AI-GREENER
2024-1-AT01-KA220-SCH-000248327

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LESSON PLAN

AI in Waste Management

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

FH CAMPUS 02

Selver Softic, Safet Softic, Yevheniia Andriichenko, Berndt Jesenko, Ioan Turcin

Disclamer

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

1. TITLE

AI in Waste Management

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

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

4. TYPE

- [x] Lesson Plan
- [ ] Project

5. DURATION

- [x] 1 x 40-50minute class
- [ ] 1 x 60-minute class
- [ ] 1 x 80-100-minute block
- [ ] 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 how AI improves waste sorting, recycling, and collection efficiency..
- **O2** – Analyse examples of robotics, computer vision, and predictive maintenance in waste systems.
- **O3** – Evaluate how AI reduces contamination, landfill use, and carbon emissions.
- **O4** – Demonstrate understanding by matching AI waste-management tools with their descriptions.

7. Key Competences Developed

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

8. Prior Knowledge / Prerequisites

Students should know basic waste categories, simple recycling concepts, and have a basic understanding of digital technologies.

9. Lesson/Project Outline

Phase 1 – Introduction (Engage & Contextualize)

Purpose: Introduce waste-management challenges and why smarter solutions are needed.
Activities:

- Show SmartWasteManagement.pptx slides 1–6.
- Class discussion:
  - Why is waste sorting difficult today?
  - What problems occur in traditional systems (contamination, hazards, low recycling rates)?

Expected Output: Students identify major issues in current waste systems.

Resource (name)	Link (to the folder on Teams)
AI in Waste Management Presentation (slides 1–6)	**AI for Smart Cities: Optimizing Energy, Transport, and Services (Slides) – in folder**

Phase 2 – Exploration (Investigate & Compare)

Purpose: Explore how AI technologies modernize waste sorting, recycling, and operations.

Activities:

- Each group studies one topic from slides 7–20:
  - AI sorting
  - Robotics
  - Computer vision
  - Predictive maintenance
  - Smart resource management
  - Cost efficiency & ROI
- Groups produce a 4-point summary:
  - How it works
  - What problem it solves
  - Sustainability benefits
  - Real example from PPT

Expected Output: Short, clear group summary explaining their assigned AI technology.

Resource (name)	Link (to the folder on Teams)
SmartCity Presentation (slides 7–20)	**AI in Waste Management (Slides) – in folder**

Worksheet "AI in Waste Management"	**In folder**

Phase 3 – Application (Hands-On Practice)

Purpose: Apply understanding by matching AI waste tools with correct functions.
Activities:

- Students complete the LearningApps activity:
- .

Expected Output: Correct matches of AI waste-management tools and descriptions.

Resource (name)	Link (to the folder on Teams)
LearningApp "Smart Waste Management: Sorting and Technology"	**https://learningapps.org/43369980**

Phase 4 – Reflection & Consolidation (Present & Connect)

Purpose: Connect lesson content to sustainability and real-world waste solutions.

Activities:

- Students complete the 4-question reflection worksheet:
  - What problems in traditional waste management systems does AI help solve?
  - How do robotics and computer vision improve sorting and recycling?
  - Why is predictive maintenance important in waste facilities?
  - Which AI waste technology do you think is most important for the future? Explain your choice.?

Expected Output: Students provide thoughtful, well-justified answers connecting AI to sustainability.

Resource (name)	Link (to the folder on Teams)
Reflection Worksheet (DOCX)	**In folder**

10. Assessment Criteria

Method	Description
Completion and accuracy of LearningApps activity	Checks if students can correctly identify AI waste technologies and functions.
Quality of group summary	Assesses accuracy and clarity when explaining an assigned AI technology.
Clear answers in reflection worksheet	Evaluates understanding of sustainability benefits and AI's role in waste systems.
Active participation in discussions and group work	Checks teamwork, communication, and engagement.

Resource (name)	Link (to the folder on Teams)

11. Teaching Materials

Name	Type (Developed/Existing)	Link	Role in the lesson
AI in Waste Management (Slides)	Developed	in folder	Core visual material
Reflection Worksheet	Developed	In folder	Individual reflection
LearningApp "Smart Waste	Developed	https://learningapps.org/43369980	Individual reflection

Management: Sorting and Technology ”			
Worksheet	Developed	In folder	Individual reflection

12. External Resources and References

Resource (name)	Link (external or to the folder on Teams)
EU Circular Economy Platform	https://circulareconomy.europa.eu/
OECD – AI & Environmental Innovation	https://www.oecd.org/environment/
European Environment Agency – Waste & Recycling	https://www.eea.europa.eu/themes/waste