

Learning Management System
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Table of Contents

1. Project Description	3
2. Use Cases	4
3. Database Requirements	6
4. Main Entities, Attributes and Keys	9
5. Entity RElationship Diagram (ERD)	12
6. Testing Tables	13
7. Database Model/EER	15
8. Forward Engineering	
9. Inserting Data	
10. Testing	17
11. Testing Table	26

Section 1: Project Description

Project based learning has proven to be beneficial in a students learning and development. It accommodates each individual student's learning style and has proven to contribute greatly to a students comprehension while learning and their retention of information. This style of instruction needs to be recorded, organized and easily monitored as it becomes more and more popular. Recording progress can be challenging for teachers and schools, and important data to improve a Learning Management System could be missed.

CoLab Learning Management System is the solution to streamline project based learning and utilizes a more robust database. CoLab will ensure seamless communication between the many different players, such as Principals, Teachers, Students, Coaches and Counselors. Students in their courses are engaging in interactive curriculum and their grades and progress are recorded by the Teacher through modules and lessons. Progress of teachers and their students is managed by the Coaches and Counselors. The counselors have collaborated with Teachers and Coaches to build an interactive curriculum for courses in which the students attend. The CoLab database is structured in a way that all grades and reports are structured not only in an organized fashion, but also containing critical information on students progress and teachers' curriculum to ensure the best possible learning outcome. The Courses contain Lessons, and are filled with Modules, Homeworks and Tests. CoLab also allows students and Teachers to tutor each other and gives them the resources to create study groups and classrooms.

Section 2: Use Cases

Use Case Title	Enrolling into a course
Actors	Student
Description	Ramir is currently taking 3 classes. They see two more classes they would like to take. Ramirs Counselor Julie enrolls them into the Math class. Julie attempts to enroll Ramir in the Art Media class but is unable to due to already being enrolled in 4 classes.

Use Case Title	Creating reports
Actors	Coach, principal, Counselor
Description	Ari(Coach) would like to report on a department to the Margot principal to celebrate the department classes good grades. Jennifer the counselor creates the reports for from the students, Ari then views the reports and is able to show the progress to Margot

Use Case Title	Editing the lesson plans
Actors	Teacher, Student
Description	Jenny(student) is going on a last minute trip with her family and is unable to attend a class day in which she will miss one of the tests. Robert, her teacher, changes the due date for the test. Jenny takes the test at a later date.

Use Case Title	Teaching a course
Actors	Teacher
Description	Pilar is a new teacher to the school. She currently is not teaching any courses. The principal assigns Pilar to the Math department and is given a class by her Coach. Pilar is in a class and teaching her students the lesson plan she created.

Use Case Title	Books
Actors	Books, Course, Teacher
Description	Sarah is a teacher and is going to be teaching the Course Vietnamese History. Sarah creates her lesson and finds a book she'd like to use that is part of the course she's teaching.

Use Case Title	Tutoring
Actors	Teacher, Student
Description	Jiho is a student at the school and is currently not taking any classes. They'd like to tutor Rein who is another student and is in a Math Class. Rein is also tutored by his Teacher Janine when she's available.

Section 3: Database Requirements (Business Rules)

1. Principal (Strong)
 - a. A principal may view many Reports
 - b. A principal shall acknowledge reports
2. Counselor (Strong)
 - a. A counselor may view many Coach Report
 - b. A counselor may view many Teacher Report
 - c. A counselor may view many Student Report
 - d. A counselor shall create a teacher
 - e. A counselor shall create a student
3. Coach(Strong)
 - a. A coach may report to one and only one Principal
 - b. A coach may submit to one and only one Counselor
 - c. A coach may generate a Teacher Report
 - d. A coach may generate a Student Report
 - e. A coach may edit a teacher user
 - f. A coach may edit a student user
4. Teacher (Strong)
 - a. A teacher may instruct zero to many courses
 - b. A teacher may be part of many classes
 - c. A teacher may assign a lesson
 - d. A teacher may assign a module
 - e. A teacher may assign a test
 - f. A teacher may assign a homework
 - g. A teacher may tutor a student
5. Student(Strong)
 - a. A student may be part of zero or many classes
 - b. A student may take zero to many courses.
 - c. A student may take zero to many Tests
 - d. A student may take zero to many Homeworks
 - e. A student may take many Modules
 - f. A student may receive a Certificate
6. Department(Strong)
 - a. A department may have zero to many Teachers
 - b. A department may have zero to many classes

7. Class (Weak)
 - a. A class shall have at least One Teacher
 - b. A class shall have at least One Student
 - c. A class shall have a Course
 - d. A class shall be part of a department
 - e. A class shall have a location on a Map
8. Study Group (Weak)
 - a. A study group shall have at least one student
 - b. A study group may be created by a student
9. Course (strong)
 - a. A course may have One and only one Teacher
 - b. A course may have Zero to many Lessons
10. Book(Strong)
 - a. A book may be assigned to a course
11. Lesson (Strong)
 - a. A lesson may be part of course
 - b. A lesson may have zero to many modules
 - c. A lesson may be taken by one student
 - d.
12. Module(Strong)
 - a. A module shall have zero to many Tests
 - b. A module shall have zero to many Homeworks
 - c. A module may be part of a Lesson
13. Homework(Strong)
 - a. A homework may be part of a module
14. Test(Strong)
 - a. A test may have belong to one and only one module
15. Coach Group(Weak)
 - a. A group shall have at least one teacher
 - b. A group shall have at least one coach
16. Report (Strong)
 - a. A report shall be a Teacher Report, Student Report or Coach
17. Student Report(Weak)

- a. A student report shall be a report
 - b. A student report may be created by a Coach or Counselor
18. Teacher Report(Weak)
- a. A teacher report shall be a report
 - b. A teacher report shall have one Teacher
 - c. A teacher report shall be created by a coach
19. Coach Report (Weak)
- a. A coach report shall be a report
 - b. A couch report shall contain one coach
 - c. A coach report shall be created by a Counselor
20. Institution (Strong)
- a. An institution will have a name
 - b. An institution shall have a map
21. Map (Strong)
- a. A map shall have an institution
22. Certificate (Strong)
- a. A certificate is awarded to zero to many students

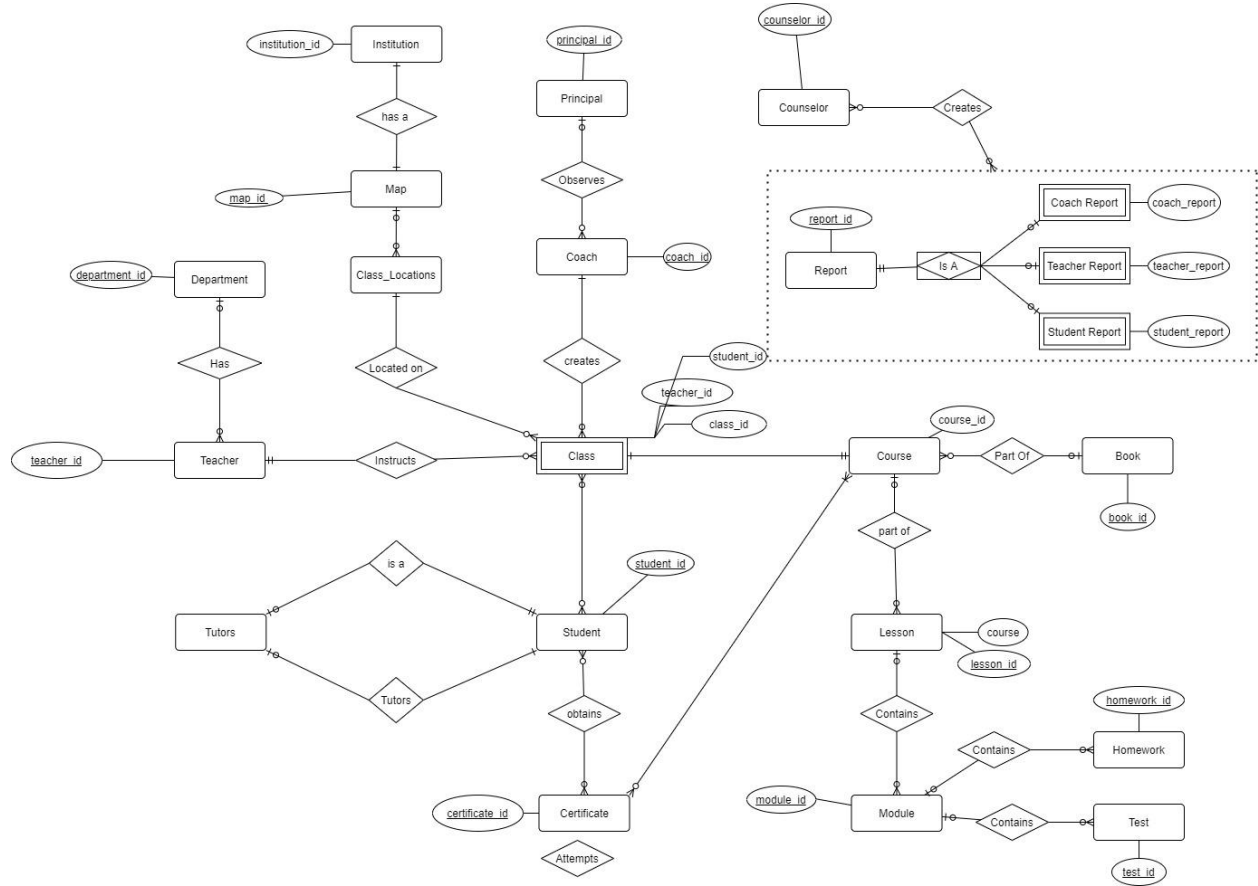
Section 4: Detailed List of Main Entities, Attributes and keys

1. Principal(Strong)
 - a. Principal_ID: key, numeric
 - b. name: string
2. Counselor (Strong)
 - a. counselor_id: key, numeric
 - b. name: string
 - c. num_of_reports: integer
3. Coach(Strong)
 - a. Coach_id: key, numeric
 - b. Coach_type: string
4. Teacher (Strong)
 - a. Teacher_ID: key, numeric
 - b. name: alphanumeric
 - c. school_id: integer
 - d. tutor: tiny int
 - e. num_of_courses: integer
5. Student (Strong)
 - a. student_id: key, numeric
 - b. student_name: string
 - c. school_id: integer
 - d. courses: integer
 - e. tutor: tinyint
6. Department (Strong)
 - a. department_id: key, alphanumeric
 - b. name: alphanumeric
 - c. size: integer
7. Class(Weak)
 - a. class_ID: key, numeric
 - b. createdby: foreign key, numeric
 - c. teacher: foreign key, numeric
 - d. course: foreign key, numeric
 - e. students: foreign key
8. Students(Weak)
 - a. students_id: key

- b. class: foreign key, integer
 - c. student: foreign key, integer
- 9. Course (Strong)
 - a. course_id: key, alphanumeric
 - b. name: Alphanumeric
 - c. course_subject: alphanumeric
 - d. book: foreign key, numeric
- 10. Book (Strong)
 - a. book_id: key, alphanumeric
 - b. book_name: alphanumeric
 - c. book_type: alphanumeric
- 11. Lesson (Strong)
 - a. lesson_id: key, numeric
 - b. lesson_topic: string
 - c. lesson_contents: medium text
 - d. course: foreign key, numeric
- 12. Module(Strong)
 - a. module_id: key, alphanumeric
 - b. module_contents: medium text
 - c. course: foreign key,numeric
- 13. Homework(Strong):
 - a. homework_id: key, alphanumeric
 - b. hw_contents: medium text
 - c. student: foreign key, numeric
 - d. grade: numeric
- 14. Test (Strong)
 - a. Test_id: key, alphanumeric
 - b. name: alphanumeric
 - c. date: date
 - d. grade: string
 - e. student: foreign key, numeric
- 15. Report(Strong)
 - a. report_id: key, alphanumeric
 - b. created_by: string
 - c. report_details: string, object
- 16. Student Report (Weak)

- a. report_id: key, numeric
 - b. counselor_id: foreign key
 - c.
17. Teacher Report (Weak)
- a. report_id: foreign key, numeric
 - b. counselor_id: foreign key
18. Coach Report (Weak)
- a. report_id: foreign key
 - b. counselor_id: foreign key
19. Institution (Strong)
- a. Institution_ID: key, alphanumeric
 - b. Name: String
 - c. Location: String
20. Map (Strong)
- a. map_id: key, numeric
 - b. building: alphanumeric
 - c. Room_number: alphanumeric
21. Class Locations (Strong)
- a. class_locations_id: key, numeric
 - b. map: foreign key, numeric
 - c. room_number : numeric
 - d. building: alphanumeric
22. Certificate (Strong)
- a. certificate_id: key, numeric
 - b. name: alphanumeric
 - c. date_issued: date
 - d. course: string
23. Tutors (Weak)
- a. tutor_id: key, foreign key, numeric
 - b. student: foreign key, numeric
 - c. topic: alphanumeric
 - d. Sessions: numeric

Section 5: Entity Relationship Diagram

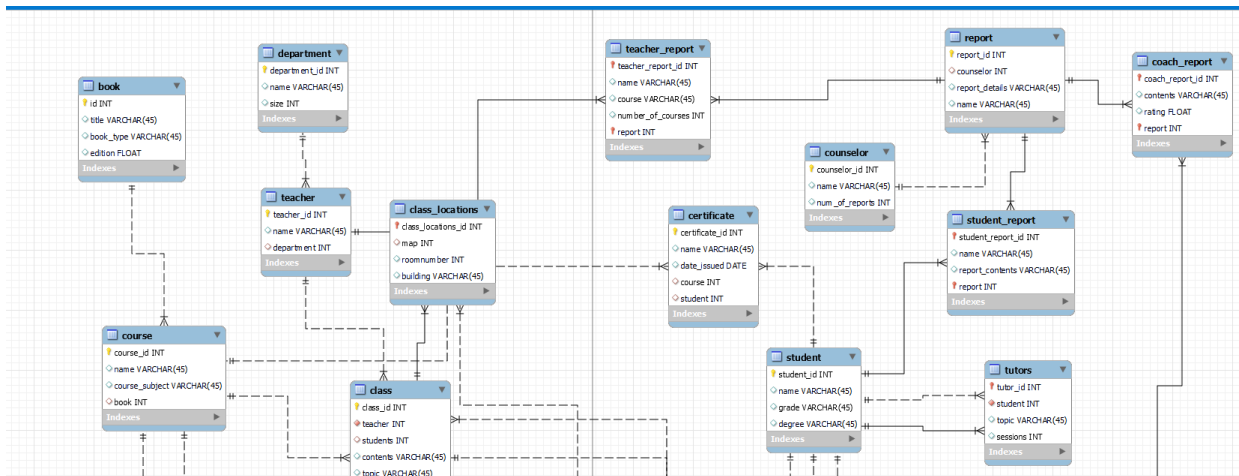
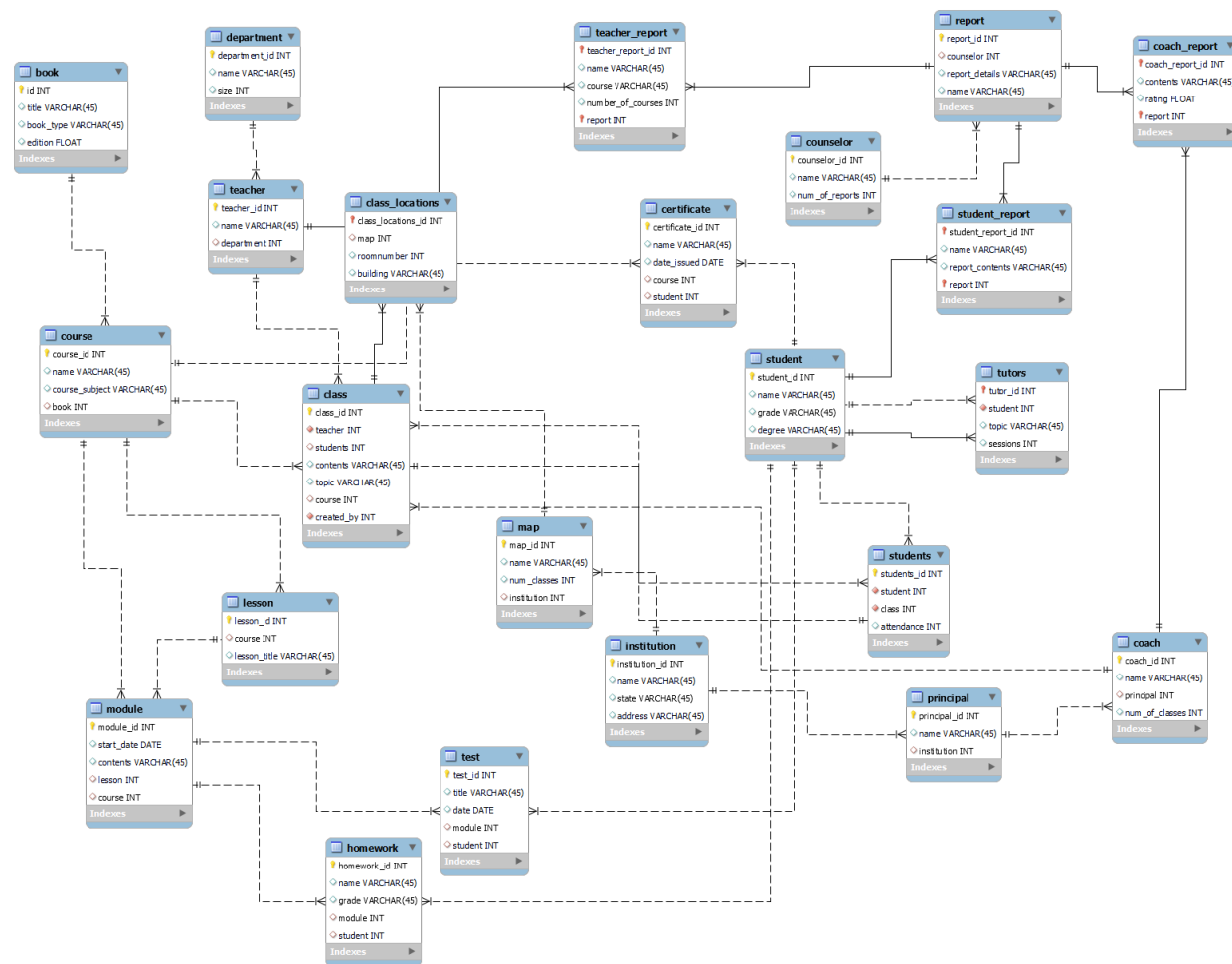


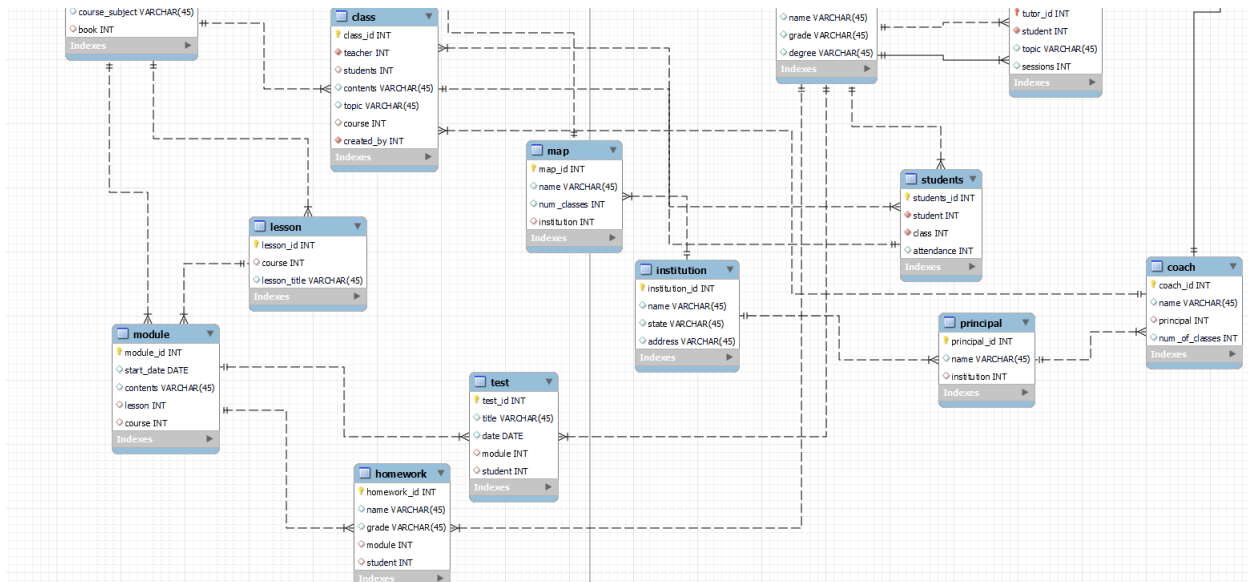
Section 6: TESTING TABLE

RULE	ENTITY A	RELATION	ENTITY B	CARDINALITY	PASS /FAIL	Error Description
1	Course	Have	Students		FAIL	Moved to class
2	Course	Have	Teacher		FAIL	Moved relation to class
3	Coach	Has	Department			
4	Department	Has	Institution	1 to Many	FAIL	
5	Homework	Part of	Module		FAIL	Moved relationship
6	Teacher	Has A	Teacher Report	1 to M	FAIL	
7	Student	Obtains	Certificate	Many to Many	FAIL	Changed from 1 Certificate to 1 student per Course
8	Student	Attempts	Lesson	0 to Many	Pass	
9	Student	Attempts	Modules	0 to Many	Pass	
10	Student	Attempts	Homework	0 to Many	Pass	
11	Module	May have	Test	1 to Many	Failed	Tests are optional
12	Student	Tutors	Student	0 to 1	Pass	
13	Teacher	Tutors	Student	0 to 1	Pass	
14	Principal	Manages	Department	1 to many	FAIL	Principal views Reports, Department
15	Coach Report	Is A	Report	0 to Many	FAIL	Changed 0 to 1
16	Teacher Report	Is A	Report	0 to Many	FAIL	Changed 0 to 1
17	Student Report	Is A	Report	0 to Many	FAIL	Changed 0 to 1
18	Teacher	Instructs	Course	0 to Many	Pass	

19	Student	Obtains	Certification	1 to 1	Pass	
20	Certification	Obtained From	Course	0 to Many	Pass	
21	Module	Contains	Test	0 to Many	Pass	
22	Module	Contains	Homework	0 to Many	Pass	
23	Lesson	Has A	Module	0 to many	Fail	Modules are contained by lesson. Modules are in zero to 1 Lessons
24	Course	Contains	(Aggregated) Lesson, Module, Test, Homework	0 to many	Pass	
25	Coach	Creates	Class	0 to many	Pass	
26	Principal	Views	Reports	0 to Many	Pass	
27	Institution	Has	Map	1 to 1	Pass	
28	Class	Has A	Department	1 to 1	Pass	
29	Class	Located On	Map	0 to Many	Pass	
30	Student	Creates	Study Group			
31	Book	Part of	Course	0 to Many	Fail	Creating a 1 to 1 relationship, since Course contains 1 book.
31	Student	Attempts	Lesson	0 to Many	Pass	
32	Student	Attempts	Module	0 to Many	Pass	
33	Student	Attempts	Test	0 to Many	Pass	
34	Student	Attempts	Homework	0 to Many	Pass	
35	Counselor	Creates	Aggregated Reports, Student Report, Teacher Report, Coach Report	0 to many	Pass	

Section 7: Database Model/EER





#	Table	FK	ON DELETE	ON UPDATE	Comment
1	Certificate	cert_student	Cascade	Cascade	If the student is deleted, then the cert must be
2	Certificate	cert_course	Cascade	Cascade	If a course is deleted, then the cert must be deleted
3	Class	class_teacher	No Action	Cascade	We want to keep the class even if the teacher is deleted
4	Class	class_course	Set Null	Cascade	If the course is deleted, we want to keep the class, maybe assign new course
5	Class	coach_creator	No Action	Cascade	Coach creates, can be deleted though
6	Class	list_of_students	Set Null	Cascade	The list of students, if the list is cleared, set null.
7	Class Locations	class_map	Set Null	Cascade	If the map is deleted, we want to set this to null to keep location
8	Class Locations	class_loc	Cascade	Cascade	If the class is deleted, then we will delete the map location
9	Coach	coach_principal	Set Null	Cascade	If the coach no longer has a principal, we want to keep this entity
10	Coach Report	report_c_id	Cascade	Cascade	If the report is deleted, we want to delete the reports also
11	Coach Report	coach	Cascade	Cascade	If the coach is deleted, we want to

					delete the report also.
12	Course	course_book	Set Null	Cascade	We don't want to remove the book if the course is created.
13	Homework	module_homework	Set Null	Cascade	If the course is deleted, we want to keep the homework.
14	Homework	student_homework	Cascade	Cascade	If the student is deleted, we will need to remove the homework
15	Lesson	lesson_course	Set Null	Cascade	If the course is deleted, we want to maintain the lessons
16	Map	map_institution	Set Null	Cascade	If the institution is gone, we want to keep the map locations
17	Module	lesson_module	Set Null	Cascade	We want to keep the modules even if lesson is deleted
18	Module	module_course	Set Null	Cascade	If the course is deleted, then we want to maintain the module
19	Principal	principal_institution	Set Null	Cascade	If the institution is gone, we want to maintain the principal lists.
20	Report	report_counselor	Cascade	Cascade	If the counselor is removed, we want to remove the reports
21	Student Report	student_report	Cascade	Cascade	If the report is removed, we will remove the report
22	Student Report	student	Cascade	Cascade	If the student is removed, we will remove the reports
23	Students	student_in_class	Cascade	Cascade	If the student is deleted, then we delete them from the lists
242	Students	students_class	Cascade	Cascade	If the class is deleted, then we will delete it from the tables of students / classes
25	Teacher	teacher_department	Set Null	Cascade	If the department is removed, then we want to keep the teachers
26	Teacher Report	teacher	Cascade	Cascade	If the teacher is removed, then we remove all the reports with the ID
27	Teacher Report	teacher_report	Cascade	Cascade	If the report is removed, then we delete this report
28	Test	module_test	Set Null	Cascade	If the module is deleted, we want to maintain the tests
29	Test	student_test	Cascade	Cascade	If the student is removed, we want to

					remove them from this table
30	Tutors	tutor_student	Cascade	Cascade	If the tutor/student is removed, we end tutoring
31	Tutors	tutor	Cascade	Cascade	If the student being tutored is removed, then we remove from tutoring table

Section 10: Testing

Entity	SQLQuery	PASS/FAIL	Error Description	Possible Solution
Institution	Delete	Pass		
Institution	Update			
Principal	Delete	Pass		
Principal	Update	Pass		
Student	Delete	Pass		
Student	Update	Pass		
Teacher	Delete	Fail	Unable to update parent class	Class table has teacher as NN, May need to update On Delete/ Update
Teacher	Update	Pass		
Department	Delete	Pass		
Department	Update	Pass		
Coach	Delete	Fail	Unable to update parent class	Class table has Coach as NN, may need to update the trigger On Delete
Coach	Update	Pass		
Counselor	Delete	Pass		
Counselor	Update	Pass		
Book	Delete	Pass		
Book	Update	Pass		
Course	Delete	Pass		
Course	Update	Pass		
Lesson	Delete	Pass		
Lesson	Update	Pass		
Module	Delete	Pass		
Module	Update	Pass		

Test	Delete	Pass		
Test	Update	Pass		
Homework	Delete	Pass		
Homework	Update	Pass		
Certificate	Delete	Pass		
Certificate	Update	Pass		
Report	Delete	Pass		
Report	Update	Pass		
Student Report	Delete	Pass		
Student Report	Update	Pass		
Teacher Report	Delete	Pass		
Teacher Report	Update	Pass		
Coach Report	Delete	Pass		
Coach Report	Update	Pass		
Class	Delete	Pass		
Class	Update	Pass		
Class Locations	Delete	Pass		
Class Locations	Update	Pass		
Tutors	Delete	Pass		
Tutors	Update	Pass		
Map	Delete	Pass		
Map	Update	Pass		
Students	Delete	Fail	Unable to update parent class	Issues may be with the Class table, and Keys Teacher/Coach
Students	Update	Fail	Unable to update/ delete parent class	Issues may be with the class table again, entity relationship between Students Table and Class Table