SEMtech!

Student Engagement & Mentoring in Technology

Activity 1: "Data Detective: Structure Spectrum Challenge"

Objective: Distinguish between structured, semi-structured, and unstructured data.

How it works:

- Prepare a set of **data scenario cards**, each describing a type of data (e.g., spreadsheet of sales, JSON user profiles, emails, YouTube videos, XML product catalog).
- Create a **spectrum chart** on a whiteboard or digital canvas with three main categories: **Structured**, **Semi-Structured**, and **Unstructured**.
- In small groups, students will:
    - Place each card on the spectrum.
    - Explain their reasoning to the class using terminology from the study guide.
    - Reflect on how this affects the choice of database model (relational vs. non-relational).

STEM Linkage: Encourages systems-level thinking and classification—crucial in computer science and information architecture.

Activity 2: "Schema Design Studio" (Hands-On Data Modeling)

Objective: Practice designing relational schemas and understanding keys.

How it works:

- Provide a **realistic scenario** (e.g., an online bookstore, school registration system, or concert ticketing platform).
- Students work in pairs or groups to:
    - Identify entities (e.g., Books, Authors, Orders).
    - Define table schemas (fields, data types).
    - Assign **primary and foreign keys** correctly.
    - Draw a **schema diagram** to represent relationships.
- Include optional use of tools like **Lucidchart**, **draw.io**, or pen-and-paper for visuals.

Extension: Students peer review another group's schema to identify correct/incorrect use of keys and relationships.

STEM Linkage: Supports understanding of database normalization, relationships, and design—core skills in database administration and data engineering.

Activity 3: "Relational vs. Non-Relational Debate & Simulation"

Objective: Compare use cases and strengths of relational vs. non-relational databases.

How it works:

- Divide class into two teams: **Relational Advocates** and **NoSQL Advocates**.
- Present each team with **case studies** (e.g., managing a school database vs. handling user-generated content for a social media app).
- Teams must:
  - Choose the appropriate database model.
  - Justify their choice using concepts like **schema rigidity**, **scalability**, and **data type diversity**.
- After the debate, simulate how each model handles the data using basic tools:
  - **Relational Model**: Represent data in table format with relationships.
  - **Non-Relational Model**: Use JSON examples to show how data is stored and queried.

STEM Linkage: Encourages critical thinking, real-world application, and systems analysis—skills aligned with cybersecurity, software development, and data science pathways.

Optional Extension:

Cybersecurity Tie-In: Discuss how structured vs. unstructured data affects **data protection strategies**, especially in relational models with strict schemas vs. flexible document stores.