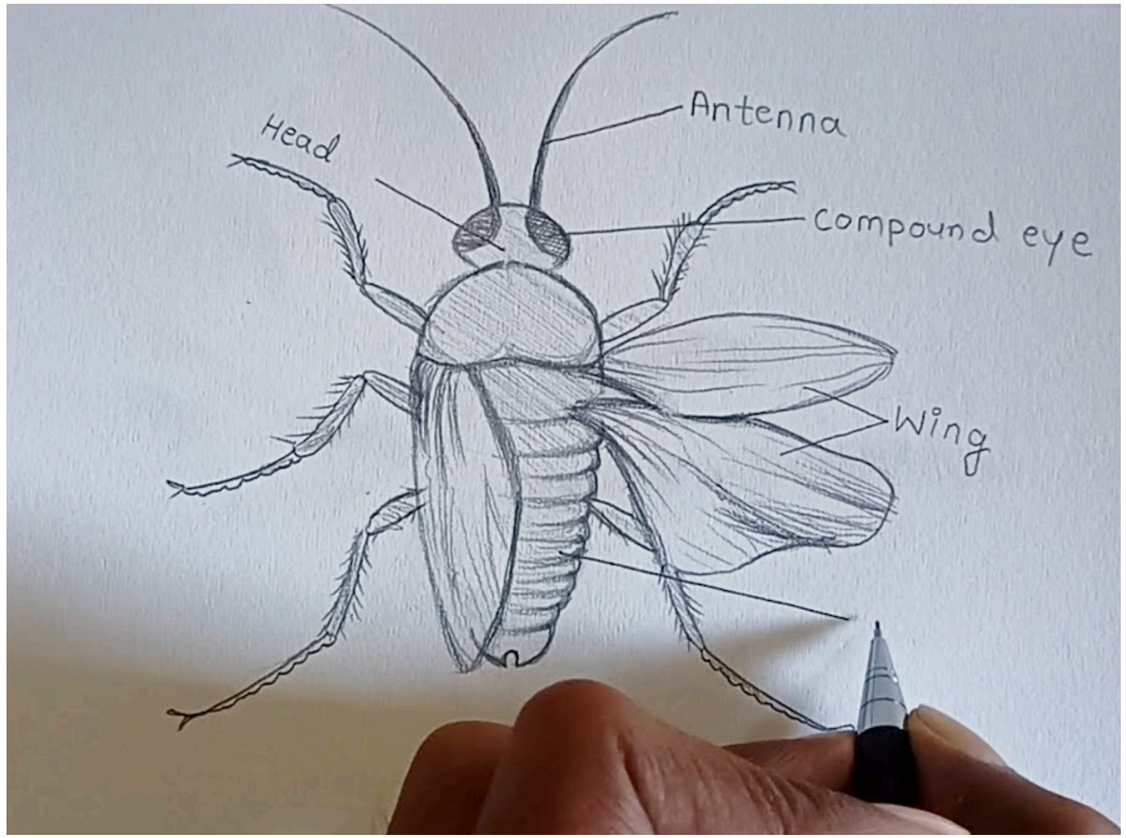
Project-Based Learning

Giving your students a need to learn, before they learn

David Ogunshola

How many of you drew this in secondary school?



$2\sin^2 x - \sin x - 1 = 0$

$2x^2 - x - 1 = 0$

$2x^2 - 2x + x - 1 = 0$

$2x(x-1) + 1(x-1) = 0$

$(2x+1)(x-1) = 0$

$(2\sin x + 1)(\sin x - 1) = 0$

$2\sin x + 1 = 0$ $\quad \sin x - 1 = 0$

$\sin x = -\frac{1}{2}$ $\quad \sin x = 1$

$x = \sin^{-1}(1)$

$x = \sin^{-1}\left(-\frac{1}{2}\right)$ $\quad x = 90°$

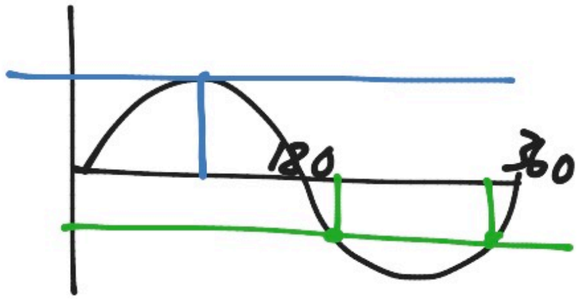
$x = -30°, 210°, 330°$

$x = \sin x$

$2x - 1 = -2$

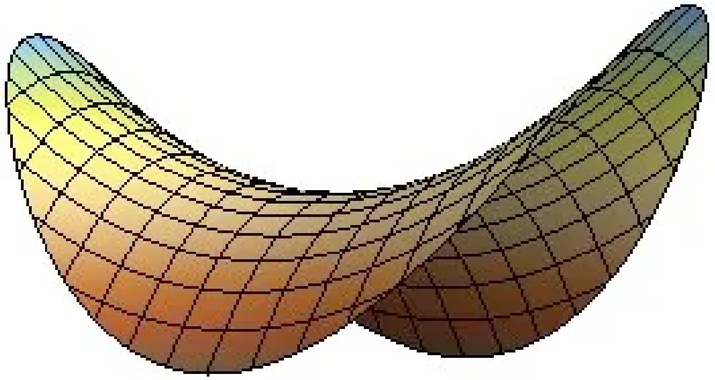
$?x? = -2 \quad ?+? = -1$

$-2, 1$



How did this make you feel?

The problem with how we learn



$$z = \frac{x^2}{a^2} - \frac{y^2}{b^2}, \quad \frac{x^2}{a^2} + \frac{y^2}{b^2} < 1$$

=

Hyperbolic Paraboloid

Two core reasons for PBL

Helps students understand how skills are applied in the real world

Creates a learning environment more likely to engage students

Project-Based Learning

An instructional approach designed to give students the opportunity to develop knowledge and skills through engaging projects set around challenges and problems they may face in the real world

In PBL, students are driven to learn because they get to see the need to learn and they have an immediate application for the knowledge.

Key features of PBL

- It is student-driven, not just teacher-directed.
- Focuses on solving real-world problems, not memorizing facts.
- Encourages collaboration and critical thinking.
- Ends with a tangible product, presentation, or solution

PBL in action: video

Guide to Implementing PBL

For any topic you want to teach

1

Identify a Real-World Problem

"What problem can my students solve with this topic?"

2

Define the Learning Goals

Ensure the project aligns with the curriculum

3

Structure the Project

Have students go through research, brainstorming, prototyping, and presenting.

4

Guide, Don't Dictate

Teachers act as facilitators, helping students explore solutions rather than giving answers.

5

Make It Collaborative & Fun

Encourage teamwork, experiments, and creativity.

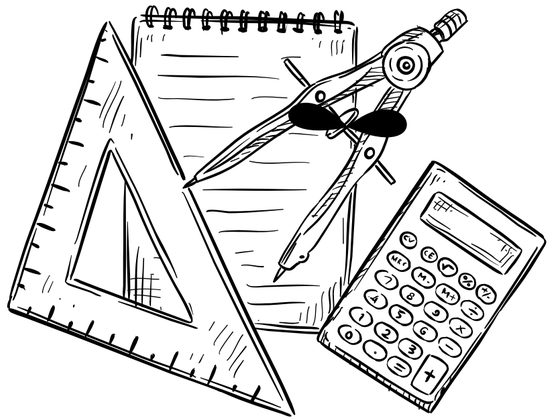
6

Assess Real-World Application

Instead of only exams, assess through presentations, reports, and product demonstrations.

Examples of PBL

MATH



Topic

Percentages, interest rates, profit & loss and data analysis.

Project:

Budgeting & Financial Planning

Have students design a financial plan for a small business or a family on a low income.

5 Phases Of PBL

1

PROJECT PLANNING

Teacher identifies what knowledge& skills they want students to learn & think about

BLOOM: understand & remember

- Identify learning target to be pulled out as need know question
- map cognitive path & thinking journey
- design & plan DQ students products
- plan instrauction & assesments

students not yet active in a project

2

PROJECT LAUNCH

Entry Event/Hook & introduction of the driving question & authetic audience

BLOOM: Create

- DQ: how can we create so that ?
- clarify product purpose & audience
- Develop need to knows.

Students became active in project

3

PROJECT IMPLEMENTATION

BLOOM: understand & remember

Teach & Assesss

- Students accuqurie, understand & apply new knowledge & cocnepts identiefied as need to know .
- Teacher user inquiry exercise collabrative learning & direct instruction where appropriate
- Teacher & students,critique & assess content , process & product relearn,revise & improve

4

PROJECT CONCULSION

Presentation of product & summative assessments

BLOOM: Create

- Students shares product with authentic audience.
- Teacher assess product & process of group
- teacher assesses knowldege & undesratdning of individuals

5

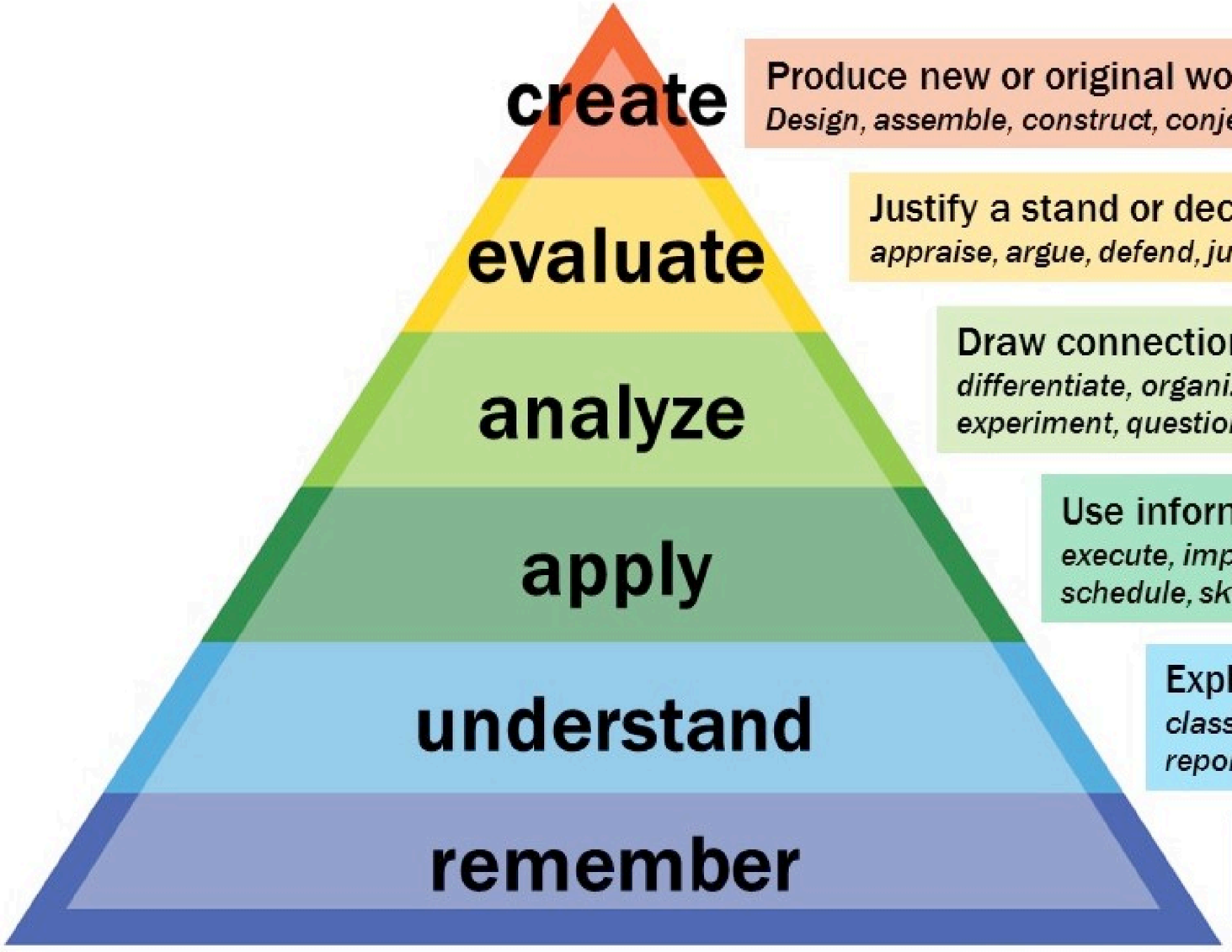
PROJECT DEBRIEF

Formal & informal reflection on planning. products& process

BLOOM: Evaluate

- Students reflect on their producs & process
- teacher reflects on prject design & implemenetation
- adjustments & revisions
- what worked what didnt? why ?

Bloom's Taxonomy



Produce new or original work
Design, assemble, construct, conjecture, develop, formulate, author, investigate

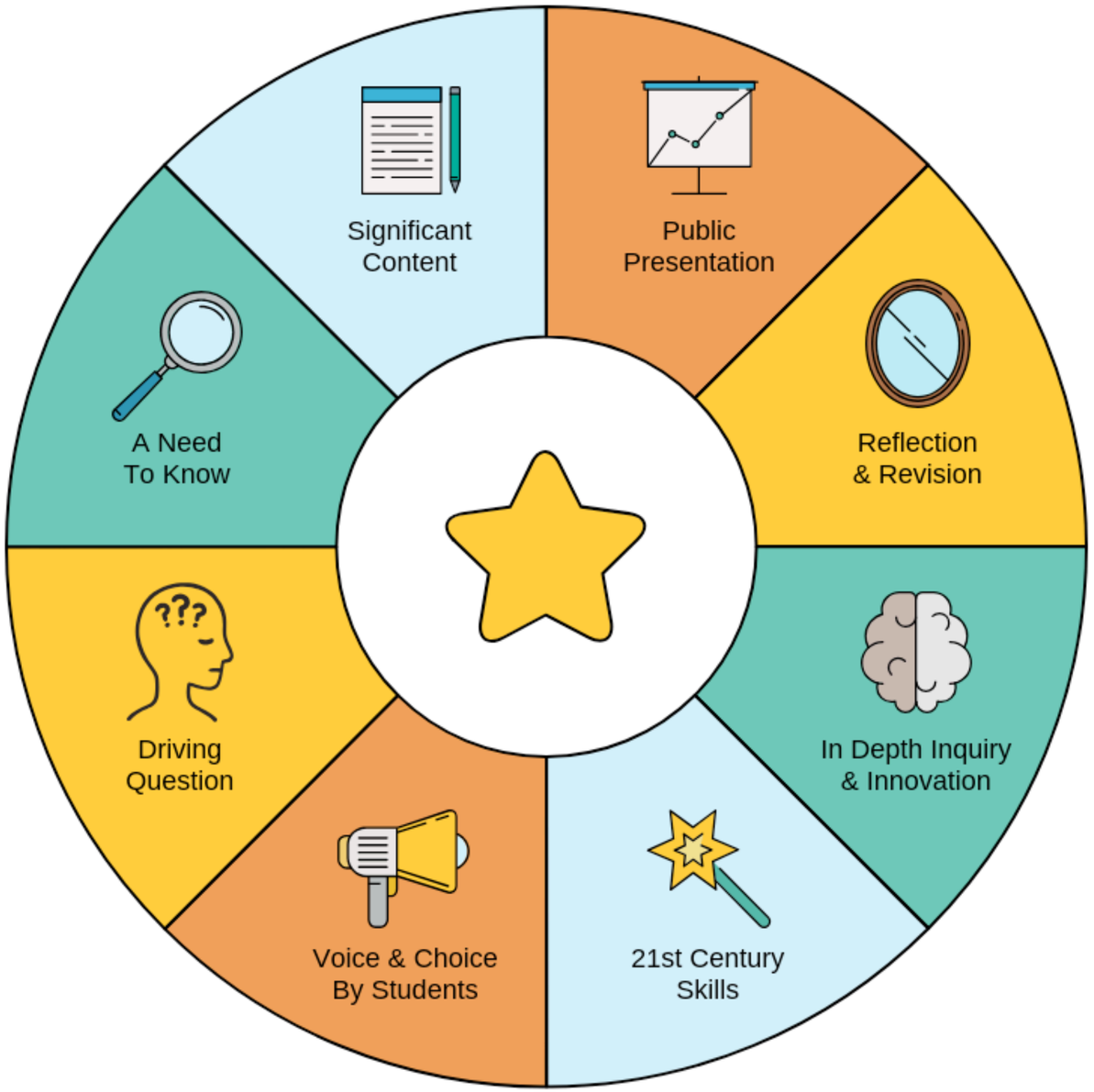
Justify a stand or decision
appraise, argue, defend, judge, select, support, value, critique, weigh

Draw connections among ideas
differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test

Use information in new situations
execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch

Explain ideas or concepts
classify, describe, discuss, explain, identify, locate, recognize, report, select, translate

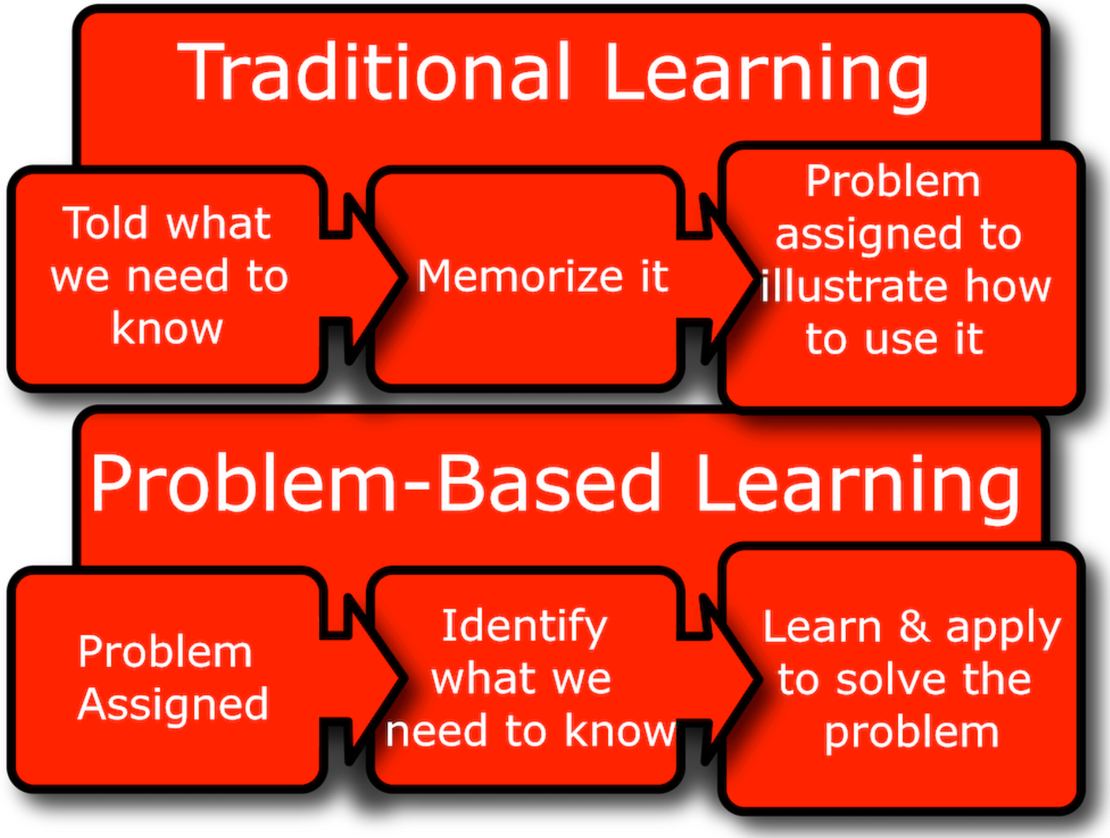
Recall facts and basic concepts
define, duplicate, list, memorize, repeat, state



What happens on the background in PBL

Problem-Based Learning

Problem-based learning is a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem.



Inquiry-Based Learning

What happens if we shifted the focus from the answer?

The goal of the entire process is not to find the right answers, but to help students develop the right framework for thinking

Inquiry-based learning is a learning process that engages students by making real-world connections through exploration and high-level questioning.

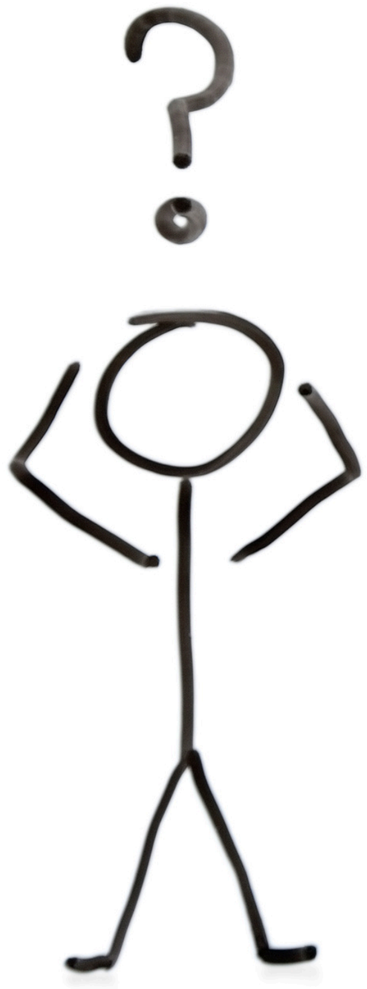
Problem-Based vs Project-Based Learning

In Project-based Learning, students produce an artefact to demonstrate their mastery of content, in Problem-Based Learning, students present a solution to a clearly defined authentic problem.

Suggested PBL Projects

for Mathematics and Science

Topic	PBL Project	Description
Measurement	**Design a Mini Football Field**	**Students measure an open space, calculate area & perimeter, and create a scaled-down model using cardboard.**
Biology	**Urban Gardening Project**	**Students plant and maintain a small vegetable garden in the school, learning about plant growth and sustainability.**
Chemistry	**Homemade Soap Production**	**Students create local soap using palm oil and lye, exploring chemical reactions in soap-making.**



1

Questions

We mostly use questions as tools for checking whether learning has happened (quizzes, tests, exams), but questions are supposed to be used as tools for learning.

Using questions the right way can turn your students into thinking machines

There are broadly two types of questions

Investigable Questions

Questions that require students to perform an ‘investigation’ before they can answer it.

The investigation will most times involve experimentation, collection of data, evidence gathered and investigative design

Non-Investigable Questions

Questions that do not create an opportunity for investigation or experimentation.

They can be answered with just theory or explanations.

There are 3 types of investigations

Descriptive

These investigations focus on counting or describing data from one phenomena.

Sample Investigable Questions

"How many seeds are in an apple?"

Which of these watermelons are the heaviest?

Comparative

These investigations use data to compare two or more phenomena.

Sample Investigable Questions

"Which of these two paper towels absorbs water the most?"

“Does sugar dissolve faster in cold or hot water?"

Experimental

These investigations manipulate a variable to collect data on the resulting variable.

Sample Investigable Questions

"At what time of the day is your shadow longest?"

“How does the weight of an item affects its response to gravity?”

Some popular mistakes teachers make when asking questions

- Calling the first student to raise their hands
- Immediately giving feedback on questions (whether right or wrong)
- Calling the same sets of students repeatedly because you know they will get it right
- Suggesting the answers to students because you want to finish the lesson fast and have no time

David Ogunshola

Founder, EarlyFounders Labs
Co-Founder, Brainy Hive Schools
Founder, Daveshoope Webmasters
Author, Early Coding for Kids

www.davidogunshola.com