

Activity 06-1: Database Design with LEGO Bricks

Big Idea

Using LEGO bricks as a tangible analogy, students will learn the concept of database normalization. This hands-on approach is designed to provide a physical and visual representation of how data can be organized in databases. The activity aims to transform abstract database concepts into something more concrete and understandable, particularly focusing on the transition from unnormalized data structures to normalized forms (1NF, 2NF, and 3NF).

Materials

- **LEGO Bricks:** A variety of colors and sizes to represent different data elements.
- **Printed Unnormalized Tables:** Tables showing unnormalized data, which can be sourced through a simple [Google search](#). These will serve as the starting point for the exercise.

Vocabulary

Database Normalization

Unnormalized Tables

1NF (First Normal Form)

2NF (Second Normal Form)

3NF (Third Normal Form)

Background

Before starting the LEGO-based database normalization activity, students should have a foundational knowledge of database concepts. This includes understanding what a database is, its basic structures like tables, rows, and columns, and key data management principles such as the role of primary keys, the issues of data redundancy, and the importance of data integrity. An introductory overview of database normalization, explaining its significance in inefficient and logical data organization, is also essential. This background will equip students with the necessary context to fully engage with and benefit from the hands-on LEGO exercise.



Activity Directions

1. **Task 1:** Preparation

- **Gather all necessary materials:** LEGO bricks and printed unnormalized tables.
- Briefly review the concepts of database normalization, specifically focusing on 1NF, 2NF, and 3NF.

2. **Task 2:** Initial Construction

- Assign each student (or group) a [printed unnormalized table](#).
- Students will use LEGO bricks to build a physical representation of the unnormalized table. Each brick represents a piece of data or a data attribute.

3. **Task 3:** Understanding 1NF (First Normal Form)

- Guide students to rearrange their LEGO structure to represent the First Normal Form (1NF), which involves eliminating duplicate data and ensuring each data element is atomic (indivisible).

4. **Task 4:** Transition to 2NF (Second Normal Form)

- Instruct students to modify their LEGO models to demonstrate the Second Normal Form (2NF). This involves ensuring that all non-key attributes are fully functionally dependent on the primary key.

5. **Task 5:** Achieving 3NF (Third Normal Form)

- Have students adjust their structures to represent the Third Normal Form (3NF), focusing on removing data columns that do not depend directly on the primary key.

6. **Task 6:** Reflection and Discussion

- Once all forms are represented, engage students in a discussion about their experiences. Ask them to explain how their LEGO structures changed with each normalization step and the significance of these changes in database design.

7. **Task 7:** Clean Up



- Ensure students disassemble their LEGO structures and return all materials to their proper place.

