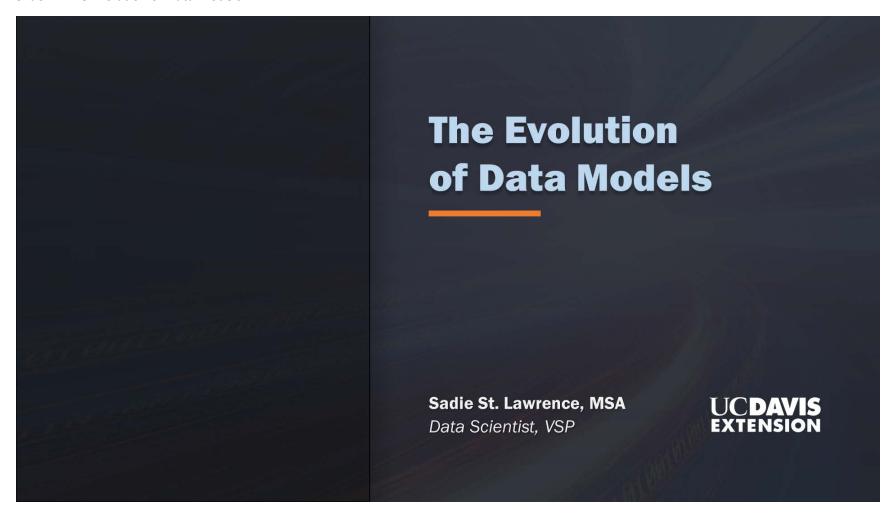
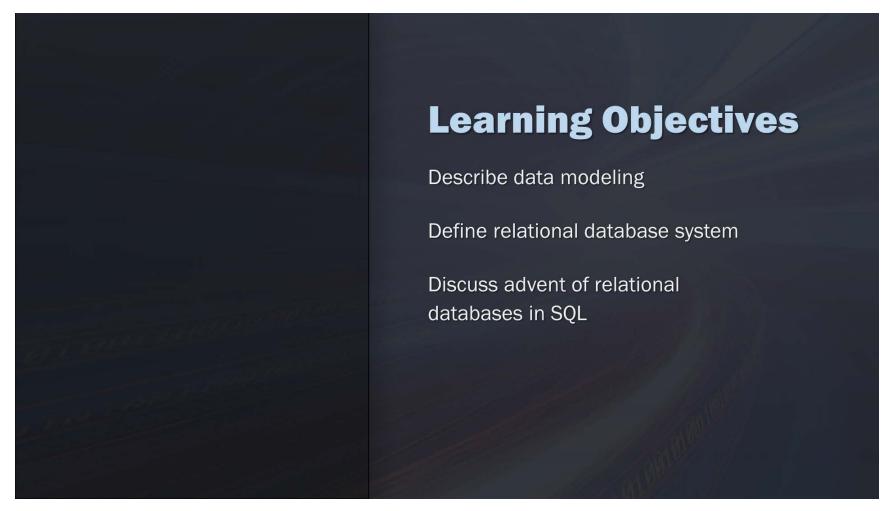
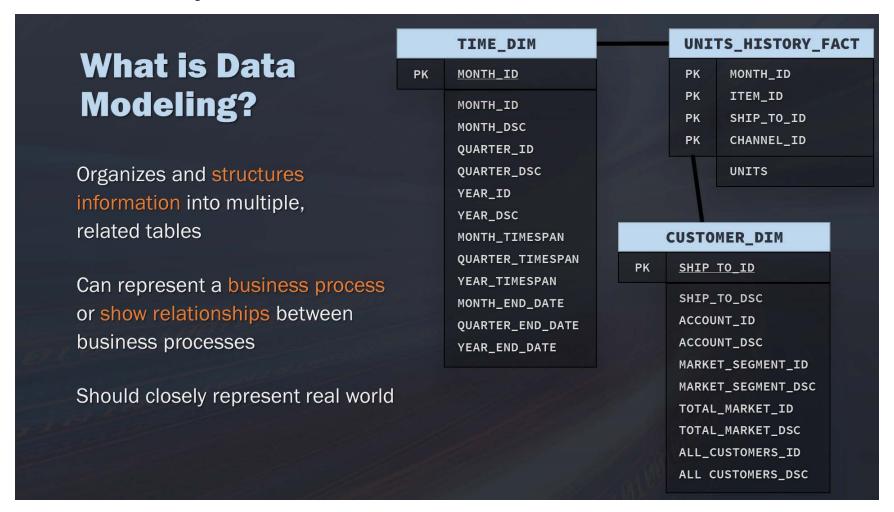
Slide 1: The Evolution of Data Models



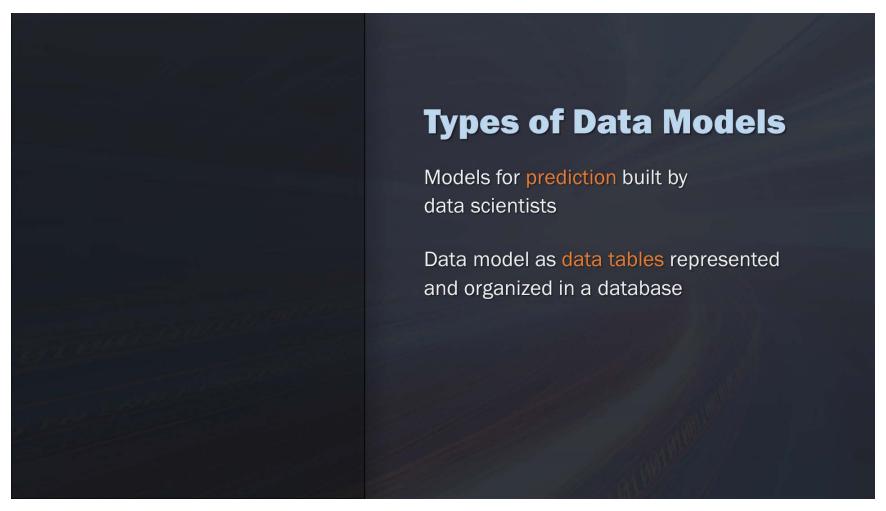
Slide 2: Learning Objectives



Slide 3: What Is Data Modeling



Slide 4: Types of Data Models



Slide 5: Evolution of Data Models

Evolution of Data Models	1960 1969	Hierarchical Network	Difficult to represent M:N relationships (hierarchical only) Structural level dependency No ad hoc queries (record-at-a-time access) Access path predefined (navigational access)
least ▲	1970	Relational	Conceptual simplicity (structural independence) Provides ad hoc queries (SQL) Set-oriented access
Semantics in Data Model	1976	Entity Relationship	Easy to understand (more semantics) Limited to conceptual modeling (no implementation component)
↓	1978	Semantic	More semantics in data model Support for complex objects
most	1985	Object-Oriented	Inheritance (class hierarchy) Behavior Unstructured data (XML)
	1990	Extended Relational (O/R DBMS)	XML data exchanges
1983 Internet is born	2009 Big Data	NoSql	Addresses Big Data problem Less semantics in data model Based on schema-less key-value data model Best suited for large sparse data stores

Slide 6: SQL in a Big Data World

