

CS 452 - Relational Database Schema

Note: In response to the “how each table relates to other entities/tables” portion of the assignment, each relation is stated unidirectionally. This means that if a table has a foreign key(s) to another table, the “**How It Relates to Other Entities/Tables**” explanation is listed under that table’s section, but it is not mentioned in the table holding the primary key being referred to (e.g., the Lesson table references the Unit table, but not vice-versa).

User:

Table Name Explanation: References the users using the video platform.

Entity Represented: A user who uses the video platform (any type).

Table Definition:

User(User_Id, Username, Password, First_Name, Last_Name, Email)

Column Names Explanation:

User_Id: A unique id (primary key) associated with each user. Auto incremented.

Username: A username associated with the user.

Password: A hashed representation of the user’s password.

First_Name: The user’s first name.

Last_Name: The user’s last name.

Email: An email associated with the user.

Evidence of Normalization:

First Normal Form (1NF): No columns hold more than one value.

Second Normal Form (2NF): No composite keys (so is in 2NF by default).

Third Normal Form (3NF): All attributes that contain functional dependencies (User_Id, Username, Email) are all candidate keys since each one is unique in the database and the dependent attributes are the same for all candidate keys (every other attribute besides the candidate keys). Therefore, the User table satisfies 3NF.

Fourth Normal Form (4NF): No multivalued dependencies in the table.

Role:

Table Name Explanation: References roles in the video platform.

Entity Represented: A role in the video platform such as student or teacher.

Table Definition:

Role(Role_Id, Role_Name)

Column Names Explanation:

Role_Id: A unique id (primary key) associated with each role. Auto incremented.

Role_Name: A name associated with the role.

Evidence of Normalization:

First Normal Form (1NF): No columns hold more than one value.

Second Normal Form (2NF): No composite keys (so is in 2NF by default).

Third Normal Form (3NF): The only functional dependency for the table is Role_Id ->

Role_Name. Role_Name obviously does not determine Role_Id, so the Role table satisfies 3NF (the primary key is the only candidate key).

Fourth Normal Form (4NF): No multivalued dependencies in the table.

User Role:

Table Name Explanation: References users associated with roles (hence the User Role name).

Note that this is a many-to-many resolution table.

Entity Represented: The roles associated with a user/the roles assigned to different users.

How It Relates to Other Entities/Tables: This table contains two foreign keys, which reference both the User and Role tables. The user role table associates user entities with role entities.

Table Definition:

User_Role(User_Id, Role_Id)

Foreign key User_Id references User.

Foreign key Role_Id references Role.

Column Names Explanation:

User_Id: An id associated with a unique user in the user table.

Role_Id: An id associated with a unique role in the role table.

Evidence of Normalization:

First Normal Form (1NF): No columns hold more than one value.

Second Normal Form (2NF): No composite keys (so is in 2NF by default).

Third Normal Form (3NF): All attributes are part of the primary key, so there are no functional dependencies on a non-candidate key.

Fourth Normal Form (4NF): This table is used for removing multivalued dependencies, and follows the 4NF mentioned in the book.

Enrollment:

Table Name Explanation: References users enrolled in a course. Note that this is a many-to-many resolution table.

Entity Represented: Courses for which a student has signed up (enrolled)/ the courses for which students have been assigned (by choice).

How It Relates to Other Tables: This table contains two foreign keys, which reference both the Course and User tables. Enrollment associates course entities with user entities.

Table Definition:

Enrollment(Course_Id, User_Id)

Foreign key Course_Id references Course.

Foreign key User_Id references User.

Column Names Explanation:

Course_Id: An id associated with a unique course in the course table.

User_Id: An id associated with a unique user in the user table.

Evidence of Normalization:

First Normal Form (1NF): No columns hold more than one value.

Second Normal Form (2NF): No composite keys (so is in 2NF by default).

Third Normal Form (3NF): All attributes are part of the primary key, so there are no functional dependencies on a non-candidate key.

Fourth Normal Form (4NF): This table is used for removing multivalued dependencies, and follows the 4NF mentioned in the book.

Course:

Table Name Explanation: References video platform courses.

Entity Represented: A course in the video platform.

Table Definition:

Course(Course_Id, Course_Name)

Column Names Explanation:

Course_Id: A unique id (primary key) associated with each course. Auto incremented.

Course_Name: A name associated with the course.

Evidence of Normalization:

First Normal Form (1NF): No columns hold more than one value.

Second Normal Form (2NF): No composite keys (so is in 2NF by default).

Third Normal Form (3NF): The only functional dependency for the table is Course_Id -> Course_Name. Course_Name obviously does not determine Course_Id, so the Course table satisfies 3NF (the primary key is the only candidate key).

Fourth Normal Form (4NF): No multivalued dependencies in the table.

Unit:

Table Name Explanation: References video platform units.

Entity Represented: A unit contained within a course.

How It Relates to Other Tables: This table contains one foreign key, which references a course in the Course table. This allows for unit entities to be “contained” within course entities.

Table Definition:

Unit(Unit_Id, Unit_Name, Unit_Number, Course_Id)

Foreign key Course_Id references Course.

Column Names Explanation:

Unit_Id: A unique id (primary key) associated with each unit. Auto incremented.

Unit_Name: A name associated with the unit.

Unit_Number: Corresponds to the order the units are displayed to the student in the course.

For example, Unit_Number 1 would be the first unit in a course.

Course_Id: The Course_Id to the parent course where this unit is contained.

Evidence of Normalization:

First Normal Form (1NF): No columns hold more than one value.

Second Normal Form (2NF): No composite keys (so is in 2NF by default).

Third Normal Form (3NF): The only functional dependency for the table is Unit_Id ->

Unit_Name, Unit_Number, and Course_Id. No other attribute depends on any other attribute (there are no candidate keys except the primary key). Therefore, the User table satisfies 3NF.

Fourth Normal Form (4NF): No multivalued dependencies in the table.

Lesson:

Table Name Explanation: References video platform lessons.

Entity Represented: A lesson contained within a unit.

How It Relates to Other Tables: This table contains one foreign key, which references a unit in the Unit table. This allows for lesson entities to be “contained” within unit entities.

Table Definition:

Lesson(Lesson_Id, Lesson_Name, Lesson_Video, Lesson_Number, Unit_Id)

Foreign key Unit_Id references Unit.

Column Names Explanation:

Lesson_Id: A unique id (primary key) associated with each lesson. Auto incremented.

Lesson_Name: A name associated with the lesson.

Lesson_Video: A URL to a video associated with the lesson.

Lesson_Number: Corresponds to the order the lessons are displayed to the student. For example, Lesson_Number 1 would be the first lesson in a unit.

Unit_Id: The Unit_Id to the parent unit where this lesson is contained.

Evidence of Normalization:

First Normal Form (1NF): No columns hold more than one value.

Second Normal Form (2NF): No composite keys (so is in 2NF by default).

Third Normal Form (3NF): The only main functional dependency for the table is Lesson_Id -> Lesson_Name, Lesson_Video, Lesson_Number, and Unit_Id. Lesson_Video could also potentially be considered a determinate for the other attributes in the table (Lesson_Video -> Lesson_Name, Lesson_Number, and Unit_Id), but it is not a current requirement in our database implementation for the Lesson_Video to be unique. Therefore, the table has only one determinant, which is the primary key, and the table follows 3NF.

Fourth Normal Form (4NF): No multivalued dependencies in the table.