

Critical Thinking

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Lesson Plan

Quick Review:

Objectives:

- To describe critical thinking skills
- To introduce open-ended problems
- To impart critical thinking skills through open-ended problems

Concepts to be covered:

- Critical thinking, understanding, applying, analyzing, evaluating, synthesizing/creating

Activities:

- Introduction to Critical thinking: PowerPoint Presentation [15 min]
- Observe 4 demonstrations/discrepant events and after each one explain the phenomena observed

1. Funny Funnel [30 min]
2. Dancing Coin [20]
3. Uncanny Can [20]
4. Rubbery Egg [20]

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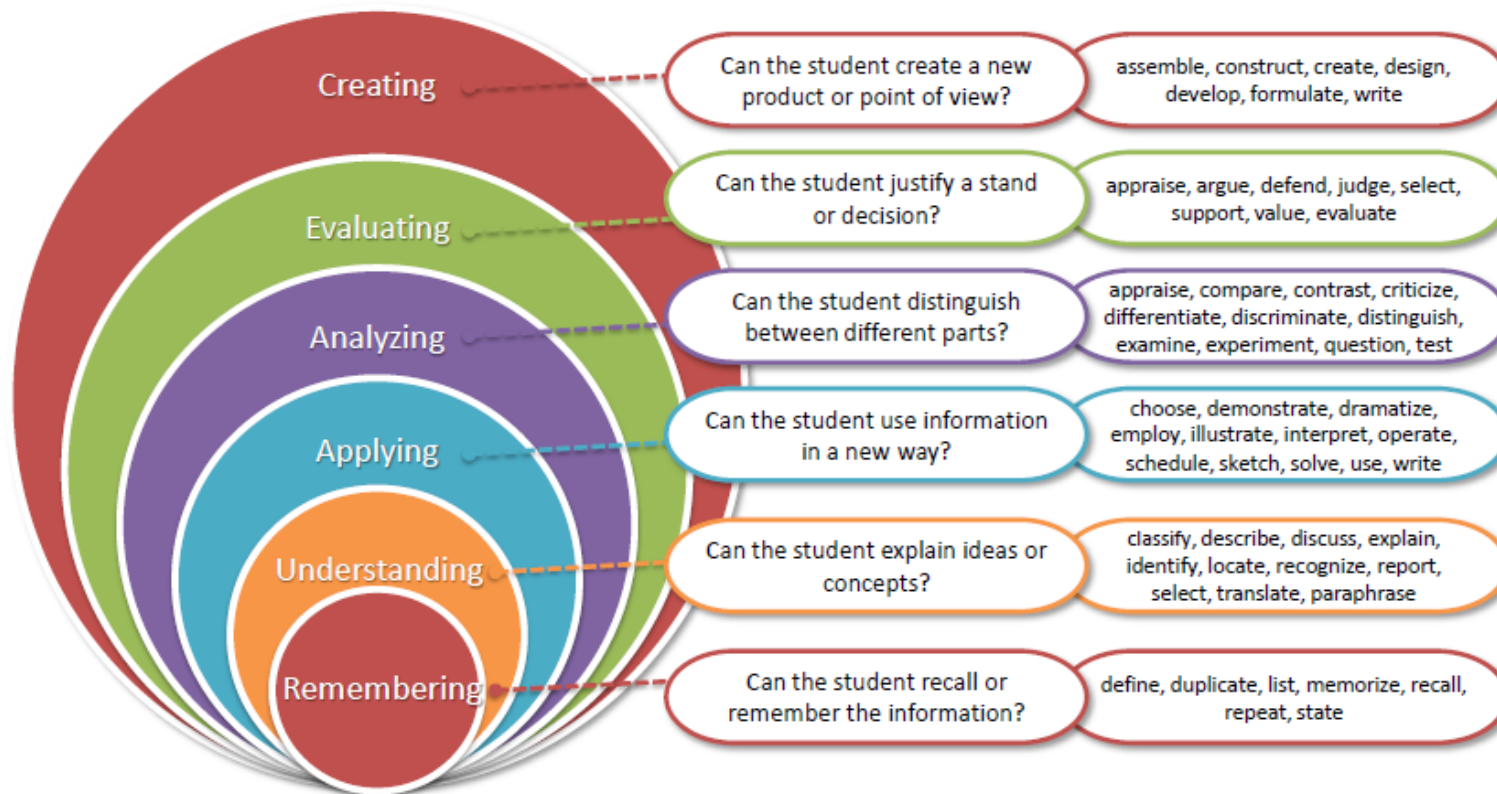


Science Education

- In addition to imparting knowledge about facts and figures, Science education is also about
 - Scientific literacy, and
 - Skills
- The most important skills: transferable critical thinking skills

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Bloom's Taxonomy (Revised)



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Quality of Education

- Nepalese education: remembering/Regurgitation, some understanding, and small degree of applying
- Partnership for 21st Century Learning has identified the following as learning and innovation skills necessary for 21st century:
 - Creativity and Innovation
 - Communication
 - Critical Thinking and Problem Solving
 - Collaboration
- Science teachers can contribute by imparting higher level thinking skills:

Dorje Gurung — Analyzing, Evaluating and Creating/Synthesizing

Higher Level Thinking Skills

- Open-ended problems
- Forces students to engage in processes that impart and reinforce those skills
- What we'll do
 - Observe a few simple demonstrations and problems of scientific nature
 - Together, we will analyze, Evaluate and create/synthesize an explanation for a at least a couple of demonstrations
 - Then you'll do the same on your own for a couple more.

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1. Funny Funnel

Watch discrepant event (demonstration), record observations, and answer this question:

- Why did the funnel stop working?

Three steps to answer question as completely as possible:

- **Analyze** (starting with the identification of the concepts and terms involved)
- Write an explanation for the observations
 - i.e. apply your knowledge of scientific terms and concepts to **create** an explanation
- **Evaluate** the explanation/demonstration
 - Would the demonstration have worked had the bottle been completely full of water? Why or why not?

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Would the demonstration work with any combination of funnel and bottle? Why or why not?

Here's a description of the criteria on which I would grade my student's write-ups.

Achievement Level		Criterion C: KNOWLEDGE AND UNDERSTANDING OF SCIENCE		
Student	Teacher	Knowledge and Understanding of Scientific Information and Concepts	Application of Scientific Information and Concepts	Mastery and Evidence of Critical Thinking Skills
5-6	5-6	Uses scientific ideas, concepts and/or processes correctly in the analysis section of the write-up.	Applies understanding of ideas, concepts and/or processes involved to provide a clear and complete solution to the discrepant event.	Analyses and evaluates the solution provided and makes judgments about the observations and/or solution supported by scientific understanding.
3-4	3-4	Uses some scientific ideas, concepts and/or processes in the analysis section of the write-up	Applies understanding of ideas, concepts and/or processes involved to provide	Analyses scientific information by identifying parts, relationships or causes.

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2. Dancing Coin

Watch discrepant event (demonstration), record observations, and answer this question:

- Why did the coin “dance”?

Steps:

- **Analyze** (starting with the identification of the concepts and terms involved)
- Write an explanation for the observations (i.e. apply your knowledge of scientific terms and concepts to **create** an explanation for the scientific phenomenon)
- **Evaluate** the explanation/demonstration

Dorje Gurung — Would the demonstration have worked had the bottle been empty? What if it had been completely filled with alcohol? Why or why not?

3. Uncanny Can

- Watch the discrepant event (demonstration) and record observations.
- What question needs to be answered here?
- Answer the question as fully as you can following the steps we followed for the first two discrepant events.

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4. Rubbery Egg

- Watch the discrepant event (demonstration) and record observations.
- What is the question here?
- Answer the question as fully as you can following the steps we followed for the first two discrepant events.

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