Biodiversity - **Habitat Fragmentation**
Lesson n°:	**6**
Topic:	**Parus Major's Inn - Design and Construction of a Birdhouse**
Lessons focus and goals:	**Goals**: This lesson aims to emphasize the importance of habitat conservation and encourages students to think about how they can actively intervene in support of it using technology. The activity not only promotes an emotional connection with nature, highlighting the essential role of birds, but also aims to develop practical and creative thinking skills. The use of technologies such as 3D printing will demonstrate to the students how digitization can be a powerful tool in environmental conservation, encouraging them to consider technological solutions to preserve habitats and ensure a sustainable future for biodiversity. **Focus:** In this specific lesson, students will design, in small groups, their birdhouse to be placed in an outdoor space of the school, with the aim of promoting the population of native species. A first introductory phase dedicated to biodiversity and habitat fragmentation will be followed by a part of local biodiversity observation and one of birdhouse design. Subsequently, students will have to, through 3D modeling software (e.g., Tinkercad, Blender, Sketchup, etc.), create their personalized design, developing practical and creative thinking skills. The actual implementation phase will follow, using the 3D printer. Finally, students will place their creations in the chosen outdoor space and present their creations to the class, highlighting the creative process and motivating the proposed solutions.
Learning objectives:	● Acquire a deep understanding of habitat fragmentation, especially in relation to one's own territory ● Develop practical skills through the design and construction of a birdhouse, applying creativity and problem-solving in a targeted manner ● Effectively communicate ideas, reflections, and design decisions ● Learn the basics of using 3D modeling software such as Tinkercad, developing targeted digital skills

	• Use slicing software like Cura to prepare 3D models, applying concepts of preparation and configuration suitable for printers • Learn the basics of how 3D printers work and the dedicated materials • Promote an active and conscious attitude towards the environment that surrounds us

Materials	• Educational resources on biodiversity and local birds. • Computer with internet access. • 3D printer. • 3D printing filament. • 3D modeling software (e.g.Tinkercad). • Slicing software (e.g. Cura).
Structure and activities	**6 modules of 45 minutes each** **Phase 1** Introduction to the concept of habitat fragmentation through short videos/articles/podcasts on the topic and exploration of local bird biodiversity • e.g. Habitat Fragmentation Lesson Habitat Fragmentation and Urban Birds • Focus on biodiversity loss related to habitat fragmentation and urban construction: a look at our territory • The importance of reforestation in solving habitat fragmentation. e.g. Guide to reforestation (ITA), Creating A Bird-Friendly Garden **Phase 2 (45 minutes)** Introduction to 3D printing and project explanation. • 3D Printing: Printing Technologies, Materials, Model Characteristics e.g. 3D PRINTING 101: The ULTIMATE Beginner's Guide All the Different 3d printing Filaments Explained! https://www.hubs.com/knowledge-base/selecting-right-3d-printing-process/ • Presentation of the operational project: building a birdhouse **Phase 2 (45 minutes)**

	• Research and observation of already made birdhouses e.g. https://www.thingiverse.com/search?q=birdhouse&page=1 • Explanation of the characteristics of a 3D model suitable for printing • Group division and design of their own birdhouses, taking into account the needs of the birds, observed characteristics (dimensions, shape, positioning methods, etc.), and suggested best practices for printable models (a maximum of 5 students per group is suggested). **Phase 3 (45 minutes)** • Introduction to 3D modeling software (Tinkercad) e.g. Tinkercad Tutorial Part 1 - (Interface and Movement) • Tutorial on how to use Tinkercad to design a birdhouse. • Construction of the customized 3D model, considering the functionality and solidity of the structure. **Phase 4 (45 minutes)** • Introduction to slicing software (Cura) and preparation of files for printing. e.g. How to Use Ultimaker Cura 5: A Beginner's Guide 2023 https://www.roboze.com/en/resources/3d-printing-profile-and-3d-printing-parameters-how-to-choose-printing-settings-to-print-a-part.html • Demonstration of the 3D printing process. • Students prepare their models and monitor the process (one test print). The prints of the remaining models can be managed by the teacher or, if available, by contacting a local Fablab (*Fabrication Laboratory)*. **Phase 5 (45 minutes**) • Placement of birdhouses in designated spaces • Discussion on the functionality and sturdiness of the created birdhouses. • Presentation of their design to the class and explanation of their design choices.

Assessments:

#1 - Birdhouse design

	Initiating	Developing	Excelling
Description of performance	The students present a very simple birdhouse project with a basic understanding of habitat fragmentation. The design may lack specific details on adapting the birdhouses to mitigate fragmentation and may reflect a limited awareness of the issue	The students demonstrate a deeper understanding of habitat fragmentation in the design of the birdhouses. The structure of the birdhouses reflects a more detailed consideration of the needs of locally threatened species and how the design can contribute to reducing fragmentation	The students exhibit an advanced understanding of habitat fragmentation in their birdhouse design. The structure is intricate, responding significantly to the needs of locally threatened species and providing innovative and specific solutions to mitigate fragmentation
Sample student response	I've thought about how the birdhouse might appeal to the birds, but I haven't considered habitat fragmentation much in the design of the birdhouses.	In my birdhouse design, I specifically aimed to consider how the design could help reduce habitat fragmentation. I strategically positioned the birdhouses to create ecological corridors and thought about how they could be used to connect fragmented habitats	The design of the birdhouses has been carefully conceived, taking habitat fragmentation into consideration. In addition to providing safe shelters, I've integrated connecting elements between the birdhouses to promote a less fragmented environment. The design aims to be an active contribution to habitat conservation

#2 - Reflection on Birdhouse Impact

	Initiating	Developing	Excelling
Description of performance	The students demonstrate a basic understanding of the impact of their birdhouse project. Reflection on the effect of the design on habitat fragmentation may be limited and generic	The students demonstrate a deeper understanding of the impact of their birdhouse project compared to habitat fragmentation. The reflection highlights a growing awareness of the importance of connecting the birdhouse design to habitat preservation	The students demonstrate an advanced awareness of the impact of their birdhouse project on birdhouses in relation to habitat fragmentation. The reflection is comprehensive, considering specific aspects of habitat conservation and suggesting deep connections between the design of the birdhouses and the mitigation of fragmentation
Sample student response	I created these birdhouses to protect the birds, but I haven't thought much about the impact on the habitat. I just hope they can provide a safe place	In the design of the birdhouses, I sought to consider how they could positively impact the habitat, providing a safe refuge that might contribute to reducing fragmentation. I believe the birdhouses can play a broader role in conservation	The design of the birdhouses has been conceived with particular attention to the impact on the habitat. I believe that by providing targeted solutions, such as strategically positioned birdhouses, we can significantly contribute to reducing fragmentation. My project aims to be an active element in habitat conservation, not just a shelter for the birds

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Quantitative Assessment Rubric:

Criteria	Initiating	Developing	Excelling
Description of Performance			
Birdhouse design			
	1-3 points	4-6 points	7-10 points
	1-3 points	4-6 points	7-10 points
	1-3 points	4-6 points	7-10 points
Reflection on Birdhouse Impact			
	1-3 points	4-6 points	7-10 points
	1-3 points	4-6 points	7-10 points
	1-3 points	4-6 points	7-10 points

Assessment Table: Inclusion and Diversity - Habitat Fragmentation

Criteria	Check
Information offered in multiple formats	
- Variety of learning materials provided	
- Text, visual, auditory resources	
Inclusive methodologies like peer-to-peer learning	
- Opportunities for collaborative activities	
- Group discussions, peer teaching	
Use of ICT tools	
- Integration of technology in learning activities	
- Use of online platforms, interactive tools	
Overall Inclusion and Diversity	
- Integration of diverse perspectives	
- Opportunities for student engagement	
- Promotion of equitable participation	

Explanation of Criteria:

- **Information offered in multiple formats:**
  - Assess whether the lesson plan provides learning materials in various formats such as text, visuals, and auditory resources to cater to diverse learning styles.

- **Inclusive methodologies like peer-to-peer learning:**
  - Evaluate if the lesson plan incorporates inclusive methodologies like peer-to-

peer learning, group discussions, and collaborative activities to encourage interaction and engagement among students.

- **Use of ICT tools:**
  - Determine if the lesson plan utilizes ICT tools such as online platforms and interactive resources to enhance learning experiences and accessibility.

- **Overall Inclusion and Diversity:**
  - Summarize the overall assessment of inclusion and diversity in the lesson plan, considering the integration of diverse perspectives, opportunities for student engagement, and promotion of equitable participation.