Activity 06-3: Hand-on Database Models with Clay/Play-Doh

Big Idea

The big idea of this lesson is to provide a hands-on, interactive learning experience that enhances students' understanding of database models. By engaging in a tactile activity where they create 3D representations of various database models, students can better visualize and comprehend the structure and relationships inherent in different types of databases.

Materials

Modeling clay or Play-Doh in various colors.
Reference images of different database models such as flat, hierarchical, network, relational, and object-oriented databases.
Tools for shaping and cutting the clay, if needed.

Vocabulary

Database Model
Flat Database Model
Hierarchical Database Model
Network Database Model
Relational Database Model
Obtect-Oriented Database Model

Background

Before the hands-on activity, students should have a basic understanding of databases, including their purpose in storing and managing data. They should be familiar with fundamental concepts of data organization and management, as well as introductory knowledge of various database models like flat, hierarchical, network, relational, and object-oriented. Familiarity with key database terms such as 'table', 'record', 'field', 'primary key', and 'foreign key' is also essential. This foundational knowledge will enable students to better grasp the practical aspects of the activity and apply theoretical concepts more effectively.

Activity Directions

1. **Preparation**
    - Gather all materials: modeling clay or Play-Doh in various colors, tools for shaping and cutting, and reference images of different database models.
    - Review the basic concepts of database models: flat, hierarchical, network, relational, and object-oriented.
2. **Introduction to Database Models**
    a. Briefly discuss each database model: flat, hierarchical, network, relational, and object-oriented.
    b. Display reference images of these models and explain their structure and characteristics.

3. **Modeling the Flat Database Model**
    - Use clay to create a simple flat database model. This should be a single layer representing a basic table with rows and columns.
    - Label parts of your model to represent different data fields.

4. **Constructing the Hierarchical Database Model**
    - Shape clay into a tree-like structure to represent a hierarchical database model, showing a single root and branches for related records.
    - Attach smaller pieces to represent various levels and nodes in the hierarchy.

5. **Creating the Network Database Model**
    - Form a network database model showing interconnected nodes. Use different colors of clay to represent various records and their many-to-many relationships.
    - Connect these nodes with clay links to illustrate the network connections.

6. **Building the Relational Database Model**
    - Create multiple tables (each a flat layer) and arrange them to represent a relational database structure.
    - Use small pieces of clay or lines to show the primary and foreign key relationships between tables.

7. **Designing the Object-Oriented Database Model**
    - Mold objects out of clay, each representing a different entity in an object-oriented database.
    - Connect these objects with lines or clay pieces to show their interrelations and the encapsulation of data and methods.

8. **Review and Discussion**

    - Once all models are created, have a class discussion. Compare each model, discussing their pros and cons, and their appropriate use cases.
    - Encourage students to share their models and describe the logic behind their structures.

9. **Clean-Up**
    - After the discussion, guide students to carefully disassemble their models and clean up their work area.

10. **Reflection**
    - Conclude the activity with a reflection session. Ask students to share what they learned about database models and how the tactile experience helped their understanding.