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[LESSON PLAN]

Eco-Product Design with Generative AI

QUADRAT HAK × HLW Bundeshandelsakademie Wolfsberg Austria	Darica İlçe Milli Eğitim Müdürlüğü Turkey	Campus 02 Fachhochschule der Wirtschaft GmbH Austria	Directorate of Secondary Education of Kefallinia Greece	Jaunpiebalgas vidusskola Latvia	Sucessos Criativos, Lda Portugal	Sredno obshtoobrazovatelno uchilishte Lyuben Karavelov Bulgaria

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Authors

Campus 02 AUS

Selver Softic
Safet Softic
Yevheniia Andriichenko
Berndt Jesenko
Ioan Turcin

Disclamer

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1. TITLE

Designing Sustainable Products with Artificial Intelligence: Eco-Product Design with Generative AI

2. GRADE LEVEL

- [ ] ISCED Level 2 – Lower Secondary Education (ages 12–15)
- [x] ISCED Level 3 – Upper Secondary Education (ages 15–18)

3. SUBJECT AREA

- [x] Environmental Studies
- [x] Economics
- [x] Computer Science
- [ ] Mathematics
- [ ] Sciences
- [ ] Geography
- [x] Technology and Design
- [ ] History
- [ ] Social Studies
- [ ] Arts and Music
- [ ] Languages

4. TYPE

- [x] Lesson Plan
- [ ] Project

5. DURATION

- [ ] 1 x 40-50minute class
- [ ] 1 x 60-minute class
- [ ] 1 x 80-100-minute block
- [x] 2 x 45-minute classes

- [ ] 2 x 60-minute classes
- [ ] Double session (2 × 60 minutes) optional project-based homework.

6. LEARNING OBJECTIVES

By the end of the lesson, students will be able to:
O1 - Explain the principles of eco-design and why sustainable product design matters for the environment.
O2 - Use a generative AI tool to create concept designs for environmentally friendly products or packaging.
O3 - Evaluate sustainability features (materials, circularity, energy, durability, waste reduction) in AI-generated designs.
O4 - Propose improvements to AI-generated eco-products and justify design decisions.

7. Key Competences Developed

- [ ] Literacy
- [ ] Multilingual competence
- [x] Mathematical competence and competence in STEM
- [x] Digital competence
- [x] Citizenship competence
- [x] Cultural awareness and expression competence
- [ ] Entrepreneurship competence
- [ ] Personal, social and learning to learn competence

8. Prior Knowledge / Prerequisites

- Basic ability to navigate a website
- No prior knowledge of AI required
- Simple understanding of environmental impacts (plastic vs. biodegradable materials)

9. Lesson/Project Outline

Phase 1 – Introduction (Engage & Contextualize)

Time: 20 minutes

Suggested Components

Short video (8 min) on plastic pollution / sustainable design
Photo examples: eco-redesign (e.g., glass vs. plastic, bamboo vs. single-use)

Guiding Questions

- What makes a product “sustainable”?
- Why do companies and consumers move towards eco-friendly designs?
- How can AI support designers?

Resource (name)	Link (to the folder on Teams)
Presentation: Slide 2-11	Designing Sustainable Products with AI.pptx

Phase 2 – Exploration (Investigate & Compare)

Time: 20 minutes

Mini-group activity

Students evaluate 3 existing products:

- Good design?
- Wasteful design?
- How would they improve it?

Introduce Generative AI

Tools may include:

- Ideogram
- Leonardo.ai
- Adobe Firefly
- DALL·E 3 (whichever available at school)

Focus on Sustainability Criteria

- Material
- Durability
- Waste
- Energy in production
- Reuse / refill
- Cultural relevance

Resource (name)	Link (to the folder on Teams)
Presentation: Slide 12-16	Designing Sustainable Products with AI.pptx

Phase 3 – Application (Hands-On Practice)

Time: 30 minutes

Hands-On Activity:
Create 3 AI-generated eco-product designs.

Steps:
1. Students choose a product category, e.g.:
   water bottle
   food packaging
   cosmetic container
   shopping bag
   school supplies
2. Students write prompts that include:
   sustainable materials (bamboo, cork, recycled paper, bioplastics, glass)
   minimalistic & functional design
   local cultural elements (optional)
3. Generate 3–5 creative options.
4.Select the best variant and justify the choice.
5. Document the process with screenshots.

Expected Outputs
- ✓ 3 AI-generated eco-designs
- ✓ 1 selected final concept
- ✓ A short explanation: Why is this sustainable?.

Resource (name)	Link (to the folder on Teams)
Presentation: Slide 17-18 Promt Sheet	Designing Sustainable Products with AI.pptx Prompt Sheet.docx

Phase 4 – Reflection & Consolidation (Present & Connect)

Time: 20 minutes

Mini-presentations (2–3 minutes per group)
- Each group shows:
- Original AI design
- Sustainability features
- Possible improvements
- Realistic materials they would choose

Reflection
Students write:
"How can eco-design and AI together reduce environmental impact in my community?"

Optional school extension
Create a school exhibition "AI-Generated Sustainable Products".

Resource (name)	Link (to the folder on Teams)
Presentation: Slide 19-20 Reflection Sheet	Designing Sustainable Products with AI.pptx Reflection Sheet .docx

10. Assessment Criteria

Performance-based (primary)
- Quality of AI prompts and generated designs
- Understanding of eco-design principles
- Ability to explain sustainability choices
- Participation in group work

Portfolio (recommended)
- 3–5 AI design images
- Notes on materials and sustainability
- Reflection text
- Screenshots of AI process

Self-assessment
Students rate their:
- Creativity
- Digital skills
- Sustainability awareness

Resource (name)	Link (to the folder on Teams)
Assessment Criteria Sheet	Assessment Criteria Sheet.docx

11. Teaching Materials

Name	Type (Developed/Existing)	Link	Role in the lesson
Teacher slides	pptx	Designing_Sustainable_Products_with AI.pptx	Main
Prompt Sheet	docx	Prompt Sheet.docx	Main
AI Tools List	Tools	Ideogram https://ideogram.ai Leonardo.ai https://leonardo.ai Adobe Firefly https://firefly.adobe.com DALL·E https://labs.openai.com Bing Image Creator https://www.bing.com/create	Main
Reflection Sheet	docx	Reflection Sheet .docx	Main
Assessment Criteria Sheet	docx	Assessment Criteria Sheet.docx	Main

12. External Resources and References

Resource (name)	Link (external or to the folder on Teams)
EU Circular Economy overview	Overview - Circular economy - Eurostat
Ellen MacArthur Foundation – sustainable design	Circular Design Meaning, Definition & Role | Ellen MacArthur Foundation
Wikimedia Commons eco-design cases	Category:Ecodesign - Wikimedia Commons
OECD. (2023). *AI and Green Innovation*.	Green technology and innovation | OECD