LEARNING SCENARIO Enhancing Students' Creative Problem Solving (CPS)

Educational level: Secondary (Upper school) **Age:** 14- 18

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LEARNING OBJECTIVES/ ASPIRATIONS

The objective is to promote learners' creativity and problem-solving skills. The educational experience is based on seven steps of CPS: (1) identifying the problem clearly, (2) researching the problem, (3) formulating creative challenges, (4) generating ideas, (5) combining and evaluating the ideas, (6) drawing up an action plan, and finally (7) and implementing the ideas. Even though the scenario can be applicable for any subject or topic, the focus is on biogeography.

NARRATIVE OVERVIEW

CPS is a prominent characteristic in fast-growing, highly skilled managerial, professional and technical occupations. My priority is to develop learners' 21st century skills especially creativity, problem-solving, and critical thinking skills. CPS is a process, method, or system for tackling a problem in an imaginative way and resulting in effective action. My objective is to foster learners' deep understanding and prepare them to apply their knowledge and abilities to meet real-life challenges by using seven steps of CPS.

First, learners are posed a question or presented a problem to arouse their curiosity or gain their interest, and they **(1) identify the problem** clearly considering possible challenges and opportunities. Second, they **(2) research the problem** and gather data from different sources and point of views individually or collaboratively. Next, they transform the problem in creative challenges and **(3) formulate** them to enhance awareness of the nature of the problem. Then, learners unlock creativity, and **(4) generate** various, unusual and weird ideas to face the problem. After that, they **(5) combine and evaluate** the ideas applying their reasoning skills. Later, they **(6) draw up an action plan** and identify the required resources. Finally, they **(7) implement the creative solution**.

In each step of the CPS process, I encourage my learners to employ divergent and convergent thinking in turn. **Divergent thinking** is the process of generating multiple ideas with convergent thinking then used to narrow these ideas down to the most feasible options. It is a cornerstone for creativity to identify, balance and practice divergent and convergent thinking. My colleagues and I integrate divergent thinking tools (brainstorming, 5W's and an H, reverse assumptions, etc.) and convergent thinking tools (the evaluation matrix, pair and share, how-how diagram) for creative problem-solving strategies into curriculum over the years (see pp. 27-46, CPS document in Literature to support).

It is important to engage learners in **the personal and social benefits** of CPS because principles of the CPS can be applied as an integral part of life in various settings. Learners transfer their knowledge and abilities into their real life. Creativity in the classroom makes the lessons more interesting and interactive. I inspire learners to believe in their own creativity because creative learners have always been eager for learning new things, which keeps them engaged and active in the learning process. For this purpose, it is important to create a peaceful environment in the classroom to reduce learners' anxiety and stimulate their problem-solving and critical thinking skills. Thus, they produce something innovative, feel free to express their ideas, think decisively about others' ideas, and respect/accept others' ideas. In this scenario, the focus is to apply seven steps of CPS on the topic of "Biogeography".

Biogeography is the study of the geographic distribution of plants, animals, and other forms of life as the result of many historical and current causes, and it includes multidiscipline like geography, ecology and biology, etc. For the topic of "Biogeography", the problem is extinction of animals. Learners analyse geographic distribution of animals and examine the evolution of animals' lives over the years. Then, they devise solutions to save animals by implementing seven steps of CPS. Finally, they create a 3D model with Tinkercad on the distribution of future animals in the specific region in order to call attention to the extinction of animals.

APPROACH TO TEACHING & LEARNING

Learners are given a series of topics/problems from which they have to select one they want to seek creative solutions to the problem. They have to generate ideas and evaluate the solutions they come up, pick the best one(s), and then design an action plan to overcome obstacles and resolve the problems creatively.

Approaches: project-based learning; problem-based learning; enquiry-based learning; and active learning

ASSESSMENT: Formative assessment

ROLES

TEACHERS: To plan the lesson; prepare materials before the lesson; introduce the topic; present a problem or give a set of questions; assign tasks; stimulate creativity, problem-solving and critical thinking skills; encourage engagement; inspire deeper learning; give feedback to guide learners.

LEARNERS: To perform seven steps of CPS in the learning process and use creative thinking skills.

PARENTS: To embrace learners' curiosity; foster their creativity, confidence and autonomy; support their research process; give feedback to their product.

Enhancing Students' Creative Problem Solving (CPS)

LEARNING ENVIRONMENT

The concept of active learning is important to create a creative problem solving scenario. Nevertheless, the teacher **interacts** with the students at all stages, by giving instruction and asking stimulating questions and gets creative answers. Learners **exchange** their ideas, and brainstorm and discuss the solutions of the problem in groups. They **reflect** on the discussion and produce best solution based on the discussion. Teacher supports learners individually but s/he does not direct them so learners **develop** their autonomy.

The key step is for the students to **investigate** and search creative solutions to the problem. The teacher can guide the process when needed. Based on the search and discussions, the students **create** a solution (e.g. 3D models on the distribution of animals around the world). Finally, the students **present** and compare their findings and share their 3D models. They get feedback from peers and teacher to evaluate their products/solutions.

POSSIBLE CHALLENGES

CPS can play a minimal role in curricula, and it can be difficult to implement it in all disciplines. Another challenge is that if learners do not possess sufficient background knowledge, they fail to draw up an action plan to solve problems creatively.

Moreover, CPS focuses on mental activities too much rather than physical activities, which can be challenging for younger learners. However, principles of the CPS can be applied as an integral part of life in various settings.

RESOURCES

- Individual laptops/tablets for learners to ensure equal access to resources; Wi-fi access.
- High quality videos, if available in the curriculum or taken from Internet resources.
- Team collaboration tools, 3D Design Apps, Mind-mapping Apps, Brainstorming Apps, Presentation Apps, and Assessment Apps etc.

LEARNING ACTIVITIES

Learning activities are around the topic of “Biogeography” to demonstrate the use of the seven steps of CPS, but one can try the activities for any subject and topic. First, learners watch a video on endemic animals to introduce the topic, get scientific knowledge related to the geographic distribution of animals, and teacher asks stimulating questions to arouse a sense of curiosity about extinction of animals.

Then, the class is divided into groups of 3 or 5 to work collaboratively, and each group selects a continent/country to study and discuss on importance of the living space and biodiversity conservation of animals. Teacher does not dominate the class; learners develop their autonomy. Teacher initiates learners to consider the evolution of animals’ lives over the years, and to specify reasons for biogeographic region, climatic and geographic conditions, and vegetation for these livings. Learners research questions, analyse distribution of animals, brainstorm and write down all ideas related to causes of this geographic distribution of animals as a mind map.

Later, they synthesize all of the data and devise a solution for the problem - extinction of animals. Furthermore, they create a 3D model on the distribution of future animals in the specific region by analysing their findings. After that, learners share their products with their peers and teachers, present their solutions to save animals, and call attention to extinction of animals. Learners get feedback from their peers, teachers and parents to revise their product. In the evaluation process, an assessment app is used, and observation notes of students’ performance during learning activities are supporting tools in order to assess learners’ achievement.

LITERATURE TO SUPPORT

- Biogeography: https://study.com/academy/lesson/biogeography-definitions-examples.html
- Creative Problem Solving: https://www.creativeeducationfoundation.org/wp-content/uploads/2015/06/CPS-Guide-6-3-web.pdf
- 3D Model: https://www.tinkercad.com/

LEARNING SCENARIO VIDEO

- https://youtu.be/ciz9pd1XzKQ

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