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| ACTIVITY PLAN | | | | |
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| **Theme** | **Subtopic** | **Activity Title** |
| STEAM Integration in Environmental Education | Engineering for Sustainable Infrastructure | Green Transportation Solutions |

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| Introduction part (or activity overview) |
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| **Introduction part (or activity overview)** | This activity focuses on exploring and designing green transportation solutions as a critical component of sustainable infrastructure. Students will delve into the environmental impacts of current transportation systems and apply engineering principles to propose innovative, sustainable transportation alternatives. |
| **SETTING** | Location: Classroom equipped with computers, internet access, and tools for creating digital and physical models.  Educational Context: Collaborative group work (2-3 students per group) |

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| Materials Needed |
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| **Materials Needed** | Computers with internet access for research and design simulations  Software for transportation modeling and design (e.g., Autodesk, Civil 3D)  Projector and screen for presentations  Materials for building small-scale models (optional) |

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| **Learning Outcomes** | * Understand the environmental challenges associated with traditional transportation systems. * Apply engineering concepts to design sustainable transportation solutions. * Develop skills in digital modeling and persuasive presentation. |  |
| **Activity Contents** | **Theoretical Part (Duration: 60 minutes)**: Provide a comprehensive overview of the challenges posed by conventional transportation systems, including their contributions to air pollution, greenhouse gas emissions, and urban sprawl. Introduce the concepts of sustainable transportation, such as electric vehicles, public transit systems, cycling infrastructure, and pedestrian-friendly urban design.   * **Key Concepts Covered**:   + Environmental impact of different modes of transportation.   + Principles of sustainable transportation design.   + Technological innovations in transportation, like autonomous vehicles and smart infrastructure. * **Video Resources**:   + "The Future of Transportation" (<https://www.youtube.com/watch?v=exampleLink1>) – Discusses emerging trends and technologies in sustainable transportation.   + "Engineering Smarter Ways to Travel" (<https://www.youtube.com/watch?v=exampleLink2>) – Showcases engineering solutions that have successfully mitigated transportation-related environmental impacts.   **Task 1: Analyzing Current Transportation Systems (Duration: 90 minutes)** **Step 1**: Each group selects a city and researches its main transportation challenges, focusing on environmental impacts.  **Step 2**: Conduct an analysis that includes:   * Current transportation modal share and its environmental repercussions. * The city’s existing policies and infrastructure concerning transportation.   **Step 3**: Present a critical review of the city's transportation system, using data visualization tools to highlight key issues and areas for improvement.  **Task 2: Designing a Sustainable Transportation Model (Duration: 120 minutes)** **Step 1**: Based on their analysis in Task 1, students design a comprehensive sustainable transportation solution for the selected city. Consider integration of multiple transport modes, use of renewable energy sources, and enhancement of urban connectivity.  **Step 2**: Develop a detailed project plan that includes:   * Proposed changes and additions to the current infrastructure. * Expected environmental and social benefits. * Implementation phases and potential challenges.   **Step 3**: Utilize digital modeling tools to create a visual representation of the proposed transportation model.  **Step 4**: Each group presents their design to the class, explaining the rationale behind their choices and the expected impact of their model. |  |
| **Assessments** | Depth of analysis on current transportation issues.  Innovation and sustainability of the proposed transportation model.  Technical proficiency in using digital modeling tools.  Clarity and persuasiveness of the final presentation. |  |
| **Key Competences** | Analytical and problem-solving skills  Technical and digital literacy  Creative and innovative thinking  Communication and teamwork |  |
| **Connections with Eco STEAM** | Engineering: Core focus on applying engineering solutions to environmental challenges in transportation.  Science: Understanding the environmental science behind transportation emissions and impacts.  Technology: Using advanced technology for simulation and modeling.  Arts: Creatively presenting transportation models and data.  Math: Utilizing mathematical models to predict outcomes and impacts. |  |
| **References** | Institute for Transportation and Development Policy https://itdp.org/ |  |
| **Notes** | This activity can extend into a project-based learning experience where students can engage with local city planners or transportation experts to discuss the feasibility of their proposals. |  |

**Evaluation Table for Green Transportation Solutions Activity**

| **Evaluation Criteria** | **Points Available** | **Comments** |
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| **1. Depth and Accuracy of Transportation Analysis** | 20 | Evaluate the thoroughness and accuracy of the analysis conducted on the existing transportation systems and their environmental impacts. |
| **2. Innovation in Sustainable Transportation Design** | 20 | Rate the creativity and innovation in the design of the proposed sustainable transportation solutions. |
| **3. Application of Engineering Principles** | 20 | Assess how effectively engineering principles are applied in the proposed transportation solutions. |
| **4. Technical Proficiency in Digital Modeling** | 15 | Evaluate the skill and accuracy in using digital tools to model the transportation solutions. |
| **5. Sustainability Features Integration** | 10 | Judge how well sustainability features are integrated into the transportation design (e.g., energy efficiency, multimodal integration). |
| **6. Clarity and Organization of Presentation** | 10 | Assess the effectiveness of the presentation in terms of clarity, organization, and the use of visual aids. |
| **7. Team Collaboration and Interaction** | 5 | Rate the level of effective collaboration and contribution from all team members throughout the project. |

**Total Points:** 100