School Management System Database

Danial Tahir
Student Number: 920838929
Github: DanTahir

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Table of Contents

Project Description

The marketplace for digital management solutions to school management has many entrants promising a wide variety of services, so a new entrant providing a School Management System Database needs to provide a product that offers the full range of services required to run a school, from course management to teacher management to staff management to resource management to parking management. Every aspect of the modern campus has to be managed to perfection for a modern school to function and a platform needs to be able to provide the power and flexibility required to deal with the deep complexity inherent in this task.

School Management System Database provides powerful features allowing for the complete management of an educational system. It allows creation of students, teachers, and staff members, allowing you to manage your school's diverse personnel. We include the powerful feature of categories enabling you to further manage your registered users.

School Management System Database has powerful course management features including the proctoring of tests and the collection of assignments. Not only that, it enables you to manage all the resources you'll need to administrate a class, from classroom space to classroom equipment to class required reading and other required resources. It even includes parking management.

Many products including Canvas and Dreamclass would be enhanced by our comprehensive resource management options in addition to our fully featured offerings in other areas. We believe School Management System Database is a powerful product that can compete in the marketplace.

Functional Requirements

1. Student (Strong)
    1.1. A student shall have many majors.
    1.2. A student shall take many class sections.
    1.3. A student shall complete many assignments.
    1.4. A student shall complete many quiz answers.
    1.5. A student shall view many documents.
    1.6. A student shall make many student payments in many semesters.
    1.7. A student shall belong to many organizations.
2. Teacher (Strong)
    2.1. A teacher shall have many teacher roles.
    2.2. A teacher shall have no more than one department.
    2.3. A teacher shall receive many teacher payments.
    2.4. A teacher shall have no more than one parking lot.
    2.5. A teacher shall teach many class sections.
    2.6. A teacher shall create many modules.
    2.7. A teacher shall create many assignments.
    2.8. A teacher shall create many quizzes.
    2.9. A teacher shall create many quiz questions.
    2.10. A teacher shall create many quiz answers.
    2.11. A teacher shall create many documents.
    2.12. A teacher shall assign many modules to many class sections.
    2.13. A teacher shall assign many assignments to many modules.
    2.14. A teacher shall assign many quizzes to many modules.
    2.15. A teacher shall assign many documents to many modules.
    2.16. A teacher shall assign many quiz questions to many quizzes.
    2.17. A teacher shall assign many quiz answers to many quiz questions.
    2.18. A teacher shall create many required resources.
    2.19. A teacher shall assign many required resources to many class sections.
    2.20. A teacher shall oversee many organizations.
3. Staff Member (Strong)
    3.1. A staff member shall have many staff roles.
    3.2. A staff member shall have no more than one department.
    3.3. A staff member shall receive many staff payments.
    3.4. A staff member shall have no more than one parking lot.
4. Teacher Role (Strong)
    4.1. A teacher role shall have many teachers.
5. Teacher Payment (Weak)
    5.1. A teacher payment shall be made to only one teacher.
6. Staff Role (Strong)
    6.1. A staff role shall have many staff members.

7. Staff Payment
    7.1. A staff payment shall be made to only one staff member.
8. Major (Strong)
    8.1. A major shall have many students.
    8.2. A major shall have many required classes.
9. Subject (Strong)
    9.1. A subject shall have many classes.
    9.2. A subject shall have no more than one department.
10. Department
    10.1. A department shall have many teachers.
    10.2. A department shall have many staff members.
    10.3. A department shall have many subjects.
11. Class (Strong)
    11.1. A class shall have no more than one subject.
    11.2. A class shall be required by many majors.
    11.3. A class shall have many class sections.
12. Class Section (Strong)
    12.1. A class section shall have no more than one class.
    12.2. A class section shall have many students.
    12.3. A class section shall have many teachers.
    12.4. A class section shall have many modules.
    12.5. A class section shall have no more than one classroom.
    12.6. A class section shall have many required resources.
    12.7. A class section shall have no more than one semester.
13. Module (Strong)
    13.1. A module shall have no more than one class.
    13.2. A module shall have many assignments.
    13.3. A module shall have many quizzes.
    13.4. A module shall have many documents.
14. Assignment (Strong)
    14.1. An assignment shall belong to no more than one module.
    14.2. An assignment shall be submitted by many students.
15. Quiz (Strong)
    15.1. A quiz shall belong to no more than one module.
    15.2. A quiz shall have many quiz questions.
16. Quiz Question (Strong)
    16.1. A quiz question shall have no more than one quiz.
    16.2. A quiz question shall have many quiz answers.
17. Quiz Answer (Strong)
    17.1. A quiz answer shall have no more than one quiz question.
    17.2. A quiz answer shall be answered by many students.
18. Document (Strong)
    18.1. A document shall belong to no more than one module.
19. Classroom (Strong)

19.1. A classroom shall be assigned to many class sections.
19.2. A classroom shall have many classroom resources.

20. Required Resources (Strong)
    20.1. A required resource shall be assigned to no more than one class section.
21. Classroom Resource (Strong)
    21.1. A classroom resource shall be assigned to many classrooms.
22. Semester (Strong)
    22.1. A semester shall belong to many class sections.
    22.2. A semester shall belong to many student payments.
23. Parking Lot (Strong)
    23.1. A parking lot shall be assigned to many students.
    23.2. A parking lot shall be assigned to many teachers.
    23.3. A parking lot shall be assigned to many staff members.
24. Organization
    24.1. An organization shall have many students.
    24.2. An organization shall have many teachers.
25. Admin (Strong)
    25.1. An admin shall create many students.
    25.2. An admin shall create many teachers.
    25.3. An admin shall create many staff members.
    25.4. An admin shall create many classrooms.
    25.5. An admin shall create many classroom resources.
    25.6. An admin shall create many parking lots.
    25.7. An admin shall create many classes.
    25.8. An admin shall create many class sections.
    25.9. An admin shall create many organizations.
    25.10. An admin shall assign many class sections to many classes.
    25.11. An admin shall assign many classrooms to many classes.
    25.12. An admin shall assign many teachers to many class sections.
    25.13. An admin shall assign many teacher roles to many teachers.
    25.14. An admin shall assign many departments to many teachers.
    25.15. An admin shall assign many positions to many staff members.
    25.16. An admin shall assign many students to many parking lots.
    25.17. An admin shall assign many teachers to many parking lots.
    25.18. An admin shall assign many staff members to many parking lots.
    25.19. An admin shall assign many teachers to many organizations.
    25.20. An admin shall assign many students to many organizations.

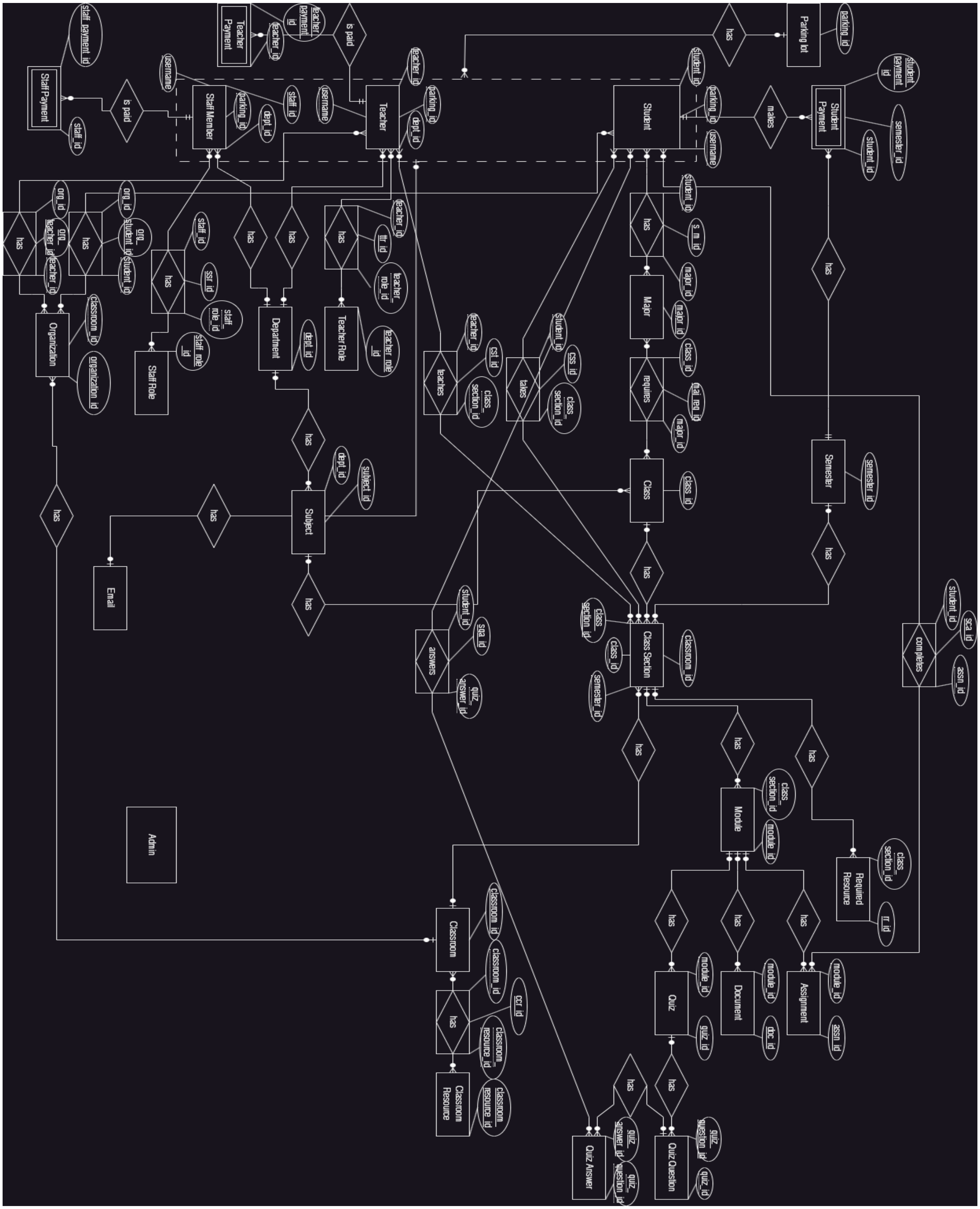
Non-functional Database Requirements

1. Performance
    1.1. The database shall respond to user requests within 2 seconds.
    1.2. The database shall respond to 95% of user requests within 100 milliseconds.
    1.3. The system shall be able to handle a minimum of 50 concurrent users without impacting performance.
    1.4. There shall be no caching of results to improve performance.
    1.5. Regular load testing shall be carried out to make sure the database can handle loads during peak events.
2. Security
    2.1. All passwords shall be stored encrypted.
    2.2. All passwords shall be transmitted encrypted.
    2.3. The database shall implement role-based permissions so that only approved users can perform necessary functions.
    2.4. Steps shall be taken to protect queries against injection attacks.
    2.5. Regular security audits shall be performed to assess and mitigate vulnerabilities.
3. Scalability
    3.1. The database shall run on one server and shall not be scalable to run on multiple servers.
    3.2. The server shall allocate resources to the database on a fixed basis and shall be restarted if those resources need to be changed.
    3.3. There will be no caching.
    3.4. Connection pooling shall not be used and all connections shall be handled as new.
    3.5. The database shall run as a single instance.
4. Capability
    4.1. The database shall be compatible with many frontends.
    4.2. The database shall have a user-friendly interface.
    4.3. The system shall provide simple reports of basic database information.
    4.4. The database shall support integration with other systems such as email.
    4.5. The database shall support basic data analysis such as querying and filtering data.
5. Environmental
    5.1. Software and hardware configurations shall be optimized to minimize energy usage.
    5.2. Paperless operations shall be encouraged by having all documentation be electronic.
    5.3. Obsolete hardware shall be disposed of responsibly via recycling.
    5.4. Virtualization shall be used where possible to minimize resource consumption.
    5.5. Remote access shall be enabled so that administrators do not need to travel to the database, minimizing carbon footprint.
6. Coding Standards
    6.1. Consistent naming conventions for database entities including tables, columns, and indexes shall be enforced.

6.2. Code shall be documented including documentation of queries, schemas, and stored procedures to facilitate teamwork and future development.
6.3. Robust error handling with meaningful error messages shall be implemented.
6.4. Code shall not be optimized but shall be provided in working order.
6.5. Best security practices including input validation and parameterized queries shall be followed.

7. Media Storage and Privacy
   7.1. Privacy shall be maintained by not tracking IP addresses.
   7.2. There shall be a privacy policy that details how data is stored and used.
   7.3. Media shall not be stored in the database.
   7.4. Links to media may be stored in the database.
   7.5. Each table shall be allocated at least 10Mb of disk space.

Entity Relationship Diagram



Entity Description

1. Student (Strong)
    * student_id (key, numeric)
    * username (key, alphanumeric)
    * date_of_birth (multivalue, numeric)
    * date_of_enrollment (multivalue, timestamp)
    * name (composite, alphanumeric)
    * password (alphanumeric)
    * parking_lot_id (key, alphanumeric)
2. Teacher (Strong)
    * teacher_id (key, numeric)
    * username (key, alphanumeric)
    * date_of_hiring (multivalue, timestamp)
    * name (composite, alphanumeric)
    * password (alphanumeric)
    * dept_id (key, numeric)
    * parking_lot_id (key, alphanumeric)
3. Email (Strong)
    * email_id (key, numeric)
    * address (key, composite, alphanumeric)
    * student_id (key, numeric)
    * teacher_id (key, numeric)
    * staff_id (key, numeric)
4. Staff Member (Strong)
    * staff_id (key, numeric)
    * username (key, alphanumeric)
    * date_of_hiring (multivalue, timestamp)
    * name (composite, alphanumeric)
    * password (alphanumeric)
    * dept_id (key, numeric)
    * parking_lot_id (key, alphanumeric)
5. Teacher Role (Strong)
    * teacher_role_id (key, numeric)
    * name (composite, alphanumeric)
    * description (alphanumeric)
    * payscale (numeric)
6. Staff Role (Strong)
    * staff_role_id (key, numeric)
    * name (composite, alphanumeric)
    * description (alphanumeric)
    * payscale (numeric)
7. Teacher-Teacher Role (Weak)
    * ttr_id (key, numeric)

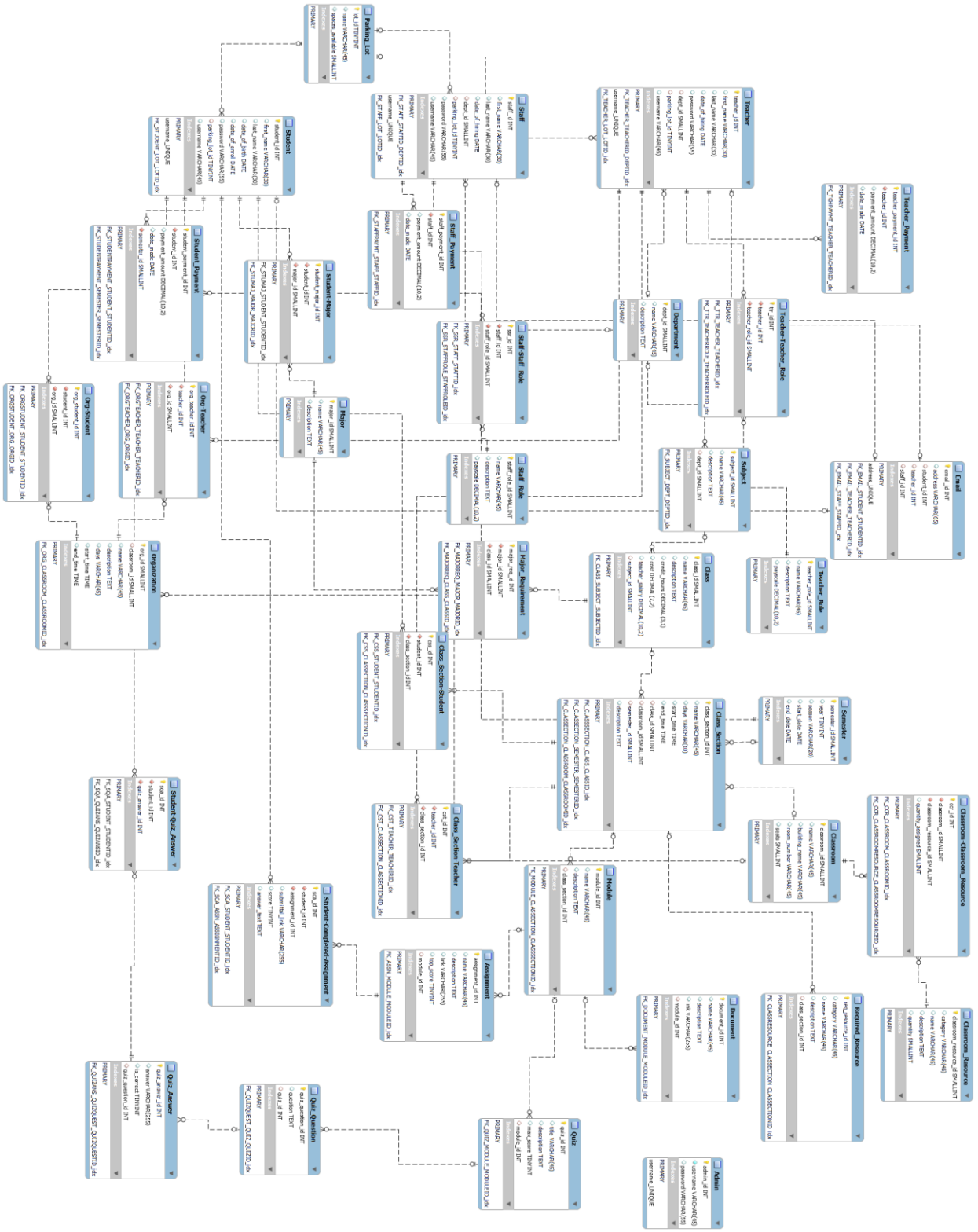
    * teacher_id (key, numeric)
    * teacher_role_id (key, numeric)
8. Staff-Staff Role (Weak)
    * ssr_id (key, numeric)
    * staff_id (key, numeric)
    * staff_role_id (key, numeric)
9. Department (Strong)
    * dept_id (key, numeric)
    * name (alphanumeric)
    * description (alphanumeric)
10. Major (Strong)
    * major_id (key, numeric)
    * name (alphanumeric)
    * description (alphanumeric)
11. Student-Major (Weak)
    * student_major_id (key, numeric)
    * student_id (key, numeric)
    * major_id (key, numeric)
12. Subject (Strong)
    * subject_id (key, numeric)
    * name (alphanumeric)
    * description (alphanumeric)
    * dept_id (key, numeric)
13. Class (Strong)
    * class_id (key, numeric)
    * name (alphanumeric)
    * description (alphanumeric)
    * credit_hours (numeric)
    * cost (numeric)
    * teacher_salary (numeric)
    * subject_id (key, numeric)
14. Major Requirement (Weak)
    * major_req_id (key, numeric)
    * major_id (key, numeric)
    * class_id (key, numeric)
15. Class Section (Strong)
    * class_section_id (key, numeric)
    * name (alphanumeric)
    * description (alphanumeric)
    * days (composite, alphanumeric)
    * hours (composite, numeric)
    * class_id (key, numeric)
    * classroom_id (key, numeric)
    * semester_id (key, numeric)

16. Class Section-Student (Weak)
    * css_id (key, numeric)
    * class_section_id (key, numeric)
    * student_id (key, numeric)
17. Class Section-Teacher (Weak)
    * cst_id (key, numeric)
    * class_section_id (key, numeric)
    * teacher_id (key, numeric)
18. Semester (Strong)
    * semester_id (key, numeric)
    * name (composite, alphanumeric)
    * start date (multivalue, numeric)
    * end date (multivalue, numeric)
19. Classroom (Strong)
    * classroom_id (key, numeric)
    * name (alphanumeric)
    * building (alphanumeric)
    * number (alphanumeric)
    * seats
20. Module (Strong)
    * module_id (key, numeric)
    * name (alphanumeric)
    * description (alphanumeric)
    * class_section_id (key, alphanumeric)
21. Document (Strong)
    * document_id (key, numeric)
    * name (alphanumeric)
    * description (alphanumeric)
    * link (alphanumeric)
    * module_id (key, numeric)
22. Assignment (Strong)
    * assignment_id (key, numeric)
    * name (alphanumeric)
    * description (alphanumeric)
    * link (alphanumeric)
    * possible_score (numeric)
    * module_id (key, numeric)
23. Quiz (Strong)
    * quiz_id (key, numeric)
    * title (alphanumeric)
    * description (alphanumeric)
    * possible_score (numeric)
    * module_id (key, numeric)
24. Quiz Question (Strong)

    * quiz_question_id (key, numeric)
    * question (alphanumeric)
    * quiz_id (key, numeric)
25. Quiz Answer (Strong)
    * quiz_answer_id (key, numeric)
    * answer (alphanumeric)
    * is_correct (numeric)
    * quiz_question_id (key, numeric)
26. Student-Completed-Assignment (Weak)
    * sca_id (key, numeric)
    * student_id (key, numeric)
    * assignment_id (key, numeric)
    * submittal_link (alphanumeric)
    * grade (numeric)
    * answer_text (alphanumeric)
27. Student Quiz Answer (Weak)
    * sqa_id (key, numeric)
    * student_id (key, numeric)
    * quiz_answer_id (key, numeric)
28. Required Resource (Strong)
    * req_resource_id (key, numeric)
    * category (alphanumeric)
    * name (alphanumeric)
    * description (alphanumeric)
    * class_section_id (key, numeric)
29. Classroom Resource (Strong)
    * class_resource_id (key, numeric)
    * category (alphanumeric)
    * name (alphanumeric)
    * description (alphanumeric)
    * quantity (numeric)
30. Classroom-Classroom Resource (Weak)
    * ccr_id (key, numeric)
    * classroom_id (key, numeric)
    * class_resource_id (key, numeric)
    * quantity_assigned (numeric)
31. Parking Lot (Strong)
    * lot_id (key, numeric)
    * name (alphanumeric)
    * spaces_available (numeric)
32. Student Payment (Weak)
    * student_payment_id (key, numeric)
    * student_id (key, numeric)
    * payment_amount (key, numeric)

    * date_made (multivalue, timestamp)
    * semester_id (key, numeric)
33. Teacher Payment (Weak)
    * teacher_payment_id (key, numeric)
    * teacher_id (key, numeric)
    * payment_amount (key, numeric)
    * date_made (multivalue, timestamp)
34. Staff Payment (Weak)
    * staff_payment_id (key, numeric)
    * staff_id (key, numeric)
    * payment_amount (key, numeric)
    * date_made (multivalue, timestamp)
35. Organization (Strong)
    * organization_id (key, numeric)
    * name (alphanumeric)
    * description (alphanumeric)
    * meeting_days (composite, alphanumeric)
    * meeting_time (composite, numeric)
    * classroom_id (key, numeric)
36. Organization-Student (Weak)
    * org_student_id (key, numeric)
    * organization_id (key, numeric)
    * student_id (key, numeric)
37. Organization-Teacher (Weak)
    * org_teacher_id (key, numeric)
    * organization_id (key, numeric)
    * student_id (key, numeric)
38. Admin (Strong)
    * admin_id (key, numeric)
    * username (alphanumeric)
    * password (alphanumeric)

Entity Establishment Relationship Diagram



Constraints Description

Table	FK	ON UPDATE	ON DELETE	Comment
Assignment	module_id	CASCADE	CASCADE	If we update a module we want to update the id and if we delete a module we want to delete an assignment assigned to it.
Class	subject_id	CASCADE	SET NULL	If a subject id is updated we want to update it but if the subject is deleted we want to keep the class.
Class_Section	class_id	CASCADE	SET NULL	If a class id is updated we want to update the section, but if a class is deleted we want to keep the section in case we want to reassign it to another class.
Class_Section	semester_id	CASCADE	SET NULL	If a semester id changes we want to update the class section, but if a semester is deleted we want to keep the class section.
Class Section	classroom_id	CASCADE	SET NULL	If a classroom id changes we want to update the class section, but if a classroom is deleted we want to reassign the class section to another classroom.
Class_Section-Student	student_id	CASCADE	CASCADE	If the student is updated or deleted we want to update or delete this record.
Class_Section-Student	class_section_id	CASCADE	CASCADE	If the class section is updated or deleted we want to update or delete this record.
Class_Section-Teacher	teacher_id	CASCADE	CASCADE	If the teacher is updated or deleted we want to update or delete this record.
Class_Section-Teacher	class_section_id	CASCADE	CASCADE	If the class section is updated or deleted we want to update or delete this record.
Classroom-Classroom_Resource	classroom_id	CASCADE	CASCADE	If the classroom id is updated we want to update this record and if the classroom is deleted there is no more need for this record.
Classroom-Classroom_Resource	classroom_resource_id	CASCADE	CASCADE	If the classroom resource id is updated we want to update this record and if the classroom resource is deleted there is no more need for this record.

Document	module_id	CASCADE	CASCADE	If the module id is changed we want to update, and if the module is deleted we want to delete any document that goes with it.
Email	student_id	CASCADE	SET NULL	If the associated student is updated we want to update but if he's deleted we want to keep the email address on record.
Email	teacher_id	CASCADE	SET NULL	If the associated teacher is updated we want to update but if he's deleted we want to keep the email address on record.
Email	staff_id	CASCADE	SET NULL	If the associated staff member is updated we want to update but if he's deleted we want to keep the email address on record.
Major_ Requirement	major_id	CASCADE	CASCADE	If the major id is changed we want to update, and if the major is deleted we want to delete its requirements
Major_ Requirement	class_id	CASCADE	CASCADE	If the class id is updated we want to update it here, and if the class is deleted we want to delete all major requirements that required that class.
Module	class_section_id	CASCADE	CASCADE	If the class section id changes we want to update, and if the class section is deleted we want to delete modules associated with it.
Organization	classroom_id	CASCADE	SET NULL	If a classroom id is updated we want to update, but if a classroom is deleted we don't want to delete the org using it.
Org-Student	student_id	CASCADE	CASCADE	If a student is updated or deleted we want to update or delete his records in this table.
Org-Student	org_id	CASCADE	CASCADE	If an organization is updated or deleted we want to update or delete its records in this table.
Org-Teacher	teacher_id	CASCADE	CASCADE	If a teacher is updated or deleted we want to update or delete his records in this table.
Org-Teacher	org_id	CASCADE	CASCADE	If an organization is updated or deleted we want to update or delete its records in this table.
Quiz	module_id	CASCADE	CASCADE	If a module is updated we want to update and if a module is deleted

				we want to delete associated quizzes.
Quiz_Answer	quiz_ question_id	CASCADE	CASCADE	If the question id is updated we want to update and if a question is deleted we want to delete associated answers.
Quiz_Question	quiz_id	CASCADE	CASCADE	If the quiz id is updated we want to update and if a quiz is deleted we want to delete associated questions.
Required_ Resource	class_ section_id	CASCADE	CASCADE	If the class section id updates we want to update it here and if the class section is deleted we want to delete associated resources.
Staff	dept_id	CASCADE	SET NULL	If the department id updates we want to update, but if the department is deleted we want to keep the staff person.
Staff	parking_ lot_id	CASCADE	SET NULL	If the parking lot id updates we want to update, but if the lot is deleted we don't want to delete every staff person with that lot.
Staff_Payment	staff_id	CASCADE	NO ACTION	If the staff id updates we want to update, but if the staff member is deleted we want to maintain the record of the payment.
Staff-Staff_Role	staff_id	CASCADE	CASCADE	If the staff member updates or deletes we want to update or delete associated relationships in this table.
Staff-Staff_Role	staff_role_id	CASCADE	CASCADE	If the staff role updates or deletes we want to update or delete associated relationships in this table.
Student	parking_lot _id	CASCADE	SET NULL	If the lot id updates we want to update, but if the lot is deleted we want to preserve students who used that lot.
Student_ Payment	student_id	CASCADE	NO ACTION	If the student id is updated we want to update, but if the student is deleted we want to preserve the record of the transaction.
Student_ Payment	semester_id	CASCADE	NO ACTION	If the semester id is updated we want to update it here, but if the semester is deleted we want to preserve the record of the transaction as originally

				committed.
Student-Completed-Assignment	student_id	CASCADE	CASCADE	When a student is updated or deleted we want to update or delete his associated records in this table.
Student-Completed-Assignment	assignment_id	CASCADE	CASCADE	When an assignment is updated or deleted we want to update or delete its associated relationships recorded in this table.
Student-Major	student_id	CASCADE	CASCADE	When a student is updated or deleted we want to update or delete his associated records in this table.
Student-Major	major_id	CASCADE	CASCADE	When a major is updated or deleted we want to update or delete its relationships recorded in this table.
Student-Quiz_Answer	student_id	CASCADE	CASCADE	When a student is updated or deleted we want to update or delete his relationships recorded in this table.
Student-Quiz_Answer	quiz_answer_id	CASCADE	CASCADE	When a quiz answer is updated or deleted we want to delete its associated relationships recorded in this table.
Subject	dept_id	CASCADE	SET NULL	When the department id updates we want to update but if a department is deleted we want to be able to assign the subject to another department.
Teacher	dept_id	CASCADE	SET NULL	When the department id updates we want to update but if the department is deleted we don't want to delete associated teachers.
Teacher	parking_lot_id	CASCADE	SET NULL	If a parking lot id updates we want to update here but if a lot is deleted we don't want to delete teachers assigned to that lot.
Teacher_Payment	teacher_id	CASCADE	NO ACTION	If a teacher id is updated we want to update here but if a teacher is deleted we want to preserve the record of the transaction.
Teacher-Teacher_Role	teacher_id	CASCADE	CASCADE	If the teacher is updated or deleted we want to update or delete their relationships recorded in this table.

Teacher-Teacher_Role	teacher_role_id	CASCADE	CASCADE	If a teacher role is updated or deleted we want to update or delete its relationships recorded in this table.