Creative Thinking Lesson Plan - PME 833

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Class: Grade 6	Subject: Science	Unit: Ecosystems
Textbook:	Science: A Closer look	pp. 194-202
Time frame:	These activities will take place within a flexible time frame agreed upon by the teacher and students to ensure that students have sufficient time to express their creativity.	

Note: The students are completing an inquiry-based unit on ecosystems and are learning about how ecosystems constantly change due to both natural and human impacts, which can have dramatic effects on the ecosystem over time.

Critical Challenge

To design a product that addresses the problem of human impacts on the ecosystem.

Purpose

These activities are designed to promote critical and creative thinking about humanity's role in the ecosystem and how our actions and products to meet our needs shape the environment. The students will apply their understanding of the parts of and relationships within ecosystems to determine ways to reduce human impacts on the ecosystem through the designing of a product that takes into consideration human needs within the environment, but reduces the impact on the ecosystem.

Outcomes

- Students will appreciate our role and relationships within the ecosystem and recognize the impacts of our activities.
- Students will think critically and creatively about how we can reduce human impacts on the ecosystem.
- Students will explore and collect evidence from the community to recognize environmental challenges.
- Students will synthesize background knowledge and newly acquired knowledge to design a product that addresses a problem of human impact on the ecosystem.
- Students will examine ideas and information through different perspectives to acquire new knowledge and assist in problem solving.
- Students will collaborate and use peers as resources to build understanding and design a product.
- Students will develop habits of mind and thinking strategies for creativity.
- Students will communicate to support and/or challenge the conclusions made by peers.
- Students will collaborate to evaluate and provide feedback on the creative work of peers for revision and improvement.

Materials:	• Smartboard • Tablets / computer lab resources • Worksheet - Impacts of our daily activities • Art /building supplies (varied based on choice of design) • Assignment Rubric / Feedback Form

Experience - Part 1		
Lesson phase	**Activity Description**	**Pedagogy**
Review	Provoke a discussion to answer the questions: ● Are changes in ecosystems positive or negative? ● How do ecosystems change over time? What are the causes of these changes? What are the effects? Encourage students to use evidence to defend their ideas and opinions and apply conceptual knowledge. Teacher will help guide the discussion and determine that the causes of change affect the ecosystem's resources (air, water, soil, sunlight), habitats (landscape), and living things. These will become criteria for thinking in the next activity.	*Review to assess background knowledge* *Thinking strategies: Using reasoned judgments to defend an opinion* *Making criteria overt*
Making Connections	Tell students that they will make a list of 3 activities that they did before coming to school today and using the criteria above (resources, habitat, and living things), they will determine the effects that these activities had on the ecosystem. The teacher will model thinking strategies by using an example and having the students assist in determining the effects: Activity: I drove my car to work. Effects on environment: Resources- Polluted the air; Used oil dug from the earth Living things - May have run over and killed bugs. Habitat - A road had to be built, which removed forests Give students the worksheet, Effects of my Daily Activities, and give time to brainstorm their activities and effects. Next, tell the students to choose the one activity that they think had the biggest impact on the ecosystem and share it in their discussion groups (groups of 4). Encourage students to give feedback and build on ideas to determine other possible effects that haven't been thought of. Next, the students rank their morning activities from greatest impact to least impact. The results will be shared and discussed as a class. Encourage students to provide new evidence and different perspectives during the discussion.	*Engagement in the topic* *Teach thinking strategies: Applying criteria for critical thinking to complement creative thinking* *Teach conceptual knowledge*
Formative assessment	As students are working, check in with each group to ensure they are following procedures and expectations, check understanding, and scaffold students who need additional help. Provide feedback on progress considering the tools for critical thinking: Habits of mind, thinking strategies, background knowledge, conceptual knowledge, applying criteria.	

Community Walk	Tell students to look out the window and make observations about what they see. Ask: Do you think this area looked the same 10 years ago? 100 years ago? 1000000 years ago? What has changed and why? Tell the students that we will go for a community walk around the school, surrounding neighbourhood, and at the base of the mountain next to the school. During the walk, the students' task is to, in their groups, use the tablets to take photographs of evidence of how humans have changed the ecosystem through their activities and products. Stress that the photographs could be of large structures having large impacts on the ecosystem like buildings or small changes like some garbage on the ground. While taking photos, the students will also keep a journal of what they photographed and take notes on the effects on the ecosystem represented in their photos while paying attention to the criteria provided above. Encourage students to try to make their group's photos unique from their peers to get a broad range of causes of change to the ecosystem. Before leaving the classroom, go over safety guidelines for the walk. Parent helpers will join on the walk to ensure safety while also allowing students to have more freedom to explore with adequate supervision and support.	*Expanding the learning environment* *Making observations in the community and natural environment* *Applying critical thinking to real-world problems within the community*
Presentation	Upon returning to the school, the students will go to the computer lab to print their best photos. Students will find a place around the school to work in groups to use their photos to produce a collage demonstrating the changes to the ecosystems caused by humans. The groups will present their collages to the class describing the photos they chose and discussing the effects that these observations have based on the criteria. Encourage students to ask questions, discuss findings, and provide supportive feedback to the groups.	*Demonstration of learning* *Develop habits of mind through communication and providing feedback*
Reflection - Homework assignment	Students will reflect in their online portfolios about the day's activities and consider the questions: ● What did you learn today about human impacts on the environment? ● Why is it important to reduce our impact on the environment and what challenges do we face? ● How can we overcome these challenges?	*Develop habits of mind through reflection*

Experience - Part 2		
Introduction of Creative Task	Tell students that as living things, humans are also part of the ecosystem, however, the photos they have taken demonstrate a problem we face in meeting our needs while reducing our impact on our ecosystem. Tell the students that they will choose one of the photos taken by their group (or by another group), and within their teams, their task will be to use creative thinking to design an action plan or new product that will serve to solve or improve upon the problem represented in the photo to reduce the impact on the ecosystem while maintaining the value in meeting human needs. Students will be given a lot of flexibility in the products they design. Some ideas include: ● An original invention that addresses the problem ● An innovation to an existing product ● An awareness campaign ● A strategic plan ● Another idea that is appropriate to the task The design can take any form such as a model, drawing, poster, presentation, video, working invention etc. The students can use any supplies/resources available in the school and have the option to bring their own supplies from home to suit the needs of the group and their design. At the end of the project, the students will present their designs at a "Help Our Ecosystem Expo". Members of the school community will be invited to attend to share the creations with a wider audience beyond the classroom.	*Giving choice to promote creativity and flexible thinking and determine best strategies to demonstrate ideas*
Definition of success criteria	To ensure that expectations for the creative task are clearly understood, agree upon a definition for creativity that needs to be met through their designs: *Creativity is the application of one's learning to develop a novel idea or product that has value within a context to respond to a problem* Using the definition, determine that the criteria for success will be to create a product that demonstrates 1. Application of learning (show understanding of ecosystems, changes in ecosystems, and the relationships within ecosystems) 2. Novelty (an original/unique product/design) 3. Value within the context (meet human needs) 4. Solution to a problem (reduce impact on the ecosystem). Show the students the blank rubric (with the criteria added) and work together with the students to fill in the spaces in the rubric to define products that will be categorized as excellent, good, satisfactory, and beginning for each of the criteria. Tell the students that they will perform a self-evaluation and peer evaluation using the rubric and use feedback to revise their work before submitting and presenting. As a class decide on a time frame and a due date that is appropriate and allows for adequate time to complete the creative task.	*Understand success criteria and means to assess creativity*

Generate ideas and dig deeper	To get started, the teacher will model the creative thinking process and teach the 'fishbone diagram'. Show a picture of someone driving a car (from original example in part 1) and draw a fishbone diagram on the board with the problem on the right side as the head (changes to the ecosystem) and the causes of the problem forming the ribs. With the students, briefly brainstorm possible solutions to the problem using sticky notes (so ideas can be revised easily as new perspectives are raised). Demonstrate how to confront challenges, take risks by exploring ideas without right or wrong answers, and using the vocabulary for critical, collaborative, and creative thinking. Next, students will apply the fishbone diagram strategy to their own problem. While working, the teacher will interact with the students, provide supportive feedback, and scaffold thinking or provide alternative thinking strategies as needed.	*Teaching the tools for creative thinking: Breaking problem into parts* *Develop habits of mind for creative thinking*
Collaborative design / Formative assessment	Give sufficient time to students to work through their designs ensuring that they have access to the resources they need (art/building supplies, tablets, computers etc.) and a good balance of support and freedom to explore ideas. As students work, teacher will implement formative assessment techniques paying close attention to the students': ● Emotions as they work through the challenge ● Self-beliefs and confidence when confronted with difficulty ● Strategies for goal setting, thinking, planning, monitoring, and designing ● Courage to take risks ● Language used for collaboration and exploring multiple perspectives ● Negotiation of conflict Provide constructive feedback, encouragement, and assist only when necessary.	*Develop thinking strategies* *Making criteria for thinking overt to make judgments* *Support expectations for community of thinkers* *Develop habits of mind to be open to new ideas/ perspectives and exploring different ideas*
Reflection	Students should do ongoing reflection in their online portfolios addressing: ● Successes and failures during the creative process ● Challenges faced and how they were dealt with ● Strengths and areas for growth	*Develop habits of mind through reflection*

Self- and Peer-evaluation	Using the assessment rubric and feedback form, students will perform a self-evaluation with their group. After, they will share their project with two other groups for peer-evaluation. Encourage students to provide meaningful feedback using the success criteria. Review expectations for peer-evaluation and feedback: ● Be critical, but respectful ● Focus on positive points before suggesting areas for improvement ● Address areas for improvement specifically and constructively ● Refer to the rubric to provide information that will help the student to improve Give adequate time for evaluation and feedback. After evaluations are completed, tell students that they should use the evaluations and feedback to make any necessary revisions to their designs.	*Establish expectations for peer evaluation to support a community of thinkers* *Peer evaluation to develop habits of mind and revise thinking strategies*
Experience - Part 3		
Help Our Ecosystem Expo	After the students have completed their designs, they will present their projects to the school community in the "Help Our Ecosystem Expo". Teachers, staff, students from other grades, and parents will be invited to the expo to share and learn from the students' creations.	*Sharing creations*

Resources:

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