

CONSTRAINT and FOREIGN KEY on MySQL

College

- College has library, labs, classroom, admin wing, clubs and association for alumni
- College maintenance is computerized.
- Each section maintain it's own records in separate table.
- All tables are bring together under single database 'college'
- tbl_main_record is their primary and parent reference

Kesavan ..,

- At final, some miracle happened.
- Kesavan completed his course and leaving the college.
- He lend some books from library.
- Also he broke some test tubes in Chemistry lab and damaged prism in Optics lab , cause fine of INR 350
- He is an active member in Red Cross Club too

DB 'college'

alumni_id	alumni_name	alumni_phone	alumni_address

tbl_alumni

volunteer_id	volunteer_blood_type	volunteer_area	volunteer_contact

tbl_red_cross

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city

tbl_main_record

tester_id	tester_contact	tester_fine_amount

tbl_lab

member_id	member_contact	member_book_id

tbl_library

book_id	book_name	book_author

tbl_books

ACTION & REACTION

- Sometimes action on parent table impacts child table.
- We need cross check both .This is what we call `CONSTRAINT`
- Basically `CONSTRAINT` 's happen `ON UPDATE & DELETE`
- **RESTRICT (= NO ACTION)** , means don't update ,don't delete
- **CASCADE** , means follow the parent table
- **SET NULL** , means delete main record,but set `NULL` in child table

scenario	ACTION	Preferred action on MAIN Table	REACTION
Lab fine	<code>ON DELETE</code>	not allowed	<code>RESTRICT</code>
	<code>ON UPDATE</code>	not allowed	<code>CASCADE</code>
Red cross membership	<code>ON DELETE</code>	Okay,delete it.	<code>CASCADE</code>
	<code>ON UPDATE</code>	Okay,delete it.	<code>CASCADE</code>
Library , pending books	<code>ON DELETE</code>	not allowed	<code>RESTRICT</code>
	<code>ON UPDATE</code>	not allowed	<code>CASCADE</code>
Alumni association	<code>ON DELETE</code>	Okay, just remove the ID	<code>SET NULL</code>
	<code>ON UPDATE</code>	Okay, just update the ID	<code>CASCADE</code>

scenario #1

- Kesavan lend two books from library.
- We must NOT ALLOW to delete the record from MAIN TABLE.
- WHENEVER TRY TO DELETE records from MAIN TABLE , it must REFER the tbl_library and verify RECORDS are all cleared from that table.

```
ALTER TABLE tbl_library
ADD CONSTRAINT FOREIGN KEY ( member_id)
REFERENCES tbl_main_record (student_id)
ON DELETE RESTRICT ;
```

In MySQL, foreign key constraints are checked immediately, so NO ACTION is the same as RESTRICT.

NO ACTION = RESTRICT

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```

In MySQL, foreign key constraints are checked immediately, so NO ACTION is the same as RESTRICT.

NO ACTION = RESTRICT

ADD CONSTRAINT FOREIGN KEY

member_id	member_contact	member_book_id

tbl_library

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city

tbl_main_record

```
mysql> DESC tbl_library;
```

Field	Type	Null	Key	Default	Extra
member_id	int(11)	NO		NULL	
member_contact	bigint(11)	NO		NULL	
member_book_id	int(11)	NO		NULL	

```
3 rows in set (0.00 sec)
```

```
mysql> ALTER TABLE tbl_library ADD CONSTRAINT FOREIGN KEY ( member_id) REFERENCES tbl_main_record (student_id) ON DELETE RESTRICT ;
```

```
Query OK, 0 rows affected (0.38 sec)
```

```
mysql> DESC tbl_library;
```

Field	Type	Null	Key	Default	Extra
member_id	int(11)	NO	MUL	NULL	
member_contact	bigint(11)	NO		NULL	
member_book_id	int(11)	NO		NULL	

```
3 rows in set (0.00 sec)
```


solution #1

member_id	member_contact	member_book_id

tbl_library

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city

tbl_main_record

```
mysql> SELECT * FROM tbl_main_record ;
```

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city
1	Kesavan	M	28	9944230824	Sholavandan	Madurai
2	Indhu	F	25	9923987682	Chrompet	Chennai
3	Sindhu	F	27	9976725421	Vellanganni	Nagapatinam
4	Babu	M	29	9939876382	Ottapallayam	Paramkudi
5	Anu	F	27	9965327287	Vannarpettai	Tirunelveli

```
5 rows in set (0.01 sec)
```

```
mysql> SELECT * FROM tbl_library;
```

member_id	member_contact	member_book_id
1	9944330824	1
1	9944330824	4
4	9939876382	1
5	9965327287	3

```
4 rows in set (0.00 sec)
```

KESAVAN lend two books in library & try to escape from college . SHOULD HE ALLOWED TO ESCAPE ?

No.

What happens on DELETE in primary table ?

member_id	member_contact	member_book_id

tbl_library

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city

tbl_main_record

```
mysql> SELECT * FROM tbl_main_record ;
```

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city
1	Kesavan	M	28	9944230824	Sholavandan	Madurai
2	Indhu	F	25	9923987682	Chrompet	Chennai
3	Sindhu	F	27	9976725421	Vellanganni	Nagapatinam
4	Babu	M	29	9939876382	Ottapallayam	Paramkudi
5	Anu	F	27	9965327287	Vannarpettai	Tirunelveli

```
5 rows in set (0.01 sec)
```

```
mysql> SELECT * FROM tbl_library;
```

member_id	member_contact	member_book_id
1	9944330824	1
1	9944330824	4
4	9939876382	1
5	9965327287	3

```
4 rows in set (0.00 sec)
```

```
mysql> DELETE FROM tbl_main_record WHERE student_id =1;
```

```
ERROR 1451 (23000): Cannot delete or update a parent row: a foreign key constraint fails
```

```
(`college`.`tbl_library`, CONSTRAINT `tbl_library_ibfk_1` FOREIGN KEY (`member_id`) REFERENCES `tbl_main_record` (`student_id`))
```

```
mysql>
```


ADD CONSTRAINT

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city	volunteer_id	volunteer_blood_type	volunteer_area	volunteer_contact

tbl_main_record **tbl_red_cross**

```
mysql> SELECT * FROM tbl_red_cross;
```

volunteer_id	volunteer_blood_type	volunteer_area	volunteer_contact
1	B+	South	9944230824
2	OB-	North	9923987682
5	O+	South	9965327287
4	AB+	East	9939876382

```
4 rows in set (0.00 sec)
```

```
mysql> SELECT * FROM tbl_main_record;
```

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city
1	Kesavan	M	28	9944230824	Sholavandan	Madurai
2	Indhu	F	25	9923987682	Chrompet	Chennai
3	Sindhu	F	27	9976725421	Vellanganni	Nagapatinam
4	Babu	M	29	9939876382	Ottapallayam	Paramkudi
5	Anu	F	27	9965327287	Vannarpettai	Tirunelveli

```
5 rows in set (0.00 sec)
```

DELETE 'd

```
mysql> SHOW CREATE TABLE tbl_red_cross \G
```

```
CREATE TABLE `tbl_red_cross` (  
  `volunteer_id` int(11) NOT NULL,  
  `volunteer_blood_type` varchar(7) COLLATE utf8_unicode_ci NOT NULL,  
  `volunteer_area` varchar(27) COLLATE utf8_unicode_ci NOT NULL,  
  `volunteer_contact` bigint(20) NOT NULL,  
  KEY `volunteer_id` (`volunteer_id`),  
  CONSTRAINT `tbl_red_cross_ibfk_1` FOREIGN KEY (`volunteer_id`) REFERENCES `tbl_main_record` (`student_id`) ON DELETE CASCADE ON UPDATE CASCADE  
) ENGINE=InnoDB DEFAULT CHARSET=utf8 COLLATE=utf8_unicode_ci |
```

```
+-----+
```

```
--+  
1 row in set (0.00 sec)
```

```
mysql> DELETE FROM tbl_main_record WHERE student_id =1;  
Query OK, 1 row affected (0.06 sec)
```

```
mysql> SELECT * FROM tbl_main_record;
```

```
+-----+-----+-----+-----+-----+-----+-----+  
| student_id | student_name | student_sex | student_age | student_mobile | student_address | student_city |  
+-----+-----+-----+-----+-----+-----+-----+  
|          2 | Indhu        | F           |          25 | 9923987682 | Chrompet        | Chennai      |  
|          3 | Sindhu       | F           |          27 | 9976725421 | Vellanganni     | Nagapatinam  |  
|          4 | Babu         | M           |          29 | 9939876382 | Ottapallayam   | Paramkudi    |  
|          5 | Anu          | F           |          27 | 9965327287 | Vannarpettai   | Tirunelveli  |  
+-----+-----+-----+-----+-----+-----+-----+
```

```
4 rows in set (0.00 sec)
```

```
mysql> SELECT * FROM tbl_red_cross;
```

```
+-----+-----+-----+-----+  
| volunteer_id | volunteer_blood_type | volunteer_area | volunteer_contact |  
+-----+-----+-----+-----+  
|          2 | OB-                  | North          | 9923987682 |  
|          5 | O+                   | South         | 9965327287 |  
|          4 | AB+                  | East          | 9939876382 |  
+-----+-----+-----+-----+
```

```
3 rows in set (0.00 sec)
```

```
mysql>
```

UPDATE 'd

```
CREATE TABLE `tbl_red_cross` (  
  `volunteer_id` int(11) NOT NULL,  
  `volunteer_blood_type` varchar(7) COLLATE utf8_unicode_ci NOT NULL,  
  `volunteer_area` varchar(27) COLLATE utf8_unicode_ci NOT NULL,  
  `volunteer_contact` bigint(20) NOT NULL,  
  KEY `volunteer_id` (`volunteer_id`),  
  CONSTRAINT `tbl_red_cross_ibfk_1` FOREIGN KEY (`volunteer_id`) REFERENCES `tbl_main_record` (`student_id`) ON DELETE CASCADE ON UPDATE CASCADE  
) ENGINE=InnoDB DEFAULT CHARSET=utf8 COLLATE=utf8_unicode_ci
```

```
mysql>SELECT * FROM tbl_main_record;
```

```
+-----+-----+-----+-----+-----+-----+-----+  
| student_id | student_name | student_sex | student_age | student_mobile | student_address | student_city |  
+-----+-----+-----+-----+-----+-----+-----+  
|          3 | Sindhu       | F           | 27          | 9976725421    | Vellanganni     | Nagapatinam  |  
|          4 | Babu         | M           | 29          | 9939876382    | Ottapallayam   | Paramkudi    |  
|          5 | Anu          | F           | 27          | 9965327287    | Vannarpettai   | Tirunelveli  |  
+-----+-----+-----+-----+-----+-----+-----+  
3 rows in set (0.00 sec)
```

```
mysql> SELECT * FROM tbl_red_cross;
```

```
+-----+-----+-----+-----+  
| volunteer_id | volunteer_blood_type | volunteer_area | volunteer_contact |  
+-----+-----+-----+-----+  
|          5 | O+                   | South         | 9965327287       |  
|          4 | AB+                  | East          | 9939876382       |  
+-----+-----+-----+-----+  
2 rows in set (0.00 sec)
```

```
mysql> UPDATE tbl_main_record SET student_id =15 WHERE student_id =5;  
Query OK, 1 row affected (0.07 sec)  
Rows matched: 1 Changed: 1 Warnings: 0
```

```
mysql> SELECT * FROM tbl_red_cross;
```

```
+-----+-----+-----+-----+  
| volunteer_id | volunteer_blood_type | volunteer_area | volunteer_contact |  
+-----+-----+-----+-----+  
|          15 | O+                   | South         | 9965327287       |  
|          4 | AB+                  | East          | 9939876382       |  
+-----+-----+-----+-----+  
2 rows in set (0.00 sec)
```

```
mysql> SELECT * FROM tbl_main_record;
```

```
+-----+-----+-----+-----+-----+-----+-----+  
| student_id | student_name | student_sex | student_age | student_mobile | student_address | student_city |  
+-----+-----+-----+-----+-----+-----+-----+  
|          3 | Sindhu       | F           | 27          | 9976725421    | Vellanganni     | Nagapatinam  |  
|          4 | Babu         | M           | 29          | 9939876382    | Ottapallayam   | Paramkudi    |  
|          15 | Anu          | F           | 27          | 9965327287    | Vannarpettai   | Tirunelveli  |  
+-----+-----+-----+-----+-----+-----+-----+  
3 rows in set (0.00 sec)
```

- College changed Anu's ID from 5 to 15
- So ID 15 should be updated to all table including tbl_red_cross
- ADD CONSTRAINT ON UPDATE too.

solution #3

```
mysql> SELECT * FROM tbl_main_record; SELECT * FROM tbl_alumni;
```

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city
1	Kesavan	M	29	9944230824	Sholavandan	Madurai
3	Sindhu	F	27	9976725421	Vellanganni	Nagapatinam
4	Babu	M	29	9939876382	Ottapallayam	Paramkudi
15	Anu	F	27	9965327287	Vannarpettai	Tirunelveli

```
4 rows in set (0.00 sec)
```

alumni_id	alumni_name	alumni_phone	alumni_address
1	Kesavan	9944230824	Sholavandan, Madurai
15	Anu	9876543214	Hyderabad

```
2 rows in set (0.00 sec)
```

```
mysql> DELETE FROM tbl_main_record WHERE student_id =1 ;
```

```
Query OK, 1 row affected (0.07 sec)
```

```
mysql> UPDATE tbl_main_record SET student_id=45 WHERE student_id =5;
```

```
Query OK, 0 rows affected (0.00 sec)
```

```
Rows matched: 0 Changed: 0 Warnings: 0
```

```
mysql> SELECT * FROM tbl_main_record; SELECT * FROM tbl_alumni;
```

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city
3	Sindhu	F	27	9976725421	Vellanganni	Nagapatinam
4	Babu	M	29	9939876382	Ottapallayam	Paramkudi
15	Anu	F	27	9965327287	Vannarpettai	Tirunelveli

```
3 rows in set (0.00 sec)
```

alumni_id	alumni_name	alumni_phone	alumni_address
NULL	Kesavan	9944230824	Sholavandan, Madurai
15	Anu	9876543214	Hyderabad

```
2 rows in set (0.00 sec)
```


solution #3

```
mysql> SELECT * FROM tbl_main_record; SELECT * FROM tbl_alumni;
```

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city
1	Kesavan	M	29	9944230824	Sholavandan	Madurai
3	Sindhu	F	27	9976725421	Vellanganni	Nagapatinam
4	Babu	M	29	9939876382	Ottapallayam	Paramkudi
15	Anu	F	27	9965327287	Vannarpettai	Tirunelveli

```
4 rows in set (0.00 sec)
```

alumni_id	alumni_name	alumni_phone	alumni_address
1	Kesavan	9944230824	Sholavandan, Madurai
15	Anu	9876543214	Hyderabad

```
2 rows in set (0.00 sec)
```

```
mysql> DELETE FROM tbl_main_record WHERE student_id =1 ;
```

```
Query OK, 1 row affected (0.07 sec)
```

```
mysql> UPDATE tbl_main_record SET student_id=45 WHERE student_id =5;
```

```
Query OK, 0 rows affected (0.00 sec)
```

```
Rows matched: 0 Changed: 0 Warnings: 0
```

```
mysql> SELECT * FROM tbl_main_record; SELECT * FROM tbl_alumni;
```

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city
3	Sindhu	F	27	9976725421	Vellanganni	Nagapatinam
4	Babu	M	29	9939876382	Ottapallayam	Paramkudi
15	Anu	F	27	9965327287	Vannarpettai	Tirunelveli

```
3 rows in set (0.00 sec)
```

alumni_id	alumni_name	alumni_phone	alumni_address
NULL	Kesavan	9944230824	Sholavandan, Madurai
15	Anu	9876543214	Hyderabad

```
2 rows in set (0.00 sec)
```

Finally blueprint of 'college'

tbl_alumni

Column	Type	Null	Default	Links to	Comments	MIME
alumni_id	int(11)	Yes	NULL	tbl_main_record -> student_id		
alumni_name	varchar(27)	No				
alumni_phone	bigint(10)	No				
alumni_address	text	No				

tbl_books

Column	Type	Null	Default	Comments	MIME
book_id	int(11)	No			
book_name	varchar(127)	No			
book_author	varchar(63)	No			

tbl_lab

Column	Type	Null	Default	Comments	MIME
tester_id	int(11)	No			
tester_contact	bigint(20)	No			
tester_fine_amount	int(11)	No			

tbl_library

Column	Type	Null	Default	Links to	Comments	MIME
member_id	int(11)	No		tbl_main_record -> student_id		
member_contact	bigint(11)	No				
member_book_id	int(11)	No		tbl_books -> book_id		

tbl_main_record

Table comments: This is PRIMARY MAIN RECORD for each student.

Column	Type	Null	Default	Comments	MIME
student_id	int(11)	No			
student_name	varchar(27)	No			
student_sex	enum('M', 'F')	No			
student_age	int(11)	No			
student_mobile	bigint(10)	No			
student_address	text	No			
student_city	varchar(27)	No			

tbl_red_cross

Column	Type	Null	Default	Links to	Comments	MIME
volunteer_id	int(11)	No		tbl_main_record -> student_id		
volunteer_blood_type	varchar(7)	No				
volunteer_area	varchar(27)	No				
volunteer_contact	bigint(20)	No				

Done !!!

Questions?

visit : kesavan.info

ON UPDATE CASCADE ON DELETE CASCADE

```
mysql> UPDATE tbl_main_record SET student_id=7 WHERE student_id =2;
Query OK, 1 row affected (0.06 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```

```
mysql> SELECT * FROM tbl_red_cross;
```

volunteer_id	volunteer_blood_type	volunteer_area	volunteer_contact
7	OB-	North	9923987682
5	O+	South	9965327287
4	AB+	East	9939876382

```
3 rows in set (0.00 sec)
```

```
mysql> SELECT * FROM tbl_main_record
-> ;
```

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city
3	Sindhu	F	27	9976725421	Vellanganni	Nagapatinam
4	Babu	M	29	9939876382	Ottapallayam	Paramkudi
5	Anu	F	27	9965327287	Vannarpettai	Tirunelveli
7	Indhu	F	25	9923987682	Chrompet	Chennai

```
4 rows in set (0.00 sec)
```

DB 'college'

alumni_id	alumni_name	alumni_phone	alumni_address

tbl_alumni

volunteer_id	volunteer_blood_type	volunteer_area	volunteer_contact

tbl_red_cross

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city

tbl_main_record

tester_id	tester_contact	tester_fine_amount

tbl_lab

member_id	member_contact	member_book_id

tbl_library

book_id	book_name	book_author

tbl_books

DB 'college'

alumni_id	alumni_name	alumni_phone	alumni_address

tbl_alumni

volunteer_id	volunteer_blood_type	volunteer_area	volunteer_contact

tbl_red_cross

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city

tbl_main_record

tester_id	tester_contact	tester_fine_amount

tbl_lab

member_id	member_contact	member_book_id

tbl_library

book_id	book_name	book_author

tbl_books

Scenario - 2

member_id	member_contact	member_book_id

tbl_library

student_id	student_name	student_sex	student_age	student_mobile	student_address	student_city

tbl_main_record

DELETE 'd

```
mysql> SHOW CREATE TABLE tbl_red_cross \G
```

```
CREATE TABLE `tbl_red_cross` (  
  `volunteer_id` int(11) NOT NULL,  
  `volunteer_blood_type` varchar(7) COLLATE utf8_unicode_ci NOT NULL,  
  `volunteer_area` varchar(27) COLLATE utf8_unicode_ci NOT NULL,  
  `volunteer_contact` bigint(20) NOT NULL,  
  KEY `volunteer_id` (`volunteer_id`),  
  CONSTRAINT `tbl_red_cross_ibfk_2` FOREIGN KEY (`volunteer_id`) REFERENCES `tbl_main_record` (`student_id`) ON DELETE CASCADE,  
  CONSTRAINT `tbl_red_cross_ibfk_1` FOREIGN KEY (`volunteer_id`) REFERENCES `tbl_main_record` (`student_id`) ON UPDATE CASCADE  
) ENGINE=InnoDB DEFAULT CHARSET=utf8 COLLATE=utf8_unicode_ci |
```

```
+-----+
```

```
+-----+  
+-----+  
+-----+  
+-----+
```

```
--+
```

```
1 row in set (0.00 sec)
```

```
mysql> DELETE FROM tbl_main_record WHERE student_id =1;  
Query OK, 1 row affected (0.06 sec)
```

```
mysql> SELECT * FROM tbl_main_record;
```

```
+-----+-----+-----+-----+-----+-----+-----+  
| student_id | student_name | student_sex | student_age | student_mobile | student_address | student_city |  
+-----+-----+-----+-----+-----+-----+-----+  
|          2 | Indhu        | F           |          25 | 9923987682    | Chrompet        | Chennai      |  
|          3 | Sindhu       | F           |          27 | 9976725421    | Vellanganni     | Nagapatinam |  
|          4 | Babu         | M           |          29 | 9939876382    | Ottapallayam   | Paramkudi    |  
|          5 | Anu          | F           |          27 | 9965327287    | Vannarpettai   | Tirunelveli  |  
+-----+-----+-----+-----+-----+-----+-----+
```

```
4 rows in set (0.00 sec)
```

```
mysql> SELECT * FROM tbl_red_cross;
```

```
+-----+-----+-----+-----+  
| volunteer_id | volunteer_blood_type | volunteer_area | volunteer_contact |  
+-----+-----+-----+-----+  
|          2 | OB-                  | North          | 9923987682 |  
|          5 | O+                   | South          | 9965327287 |  
|          4 | AB+                  | East           | 9939876382 |  
+-----+-----+-----+-----+
```

```
3 rows in set (0.00 sec)
```

```
mysql>
```