

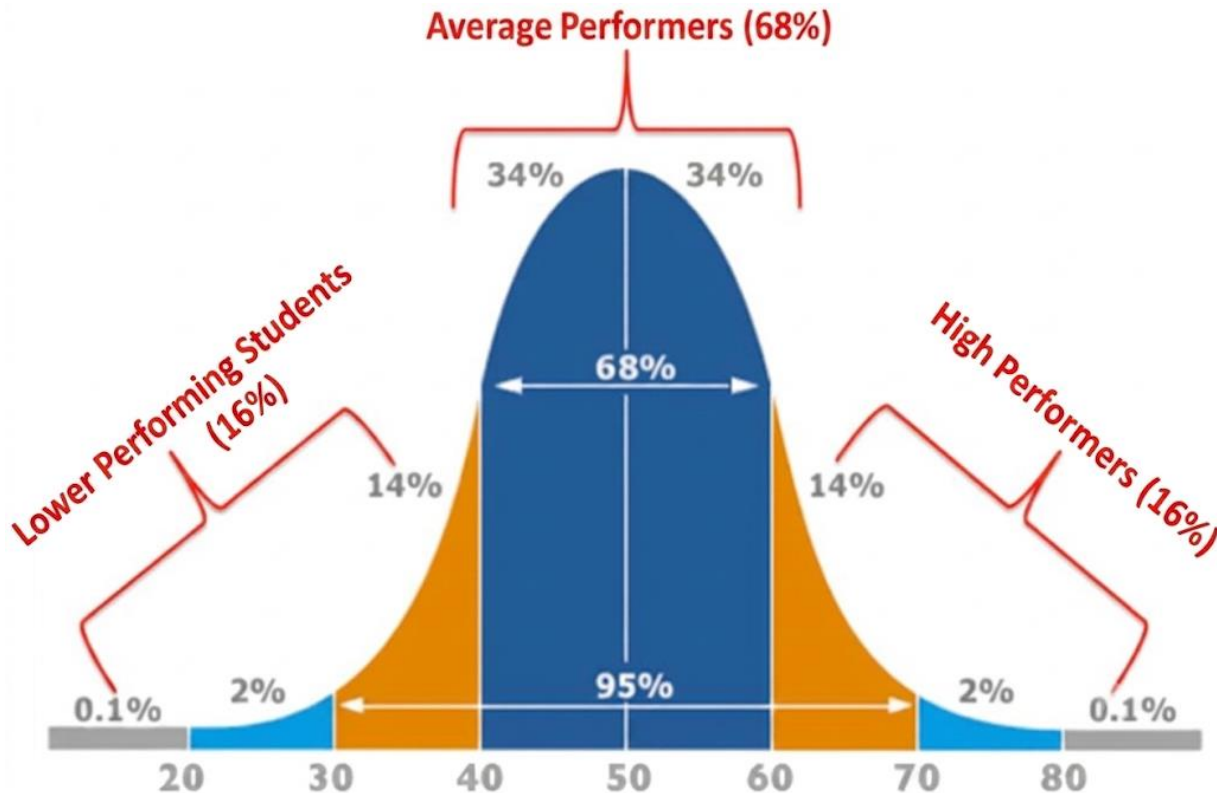
Practical Implementation of Teaching Methods for PhD Students

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Three types of students in the classroom according to Gaussian curve



A classic, strict bell curve grading distribution operates as follows:

Top 10%: A grades
Next 20%: B grades
Middle 40%: C grades
Next 20%: D grades
Bottom 10%: F grades

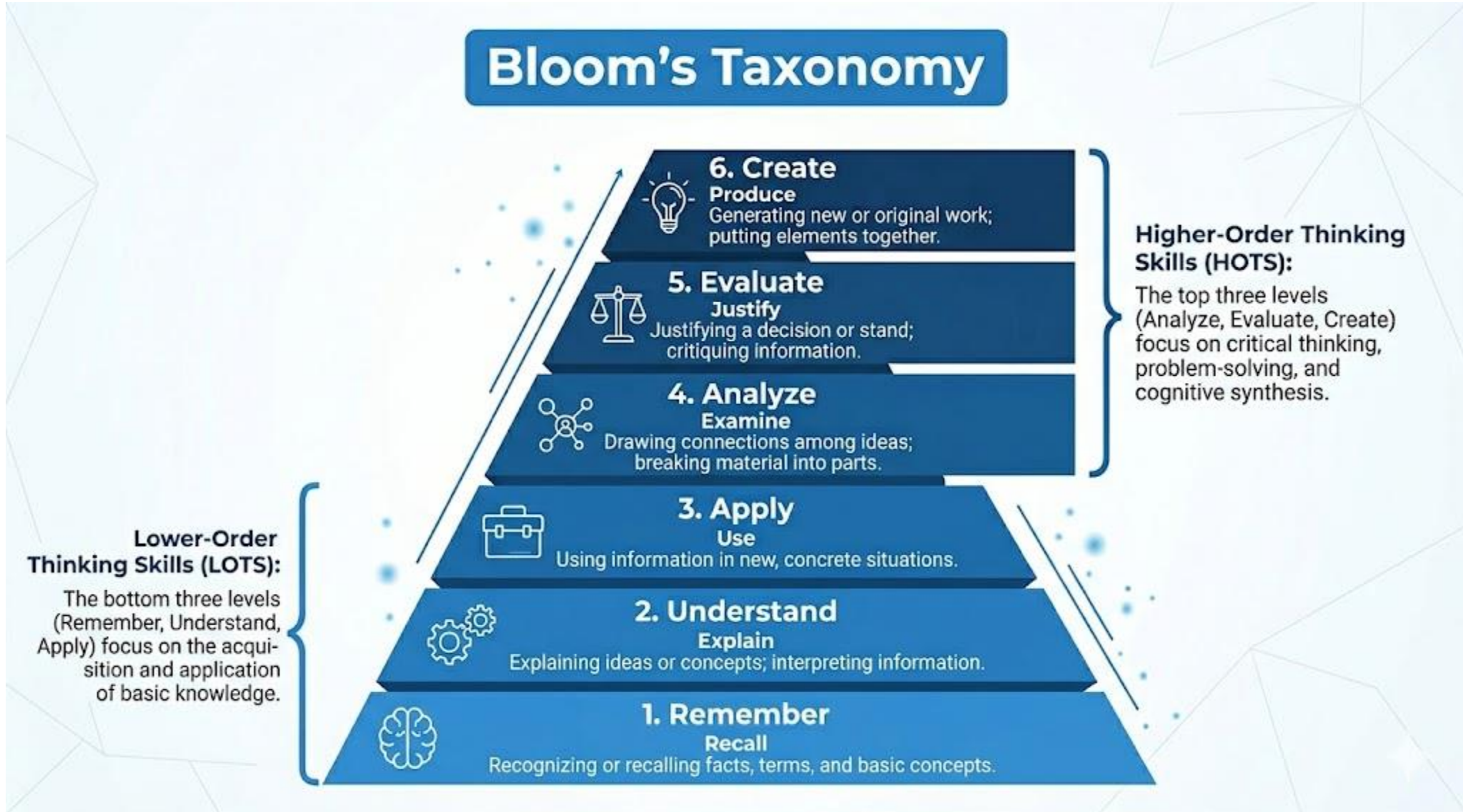
Teaching methodology



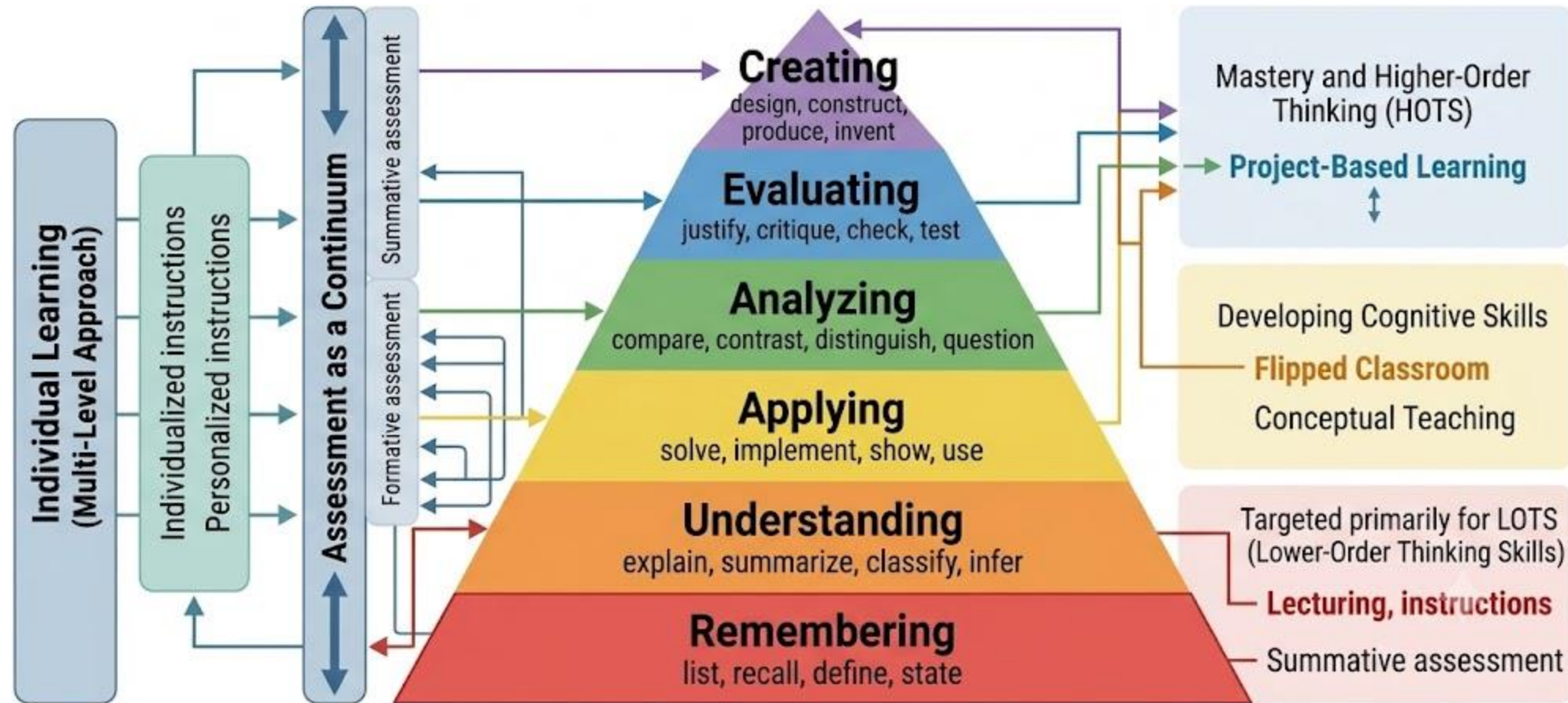
- Lecturing, instructions
- Flipped Classroom
- Individual learning
 - Individualized learning
 - Differentiated instructions
 - Personalized instructions
- Summative assessment
- Formative assessment
- Conceptual teaching
- Project-Based Learning



Bloom's Taxonomy is a hierarchical framework used to classify educational learning objectives into levels of complexity and specificity. It is widely used by educators to design curricula, assessments, and teaching methods that promote higher-order thinking rather than just **rote memorization**.



Integrating Teaching Methodologies (from image_175962.png) with Bloom's Revised Taxonomy



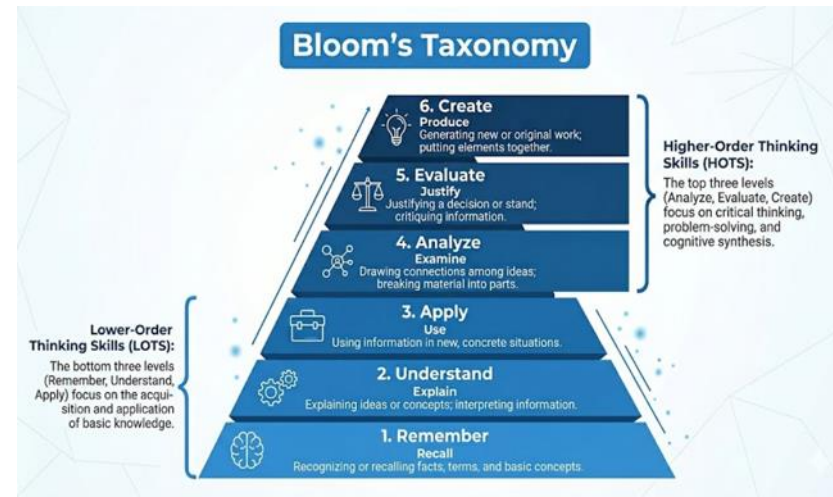
Practical Implementation



Option A

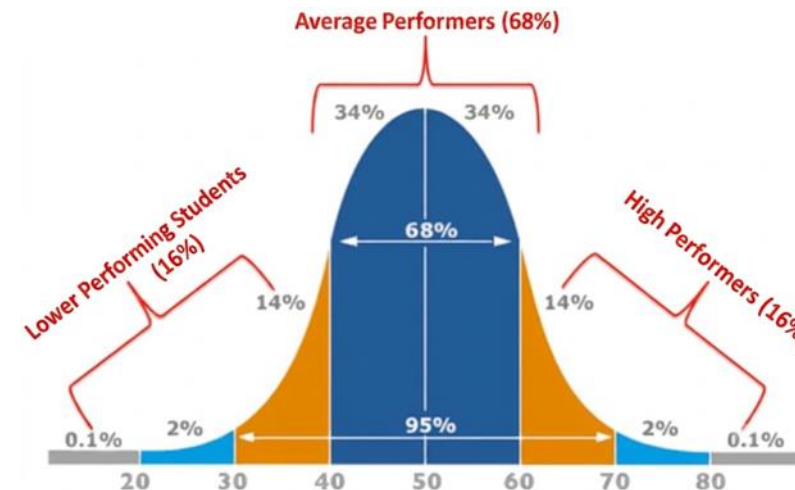
- 1 Flipped Classroom
2. Individual learning

- Individualized learning
- Differentiated instructions
- Personalized instructions



Mini lessons

- a) 10 min Presentation
5 min Formative assessment
- b) 10 min Presentation
5 min Formative assessment
- c) 10 min Presentation
5 min Formative assessment
- d) **7 min Summative assessment**





Objective: Design a comprehensive theoretical lesson plan on "Patient Room Ventilation Systems" utilizing the "Option A" teaching framework and applying the Gaussian curve to differentiate instruction.

Part 1: Applying the Gaussian Curve (Differentiated Instruction)

Your lesson plan must account for the three types of students in the classroom according to the Gaussian curve. Outline how your instructional materials and questions will be tailored for:

Lower Performing Students (16%): Focus on foundational concepts (e.g., basic definitions of airflow and exhaust). Include individualized or personalized instructions to support their learning.

Average Performers (68%): Focus on core competencies (e.g., understanding standard Air Changes per Hour requirements and general room pressurization).

High Performers (16%): Focus on complex applications (e.g., calculating ventilation rates for isolation rooms or troubleshooting HVAC failures).

Part 2: Flipped Classroom Preparation

Define the "Flipped Classroom" materials. What pre-reading, videos, or basic diagrams regarding hospital ventilation standards should the students review independently before attending the in-class session?

Part 3: Option A Mini-Lesson Structure

Structure your in-class time strictly according to the "Option A" framework. For each block, detail the specific ventilation topics you will cover and the exact formative assessment you will use to check for understanding.

Part 4 :Summative assessment: Design a brief, comprehensive final assessment (a short quiz, test or scenario analysis) that accurately evaluates the students' retention of the entire lesson. Ensure the grading distribution anticipates the classic bell curve model (Top 10% A, Next 20% B, Middle 40% C, Next 20% D, Bottom 10% F).

Option B

1. Flipped Classroom
2. Individual learning
3. Project Based Learning

Divide the class into 2–4 groups, depending on the number of students in the classroom. Each group should contain a mix of high-, average-, and lower-performing students. Each student within the group must be assigned a specific role and responsibility:

Leader: Coordinator

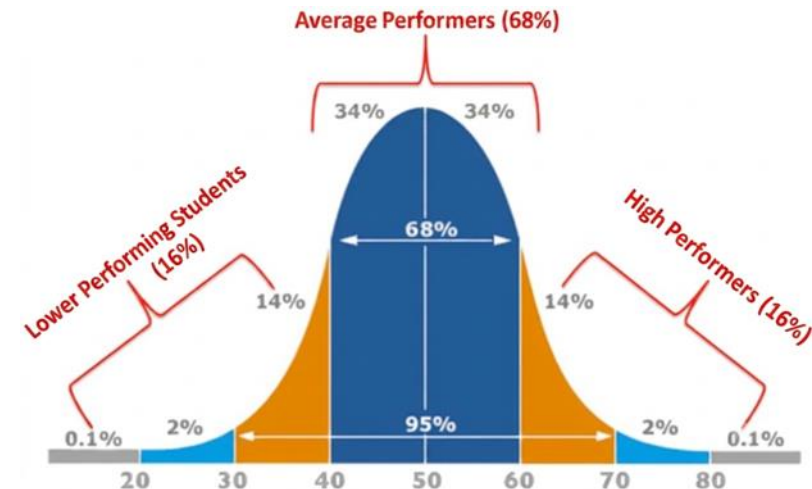
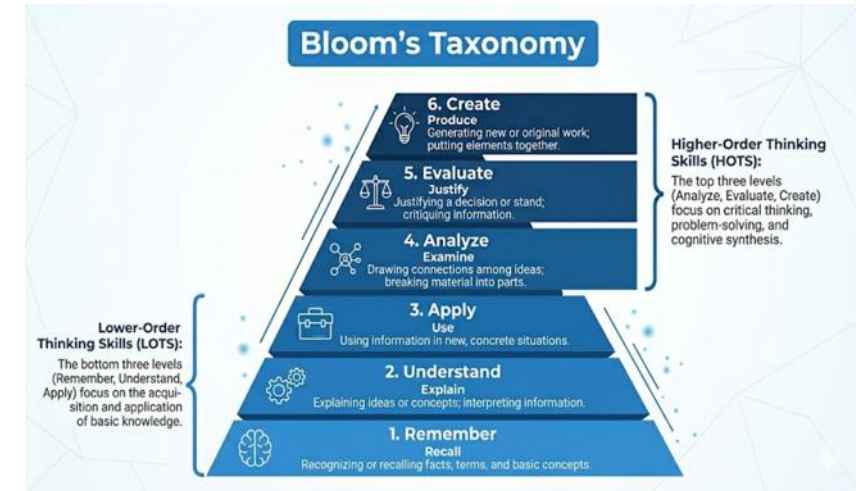
Researcher: Checks sources and literature for the entire team.

Data Analyst: Prepares and analyzes survey/data for everyone.

Content Architect: Organizes it into a coherent, logical whole.

Critic/Practitioner: Tests solutions and identifies weaknesses.

Assessment?



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Assessment for PBL



1. Formative Assessment (Evaluating the Process)

Because PBL takes place over weeks or months, you cannot wait until the end to assign a grade. Formative assessments keep students on track and measure skill acquisition in real-time.

Example: scheduled reviews of outlines, drafts or prototypes before the final product is built, daily or weekly written reflections where students document what they researched, challenges they faced, and how they solved them., quick, end-of-class prompts to check comprehension of a specific concept taught that day to support the project.

2. Summative Assessment (Evaluating the Product)

The culmination of a PBL unit should be an authentic demonstration of mastery, ideally presented to an audience beyond the teacher.

Example: Students present their solutions to a panel of community experts, parents, or younger students. The presentation itself (public speaking, visual design) is assessed alongside the content. Grading the actual podcast, physical model, business plan, or software application **the student created**, rather than an essay about what they created.

3. Self and Peer Assessment (Evaluating Collaboration)

Since PBL relies heavily on teamwork, assessing soft skills like communication, leadership, and reliability is critical.

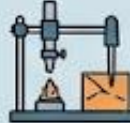
4. Multi-Dimensional Rubrics: The most effective way to grade these diverse components is through a comprehensive, student-facing rubric provided on day one. A PBL rubric should include criteria for:

- **Content Mastery:** Did they accurately apply the required academic standards?
- **Skill Execution:** Is the final product (e.g., video, model, essay) high-quality and well-constructed?
- **21st-Century Skills:** Did they demonstrate critical thinking, effective communication, and collaboration?





OPERATING ROOM (OR) VENTILATION LABORATORY PROJECT RUBRIC: ASSESSMENT TOOL

ASSESSMENT CRITERIA	EXEMPLARY (4 PTS)	PROFICIENT (3 PTS)	DEVELOPING (2 PTS)	EMERGING (1 PT)
 FLUID DYNAMICS & AIRFLOW ANALYSIS 	Advanced understanding, laminar flow optimized, ACH exceeds standard (e.g., >20 ACH), positive pressure maintains cleanliness.	Advanced understanding, laminar flow optimized, ACH air currents and velocity, positive pressure pressure gradients.	Fluid interprets flow dynamics, turbulent wants to maintain positive pressure or + pressure gradients.	Misinterprets fluid dynamics, turbulent flow, fails to maintain positive pressure or minimal ACH.
 STANDARD COMPLIANCE & SAFETY 	Flawless compliance, zero infection pathways identified, rigorous safety protocols.	Adherence to ASHRAE 170, CDC Guidelines, and complete infection prevention.	Adherence to ASHRAE 170, CDC Guidelines, and lacks proper standards referencing.	Significant violations, clear infection risks, lacks proper standards referencing.
 EXPERIMENTAL DESIGN & EXECUTION 	Innovative testing rig/software, controlled variables, accurate data capturing.	Design of model/simulation, data collection method, variables control.	Design of model/unreliable data method, and accurate data control.	Poorly designed, unreliable data, lack of controls.
 DATA ANALYSIS & INTERPRETATION 	Detailed statistical and graphical analysis (CFD plots), insightful conclusions with strong evidence.	Data processing, graphical analysis (e.g., CFD plots), conclusions with strong evidence.	Inaccurate calculations, graphical data, and conclusions.	Inaccurate calculations, poor visualization, unsubstantiated claims.
 COLLABORATION & REFLECTION 	All members contribute equally, team dynamics, active peer feedback, insightful self-reflection.	Individual contribution, both envher students, peer review, and self-reflection.	Unbalanced contribute, communication, peer review, and self-reflection.	Unbalanced work, poor communication, no reflection.





Objective: Design a comprehensive theoretical lesson plan on "Patient Room Ventilation Systems" utilizing the "Option B" teaching framework and applying the Gaussian curve to structure collaborative group work.

Part 1: Flipped Classroom & Individual Learning

Define the foundational knowledge students must acquire before the collaborative session.

Pre-class Materials: Detail the specific resources (e.g., articles on Air Changes per Hour (ACH), videos on negative vs. positive room pressurization, or diagrams of HEPA filtration systems) that students will study independently.

Individual Preparation Check: Briefly describe how you will ensure students have completed their individual learning before moving to the project phase.

Part 2: Gaussian Curve Group Formation

According to the Option B framework, you must divide the class into 2–4 groups.

Applying the Curve: Explicitly outline how you will structure these groups to ensure each contains a balanced mix of high-performing (16%), average-performing (68%), and lower-performing (16%) students based on the classic bell curve distribution.

Explain how this mixed-ability grouping will support peer-to-peer learning regarding complex ventilation concepts.

Part 3: Project-Based Learning (PBL) Implementation

Design a core group project focused on patient room ventilation (e.g., "Design an optimal ventilation strategy for a new infectious disease isolation ward"). Within this project, explicitly define the tasks for each of the required student roles: Leader, Researcher, Data Analyst, Content Architect, Critic/Practitioner

Part 4: Assessment: Desing it?



Digital teaching



Digital teaching means using technology, software, and online tools to help students learn. In the age of AI, teachers are trying to find a perfect balance—a "hybrid harmony." This means they use AI to take care of boring paperwork and customize lessons for each student. At the same time, they make sure to keep a strong human connection and give students plenty of breaks from their screens.

Digital teaching works perfectly well in **Model 1:1**, when each student is equipped with their own dedicated laptop, tablet, or digital tool to interact with the curriculum.

In a **1:1 device classroom**, the teacher shifts from being the "sage on the stage" to a learning facilitator. The device becomes the primary conduit for agency, personalization, and creation.

To apply this effectively, **the SAMR** model needs to be applied to scale the depth of digital teaching.



The SAMR model



Substitution: Students read a lab manual downloaded onto their screen as a static text file instead of looking at a printed handout.

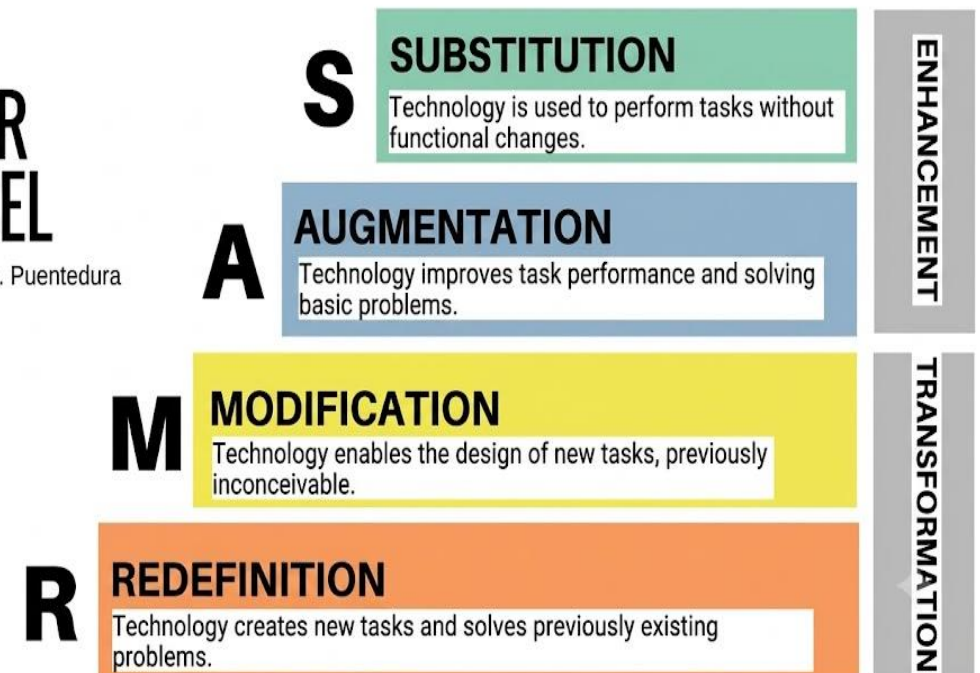
Augmentation: Students fill out an online spreadsheet (like Google Sheets, Excel, Apple Numbers) during the lab, which automatically generates a bar graph from their raw data.

Modification: Students use digital probes hooked up to their laptops to record real-time pH level changes in a liquid, instantly logging data to a shared class database to compare anomalies across different teams.

Redefinition: Students design a video documentary of their lab results, embed an interactive simulator showing the molecular breakdown of the chemical reaction, and publish their findings to an open school blog for community discussion.

THE SAMR MODEL

Dr. Ruben R. Puentedura



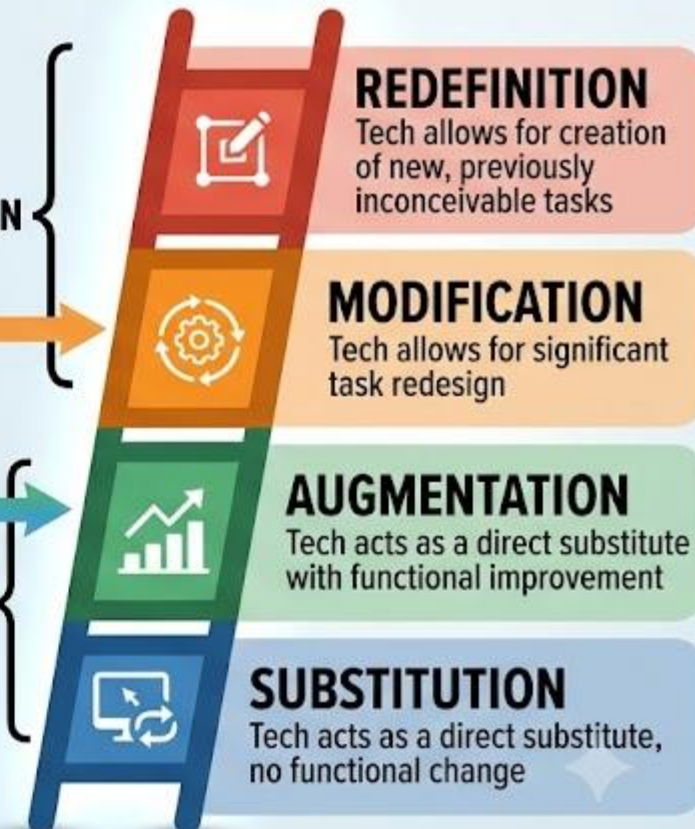
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BLOOM'S TAXONOMY (Revised)



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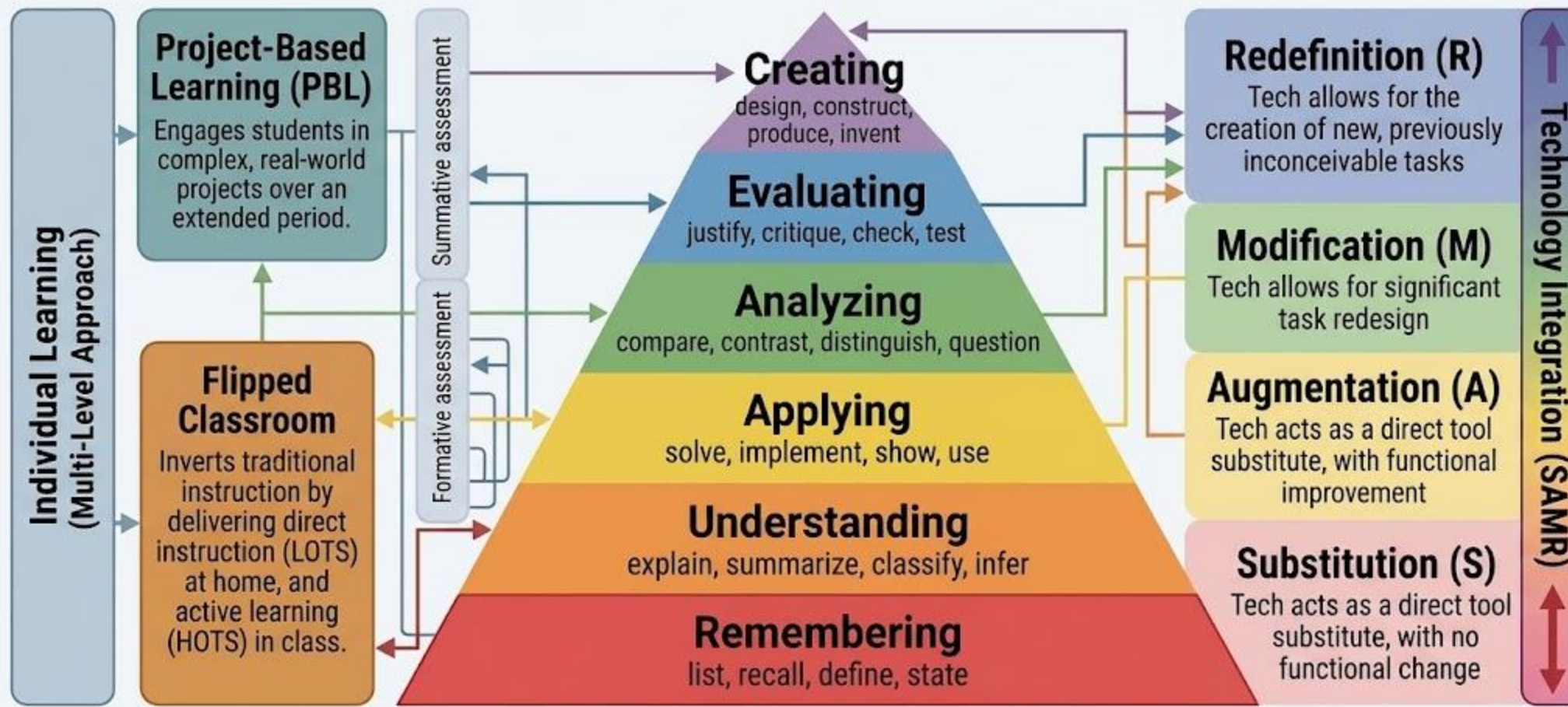
SAMR MODEL



TRANSFORMATION

ENHANCEMENT

Integrating Teaching Methodologies with Bloom's Revised Taxonomy (Revised Model)



Digital teaching Platform



Google classroom

Microsoft Teams for Education



High school

Canvas LMS

Moodle



University

Kiddom or Otus



Primary school

Google Classroom sits somewhere between a simple assignment manager and a full-scale learning management system (LMS), its closest alternatives usually depend on what ecosystem you prefer or how advanced your needs are.



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Google classroom



1 Flipped Classroom

2. Individual learning

- Individualized learning
- Differentiated instructions
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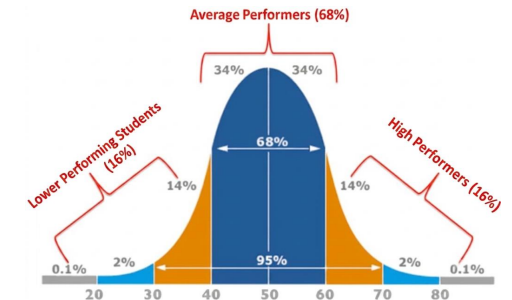
c) 10 min Presentation

5 min Formative assessment

d) **7 min Summative assessment**

- Google form, Microsoft Forms , Nextcloud Forms, CryptPad Forms
- Google docs, Microsoft Word, Apple Pages (3 types of documents)

- Google slides, PP, Apple Keynote
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- Google slides , PP, Apple Keynote
- Google docs (3 documents)
- Google slides, PP, Apple Keynote
- Google docs (3 documents)
- **Google docs**



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Practical Implementation



1 Flipped Classroom

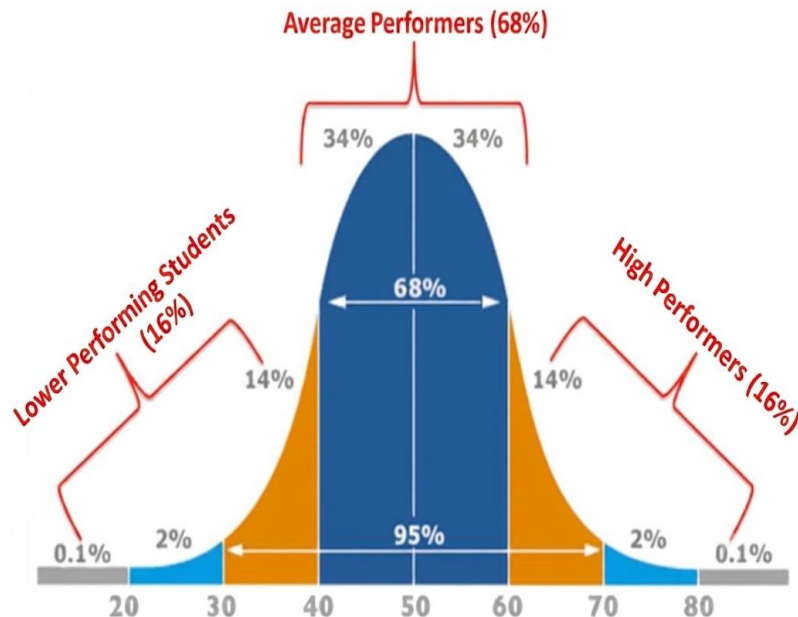
Google form, Microsoft Forms , Nextcloud Forms, CryptPad Forms

2. Individual learning

3. Project Based Learning

Google Slides, Google docs, PP, Apple Keynote

Each group must work on one Google Slides presentation. The teacher will have access to each presentation.



Divide the class into 2–4 groups, depending on the number of students in the classroom. Each group should contain a mix of high-, average-, and lower-performing students. Each student within the group must be assigned a specific role and responsibility:



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Practical Task



Outline a session plan for Option A.

Flipped Classroom (Pre-work): What Google Form assignment will you create (e.g., basic definition quiz based on a video link)

Individual Learning (Differentiation): Describe how you will create three distinct Google Docs (one each for Lower, Average, and High-performing students) to practice the same core concept but with varied scaffolding, problem difficulty, or activity types.

How do these different paths ensure all students make progress?

Outline a sequence of three mini-lessons (presentation + formative assessment). Specify what Google Slides presentation topics and what Google Docs activities you will use.

Outline a session plan for Option B.

How many groups will you divide your class into (e.g., 2–4)? Explain your rationale based on class size. State how you will ensure each group is a balanced mix of performance levels (referencing the Gaussian curve mapping).

Create a suitable PBL engineering project scenario which include Challenging Question. Authenticity & Public Product.

Describe what real-world tools the students will use and the final presentation context (who is the real-world audience?).

How are you assign the role of students within the group?

