实验环境

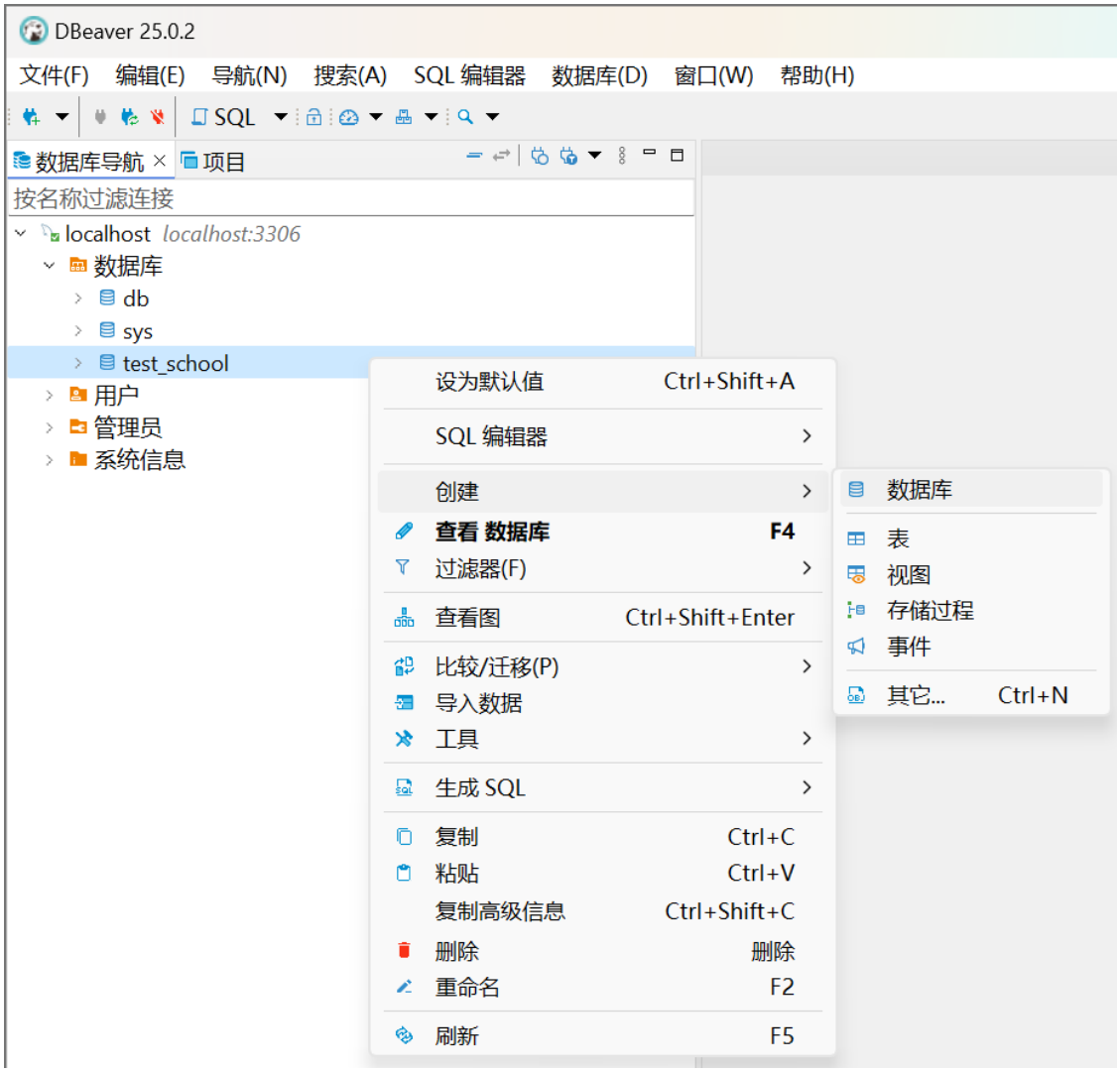
- Windows 11 系统
- MySQL 9.2
- DBeaver 25.0.2

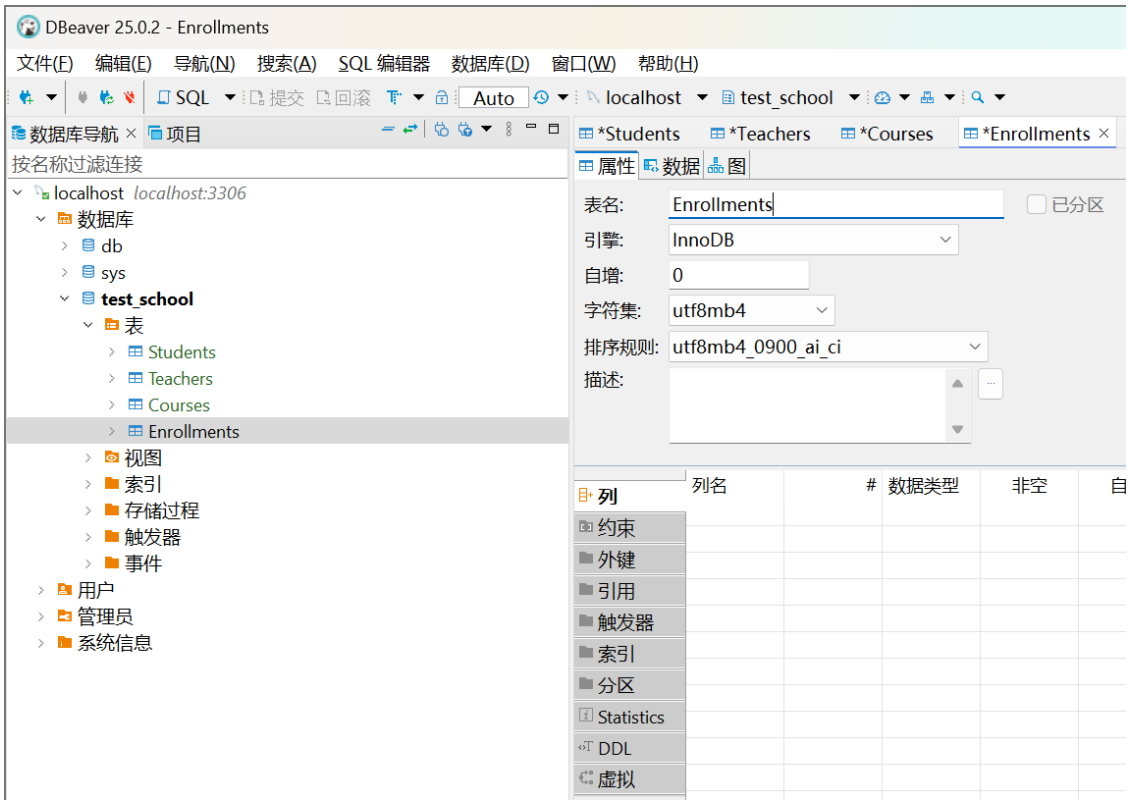
实验内容与完成情况

- 数据库设计（学生选课）
    - 学生表 Students
        - student_id(primary key)(INT)
        - name(VARCHAR)
        - email(VARCHAR)
    - 教师表 Teachers
        - teacher_id(primary key)(INT)
        - name(VARCHAR)
        - email(VARCHAR)
    - 课程表 Courses
        - course_id(primary key)(INT)
        - name(VARCHAR)
        - description(VARCHAR)
        - teacher_id(foreign key)
    - 选课表 Enrollments
        - student_id(primary key)(foreign key)
        - course_id(primary key)(foreign key)
        - grade(FLOAT)
- 数据定义
    - 表的创建

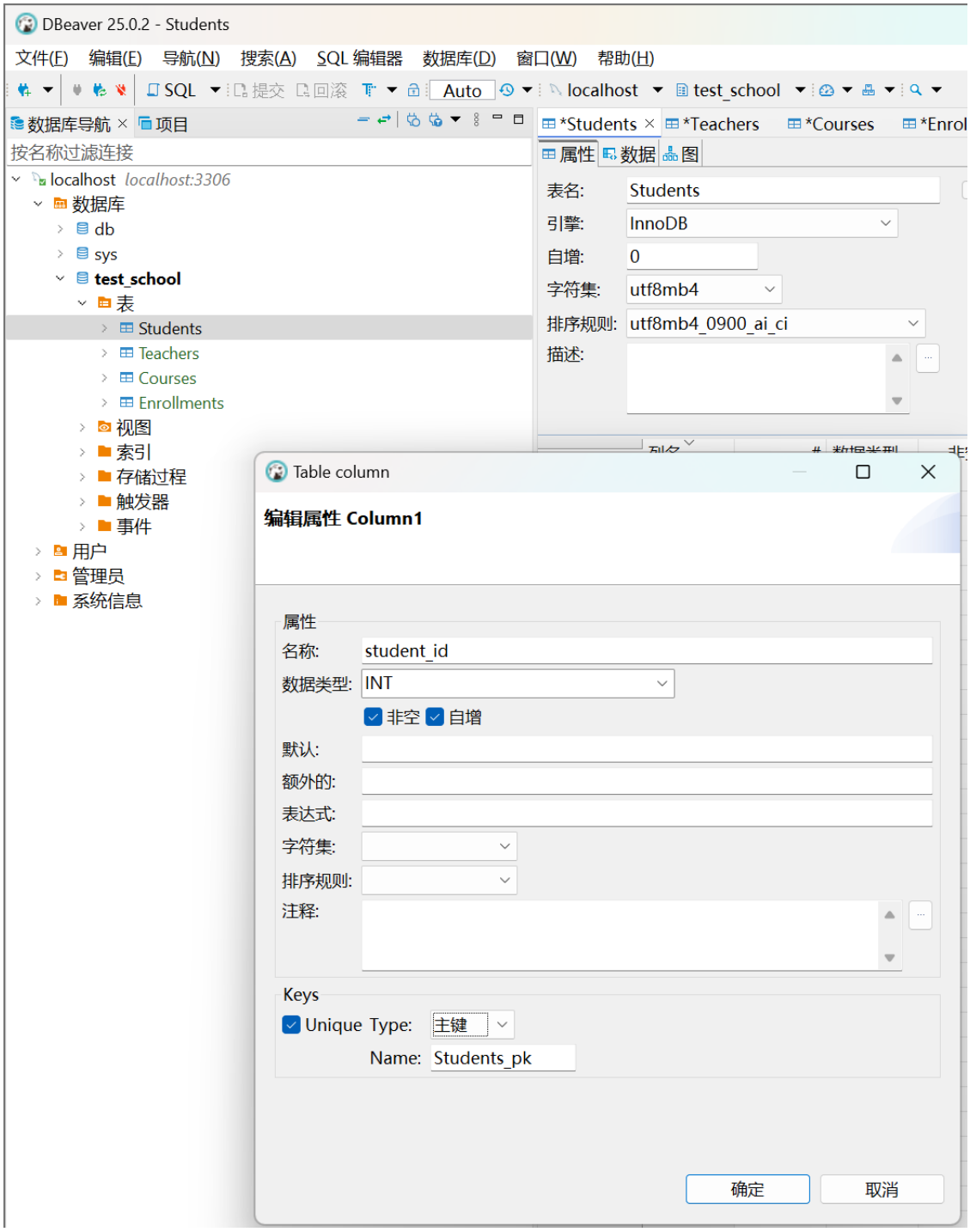
        1. 连接到 MySQL 后右键数据库，创建 test_school 数据库

2. 右键 test_school 数据库，依次创建上述四个表

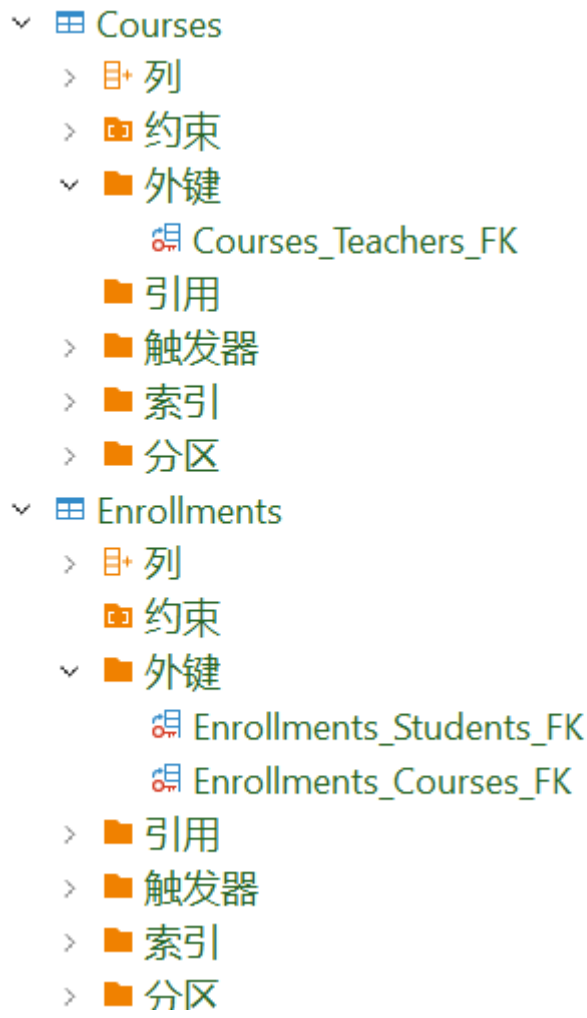




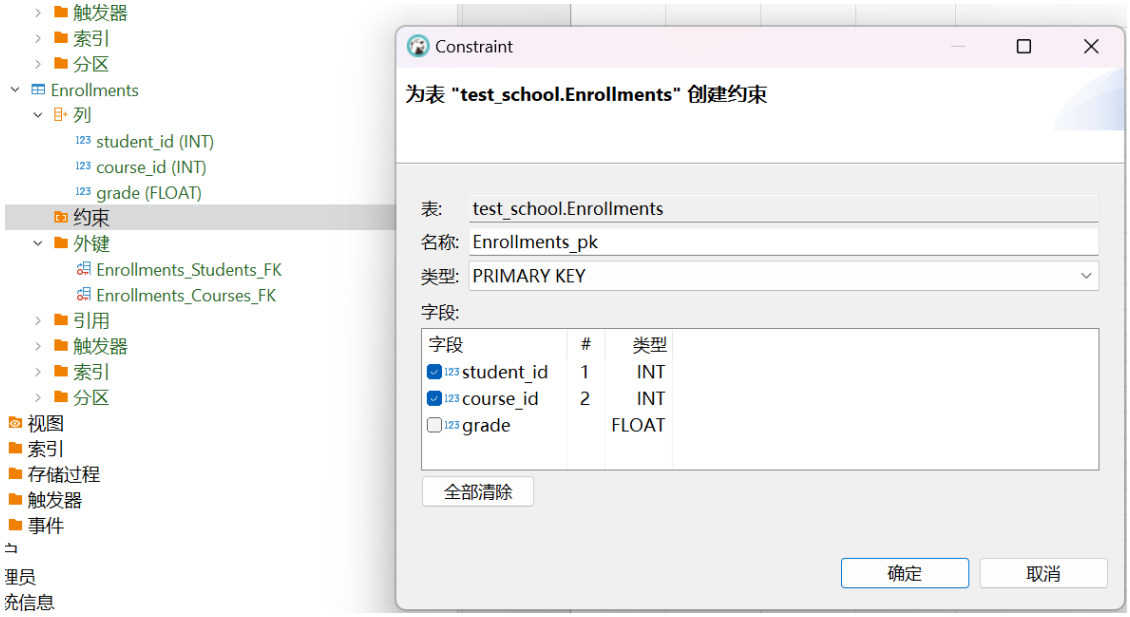
3. 依次右键四个表，创建列



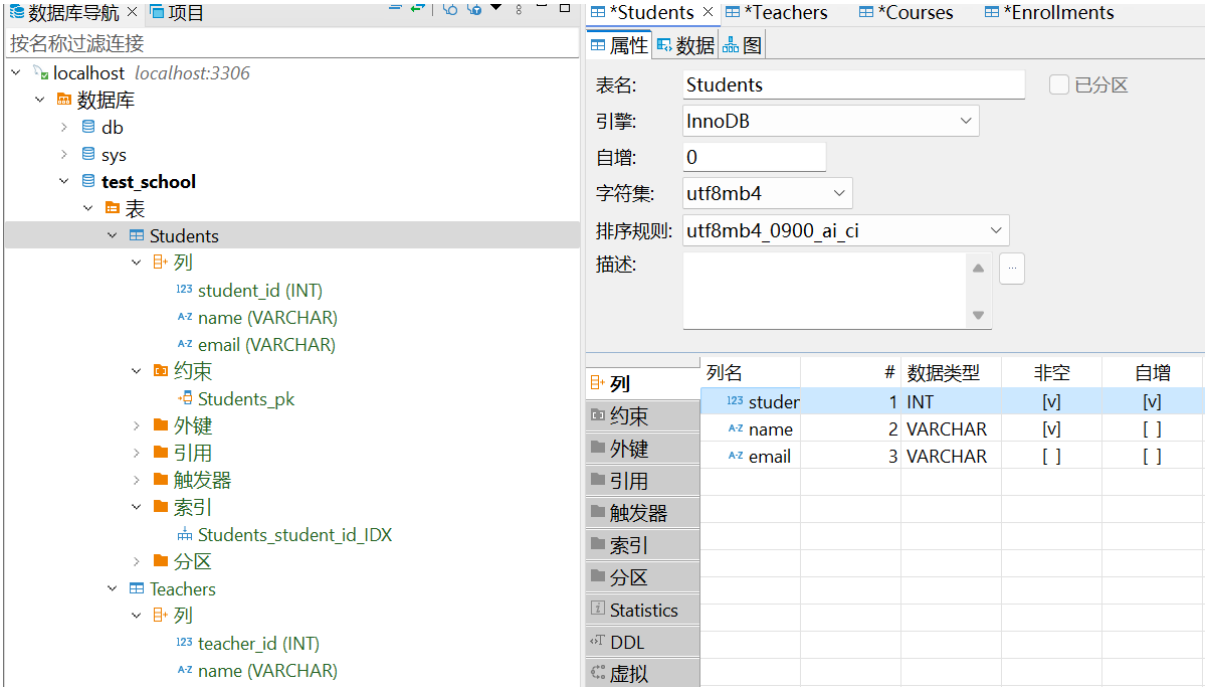
4. 设置 Courses 表和 Enrollments 表的外键



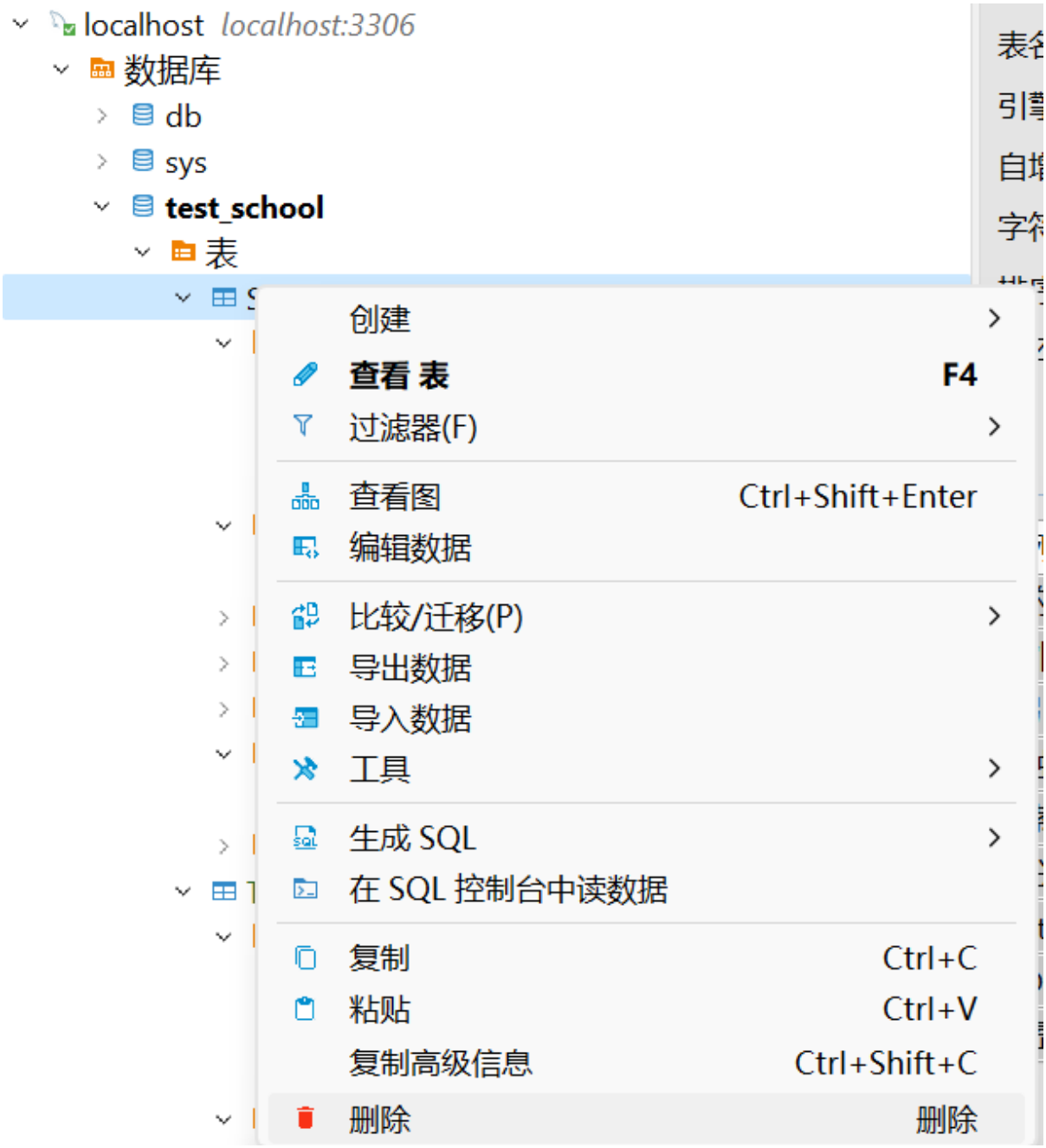
5. 设置 Enrollments 表的约束



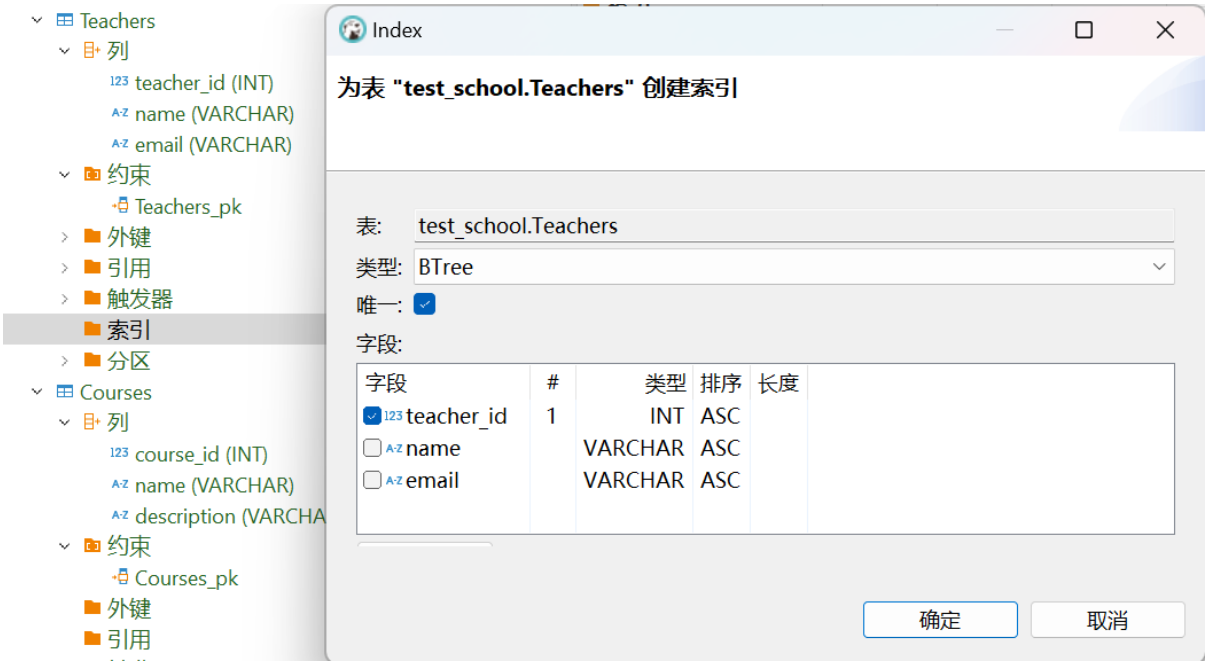
- 表的修改 双击 Students 表的 student_id 列的自增选项[ ]，成功设置自增属性



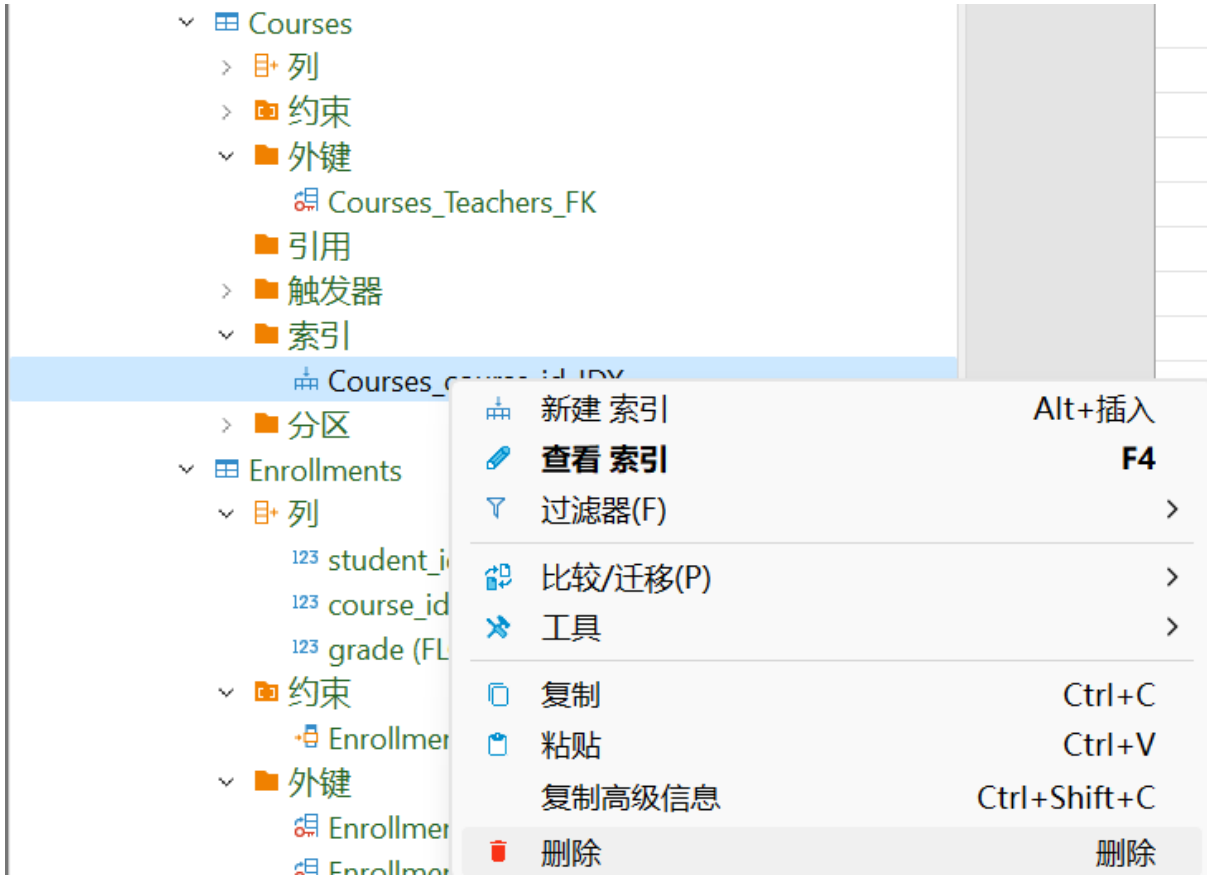
- 表的删除 右键表即可删除表



- 索引的创建 创建主键索引



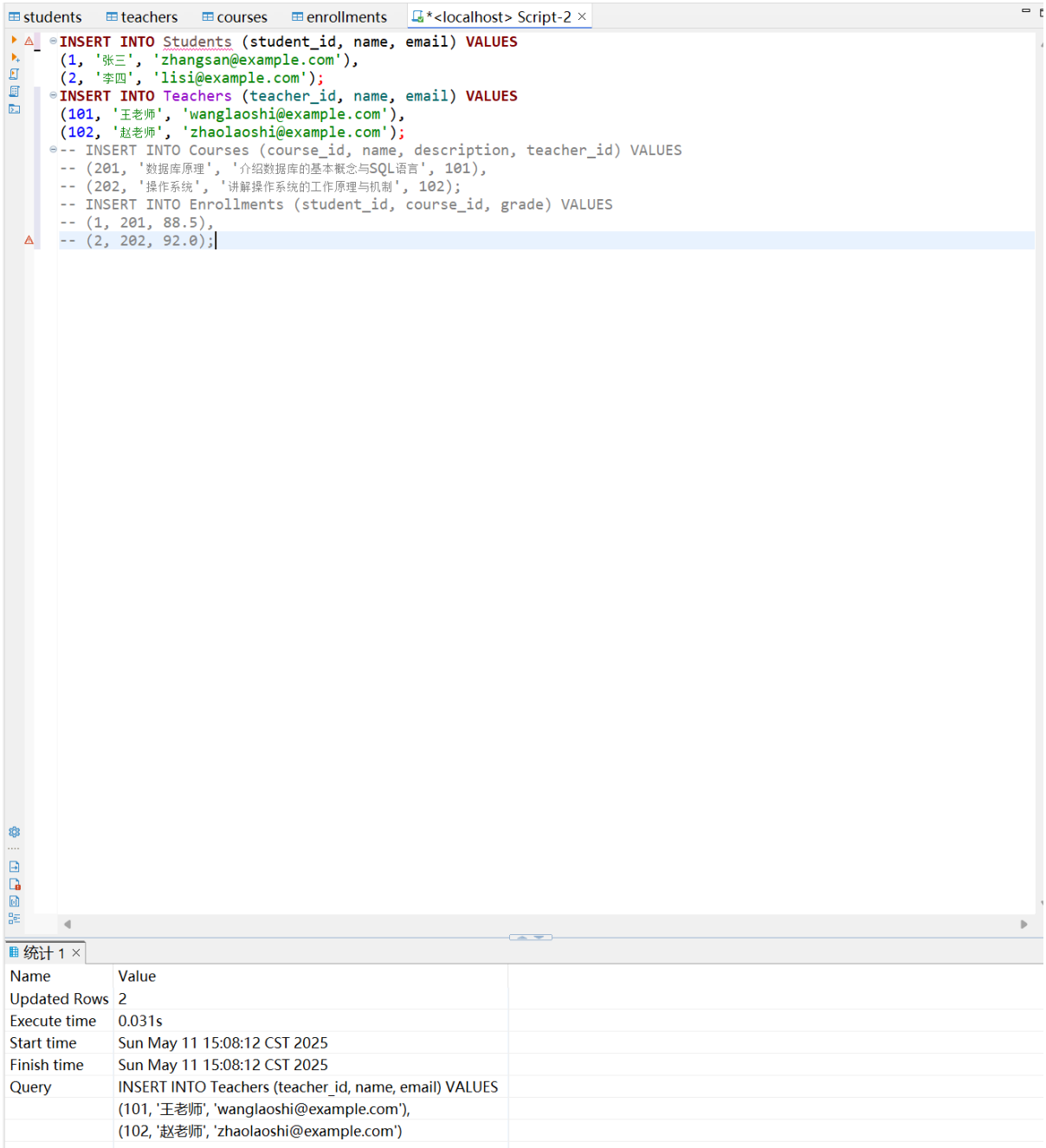
- 索引的删除 右键索引即可删除索引



- 数据操作
  - 插入数据 点击 SQL 按钮，输入对应语句进行插入

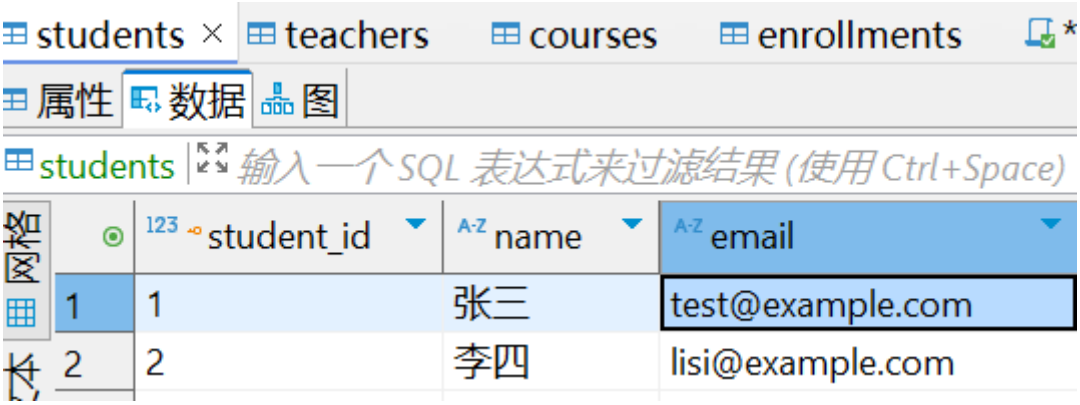
```
INSERT INTO Students (student_id, name, email) VALUES
(1, '张三', 'zhangsan@example.com'),
(2, '李四', 'lisi@example.com');
INSERT INTO Teachers (teacher_id, name, email) VALUES
(101, '王老师', 'wanglaoshi@example.com'),
(102, '赵老师', 'zhaolaoshi@example.com');
```

```
INSERT INTO Courses (course_id, name, description, teacher_id) VALUES
(201, '数据库原理', '介绍数据库的基本概念与SQL语言', 101),
(202, '操作系统', '讲解操作系统的工作原理与机制', 102);
INSERT INTO Enrollments (student_id, course_id, grade) VALUES
(1, 201, 88.5),
(2, 202, 92.0);
```



- 修改数据 修改学号为 1 的学生的邮箱

```
UPDATE Students
SET email = 'test@example.com'
WHERE student_id = 1;
```

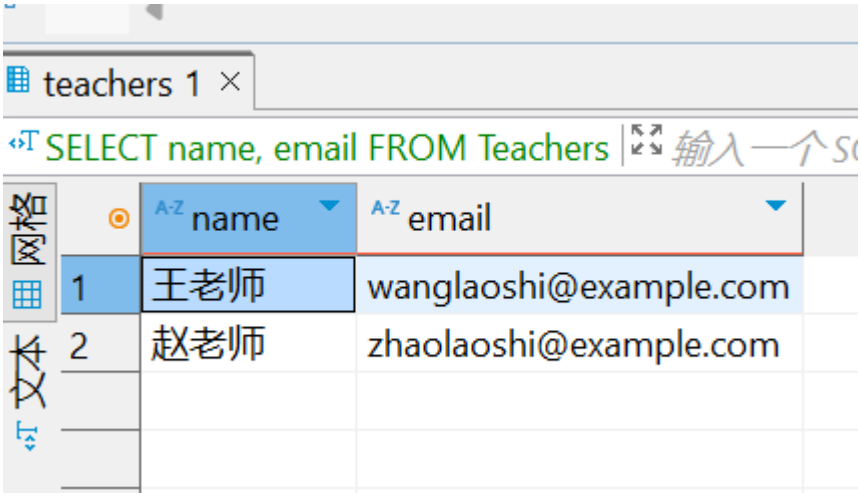


- 删除数据 删除学号为 2 的学生的选课记录

```
DELETE FROM Enrollments
WHERE student_id = 2
```

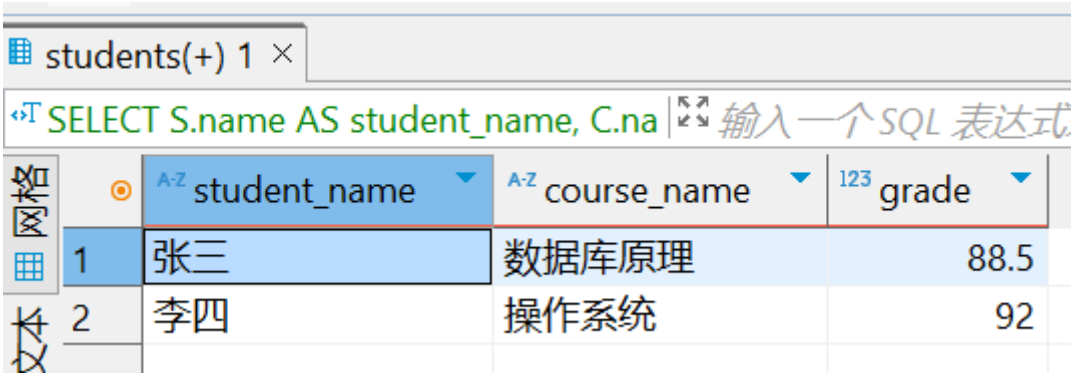
- 单表查询 查询所有教师的名字与邮箱

```
SELECT name, email
FROM Teachers;
```



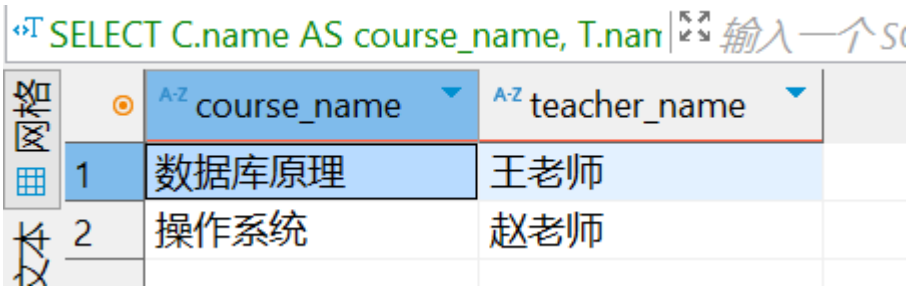
- 连接查询
    1. 查询每个学生的姓名及其所选课程名称和成绩

```
SELECT S.name AS student_name, C.name AS course_name, E.grade
FROM Students S
JOIN Enrollments E ON S.student_id = E.student_id
JOIN Courses C ON E.course_id = C.course_id;
```



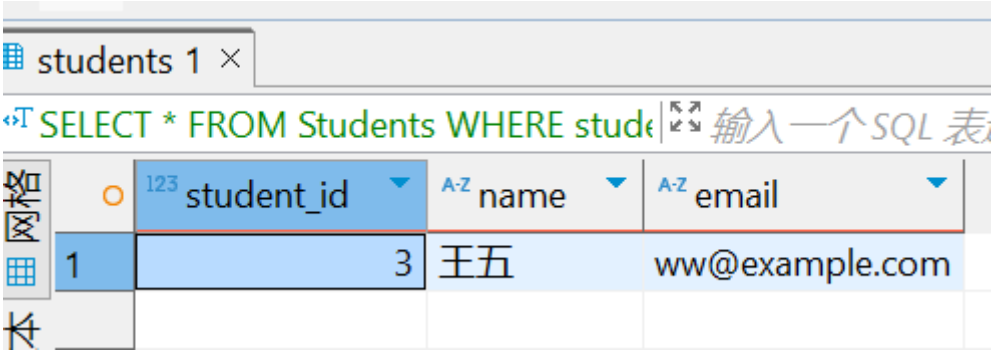
2. 查询每门课程的名称及其授课教师的姓名

```
SELECT C.name AS course_name, T.name AS teacher_name
FROM Courses C
JOIN Teachers T ON C.teacher_id = T.teacher_id;
```



- 嵌套查询
  1. 查询没有选修任何课程的学生

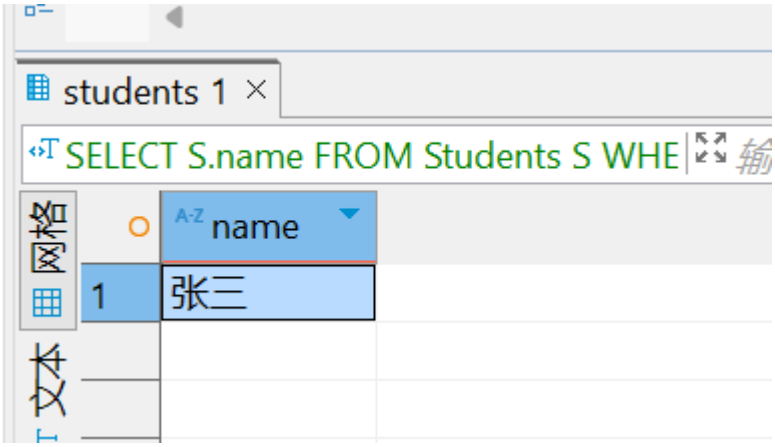
```
INSERT INTO Students
(student_id, name, email)
VALUES(3, '王五', 'ww@example.com');
SELECT *
FROM Students
WHERE student_id NOT IN (
    SELECT DISTINCT student_id FROM Enrollments
);
```



2. 查询选修了数据库原理这门课程的所有学生的姓名

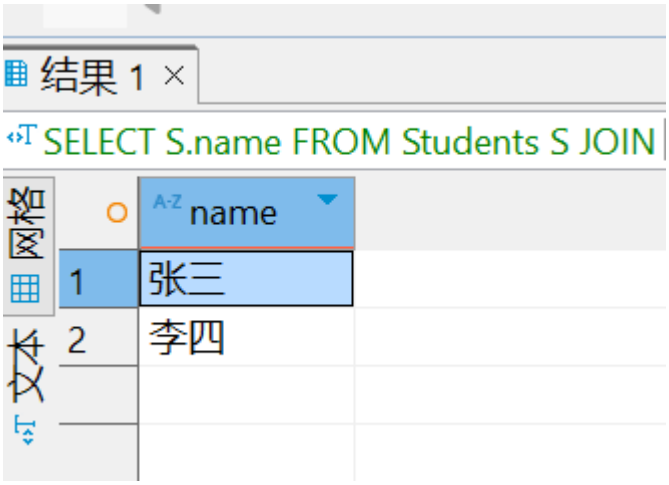
```

```

```sql
SELECT S.name
FROM Students S
WHERE S.student_id IN (
    SELECT E.student_id
    FROM Enrollments E
    JOIN Courses C ON E.course_id = C.course_id
    WHERE C.name = '数据库原理'
);
```



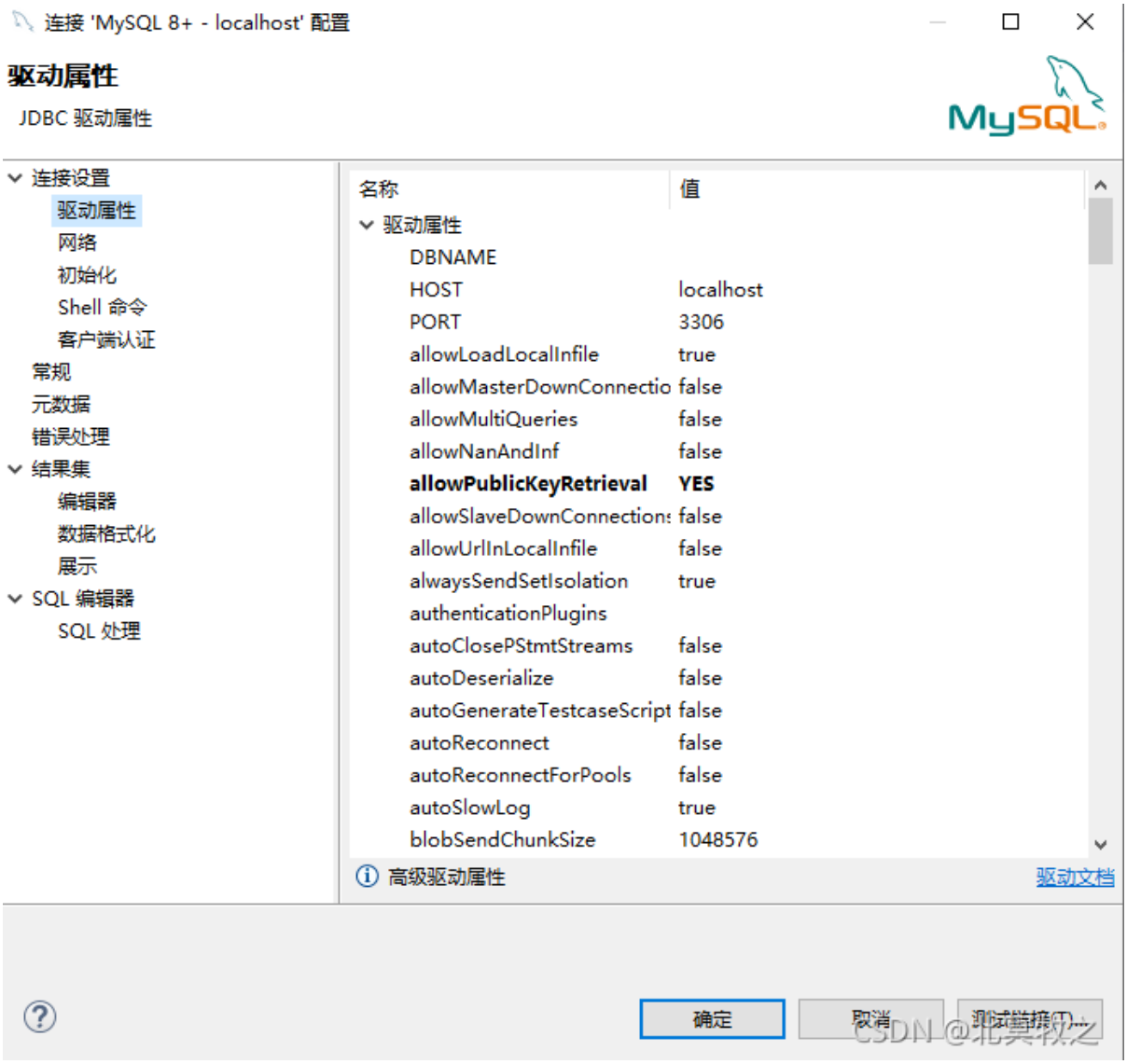
- 集合查询 查询选修了数据库原理或者操作系统课程的所有学生姓名

```sql
SELECT S.name
FROM Students S
JOIN Enrollments E ON S.student_id = E.student_id
JOIN Courses C ON E.course_id = C.course_id
WHERE C.name = '数据库原理'

UNION

SELECT S.name
FROM Students S
JOIN Enrollments E ON S.student_id = E.student_id
JOIN Courses C ON E.course_id = C.course_id
WHERE C.name = '操作系统';
```



出现的问题及解决方案

- 连接 MySQL 时报错 `Public Key Retrieval is not allowed`
  - 在连接设置中将`allowPublicKeyRetrieval`设置为true



- 插入数据时报错表不存在
  - 在四个表中点击下方保存按钮
- 插入数据时第四个表报错 `Cannot add or update a child row: a foreign key constraint fails (\`test_school\`.\`enrollments\`, CONSTRAINT \`enrollments_students_FK\` FOREIGN KEY (\`student_id\`) REFERENCES \`students\` (\`student_id\`))`
  - 先插入 Students 表和 Teachers 表后再插入其余两个表，不在同一个 SQL 脚本中执行所有插入