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| ACTIVITY PLAN | | | | |
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| **Theme** | **Subtopic** | **Activity Title** |
| STEAM Integration in Environmental Education | Mathematics in Environmental Modeling and Analysis | Using Mathematics for Environmental Modeling and Analysis |

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| Introduction part (or activity overview) |
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| **Introduction part (or activity overview)** | This activity aims to demonstrate the critical role of mathematics in understanding and solving environmental problems through modeling and analysis. Students will use mathematical concepts and tools to analyze environmental data and create models that can predict and address environmental issues. |
| **SETTING** | Location: Classroom and computer lab for research and analysis.  Educational Context: Collaborative group work (4-5 students per group). |

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| Materials Needed |
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| **Materials Needed** | Computers with internet access and relevant software (e.g., spreadsheets, mathematical modeling tools)  Access to online data sources for environmental statistics  Projector for presentations  Graph paper, calculators, and other mathematical tools |

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| **Learning Outcomes** | * Understand the role of mathematics in environmental modeling and analysis. * Develop skills in data collection, analysis, and mathematical modeling. * Enhance abilities in research, project development, and presentation. |  |
| **Activity Contents** | **Theoretical Part (Duration: 45 minutes)**: Begin with an introduction to the significance of mathematics in addressing environmental issues. Highlight various mathematical methods and tools used in environmental analysis.   * **Introduction to Environmental Mathematics**:   + Discuss the application of statistical methods, differential equations, and computational models in environmental science.   + Explore case studies where mathematical modeling has successfully addressed environmental challenges. * **Video Resources**:   + " Environmental Science track - Math & Science Institute " https://www.youtube.com/watch?v=S4fTX8kMgKI – A video showcasing the role of mathematics in environmental science and its applications.   **Task 1: Data Collection and Analysis (Duration: 45 minutes)** **Objective**: To collect and analyze environmental data using mathematical tools.   * **Step 1**: Form groups and assign each group a specific environmental parameter to study (e.g., air quality, water quality, temperature changes). * **Step 2**: Use online data sources to collect historical data on the assigned parameter. * **Step 3**: Input the data into a spreadsheet or mathematical software to analyze trends, patterns, and anomalies. * **Step 4**: Use statistical methods to interpret the data and draw conclusions.   **Task 2: Mathematical Modeling (Duration: 90 minutes)** **Objective**: To create a mathematical model that predicts future environmental conditions based on collected data.   * **Step 1**: Based on the data analysis, develop a mathematical model using relevant methods (e.g., regression analysis, differential equations). * **Step 2**: Use the model to predict future values of the environmental parameter under different scenarios (e.g., increased pollution, climate change mitigation efforts). * **Step 3**: Validate the model by comparing its predictions with actual data and adjust as necessary. * **Step 4**: Prepare a presentation summarizing the data analysis, model development, predictions, and potential solutions based on the model.   **Task 3: Presentation and Feedback (Duration: 45 minutes)** **Objective**: To present the mathematical model and analysis to the class and receive feedback.   * **Step 1**: Each group presents their data analysis, mathematical model, and predictions to the class. * **Step 2**: Conduct a Q&A session where other students and the instructor can provide feedback and ask challenging questions. * **Step 3**: Groups reflect on the feedback received and discuss potential improvements. |  |
| **Assessments** | Accuracy and thoroughness in data collection and analysis.  Innovation and appropriateness of the mathematical model.  Quality and feasibility of the model predictions.  Clarity and persuasiveness of the presentation.  Team collaboration and dynamics. |  |
| **Key Competences** | Research and analytical skills  Mathematical proficiency in environmental applications  Strategic planning and project management  Effective communication and presentation skills  Teamwork and collaboration |  |
| **Connections with Eco STEAM** | Eco: Understanding and addressing environmental issues through mathematical analysis.  Science: Applying scientific principles to analyze and solve environmental problems.  Technology: Utilizing digital tools and software for data analysis and modeling.  Engineering: Designing and validating mathematical models to address environmental challenges.  Arts: Creating engaging presentations and visualizations to communicate findings.  Math: Using data analysis, statistical methods, and mathematical models to support environmental solutions. |  |
| **References** | www.environmentalmath.org |  |
| **Notes** | This activity can be extended into a longer-term project, where students continuously develop and refine their mathematical models based on ongoing research and feedback. |  |

**Evaluation Criteria Table for Using Mathematics for Environmental Modeling and Analysis Activity**

| **Evaluation Criteria** | **Points Available** | **Comments** |
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| **1. Accuracy and Thoroughness in Data Collection and Analysis** | 20 | Assess the precision and comprehensiveness of the data collected and analyzed. |
| **2. Innovation and Appropriateness of the Mathematical Model** | 20 | Evaluate the creativity and suitability of the mathematical model developed to address the environmental issue. |
| **3. Quality and Feasibility of Model Predictions** | 20 | Rate the reliability and practicality of the model's predictions and solutions. |
| **4. Clarity and Persuasiveness of Presentation** | 20 | Rate the clarity, persuasiveness, and professionalism of the presentation. |
| **5. Team Collaboration and Dynamics** | 20 | Assess the level of teamwork, including communication, cooperation, and mutual support among team members. |

**Total Points:** 100