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

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| Introduction part (or activity overview) |
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| **Introduction part (or activity overview)** | This activity focuses on the integration of engineering principles in the development of sustainable infrastructure. Students will explore how engineering can be applied to enhance sustainability in urban planning, energy systems, and water management. The goal is to develop a conceptual design for a piece of sustainable infrastructure that addresses specific environmental challenges. |
| **SETTING** | Location: Classroom equipped with computers, internet access, and resources for model creation (optional physical modeling materials).  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  Software for architectural and engineering design (e.g., AutoCAD, SketchUp)  Projector and screen for presentations  Materials for building physical models (e.g., cardboard, glue, markers) (optional) |

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| **Learning Outcomes** | * Understand the role of engineering in developing sustainable infrastructure. * Apply engineering concepts to design a sustainable infrastructure project. * Enhance skills in digital modeling and presentation. |  |
| **Activity Contents** | **Theoretical Part (Duration: 60 minutes)**: Provide a comprehensive overview of sustainable infrastructure, discussing its importance in modern urban planning, energy conservation, and environmental protection. Highlight engineering solutions like green buildings, renewable energy installations, and eco-friendly water management systems.   * **Key Concepts Covered**:   + Principles of sustainable design and construction   + Innovations in green building materials and techniques   + The impact of infrastructure on natural resources and ecosystems * **Video Resources**:   + "Engineering Sustainable Cities" (<https://www.youtube.com/watch?v=exampleLink1>) – Details how engineers design cities that balance human needs with environmental protection.   + "Innovations in Sustainable Infrastructure" (<https://www.youtube.com/watch?v=exampleLink2>) – Explores recent engineering advancements in creating more sustainable and resilient infrastructure.   **Task 1: Sustainable Infrastructure Case Study (Duration: 90 minutes)** **Step 1**: Each group selects a real-world example of sustainable infrastructure that integrates innovative engineering solutions. Possible focuses could include energy-efficient building designs, sustainable urban drainage systems, or integrated renewable energy systems.  **Step 2**: Conduct in-depth research on the selected project, analyzing:   * Engineering principles utilized * Environmental impact and sustainability features * Challenges faced during design and implementation and solutions adopted   **Step 3**: Create a detailed presentation of the case study, illustrating the engineering concepts and sustainability outcomes through diagrams, photos, and data.  **Task 2: Designing a Sustainable Infrastructure Project (Duration: 120 minutes)** **Step 1**: Identify a local environmental issue that could be addressed through improved infrastructure. Consider factors like energy consumption, water runoff, or urban heat.  **Step 2**: Utilize engineering software to design a conceptual model of a sustainable infrastructure solution. The design should include:   * A detailed layout that incorporates sustainable materials and technologies * Energy and water conservation features * Integration into the existing urban or natural landscape   **Step 3**: Each group presents their conceptual design to the class, explaining their design choices, expected sustainability outcomes, and potential community impact. Feedback is solicited from peers and the instructor. |  |
| **Assessments** | Depth and relevance of case study research  Innovation and practicality of the sustainable infrastructure design  Technical proficiency in digital modeling and design  Clarity and effectiveness of final presentation |  |
| **Key Competences** | Technical and digital literacy  Environmental and sustainability awareness  Creative and critical thinking  Communication and teamwork |  |
| **Connections with Eco STEAM** | Engineering: Core focus on applying engineering skills to solve environmental problems.  Science: Understanding the scientific principles that underpin sustainable infrastructure.  Technology: Using advanced software for design and simulation.  Arts: Incorporating aesthetic considerations into functional designs.  Math: Employing quantitative analysis for design and environmental impact assessment. |  |
| **References** | https://sustainableinfrastructure.org/ |  |
| **Notes** | This activity can be extended into a longer-term project where students might interact with local planning or environmental agencies to discuss the feasibility and potential implementation of their designs. |  |

**Evaluation Table for Engineering for Sustainable Infrastructure Activity**

| **Evaluation Criteria** | **Points Available** | **Comments** |
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| **1. Depth of Case Study Research** | 20 | Evaluate the thoroughness and depth of the research conducted on the selected sustainable infrastructure case study. |
| **2. Understanding of Engineering Principles** | 20 | Assess the accuracy and application of engineering principles in the analysis of the case study. |
| **3. Innovation in Design** | 20 | Rate the creativity and innovation in the design of the proposed sustainable infrastructure project. |
| **4. Sustainability Features** | 15 | Evaluate how well sustainability features are integrated into the infrastructure design. |
| **5. Technical Proficiency in Modeling** | 10 | Assess the technical skill and accuracy in using engineering software to create digital models. |
| **6. Clarity and Organization of Presentation** | 10 | Judge 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