

# 实 验 报 告

课程名称： 移动应用开发

学 院： 计算机科学与工程学院

专 业： 计算机科学与技术 班 级： 5 班

姓 名： 尹浩男 学 号： 201801051827

年 月 日

山东科技大学教务处制

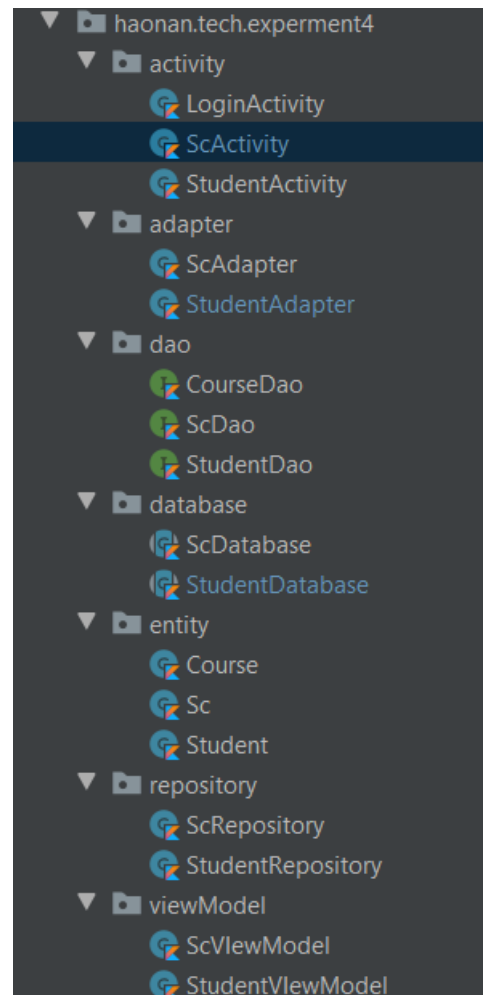
# 实 验 报 告

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组 别		姓 名	尹浩男	同组实验者	
实验项目 名称	数据存储		实验日期		
教师评语					
实验成绩：			指导教师（签名）：		
			年 月 日		
<h2>一、实验目的</h2> <ul style="list-style-type: none"><li>● 熟练掌握 Android 中基于文件和数据库的数据管理功能。</li></ul> <h2>二、实验内容</h2> <ul style="list-style-type: none"><li>● 设计实现一个管理学生及其选修的课程、课程成绩的 Android APP。APP 的基本功能包括：（1）用户登录成功后可以使用 APP，登录 APP 所使用的用户名、密码存储在文件中；（2）学生信息、课程信息、学生选课结果及成绩存储在 SQLite 数据库中，并提供学生添加、删除、修改、浏览（点击某个学生后，呈现学生选修的课程及其成绩）功能，以及学生成绩的添加、删除和修改功能。</li></ul> <h2>三、实验要求</h2> <ul style="list-style-type: none"><li>● 实现上述的基本功能要求。在此基础上，可以进一步优化界面，也可以进一步添加其他功能。</li><li>● 实验报告提交内容：1）结合系统界面（截图）介绍 APP 功能；2）核心实现代码（Java 或 Kotlin 代码）和布局文件等。</li></ul>					

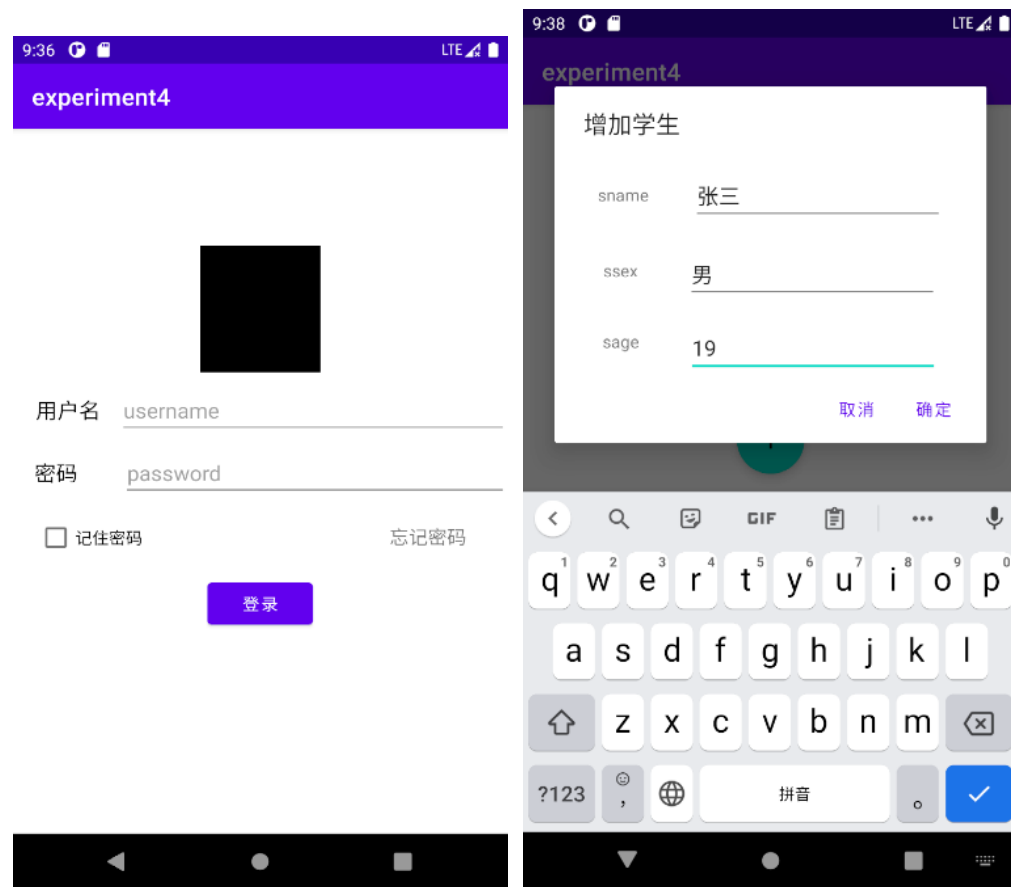
## 四、实验代码

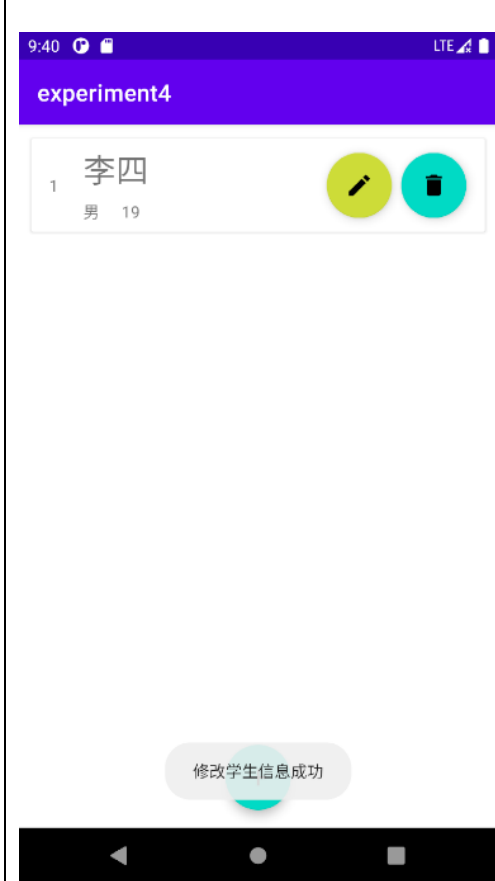
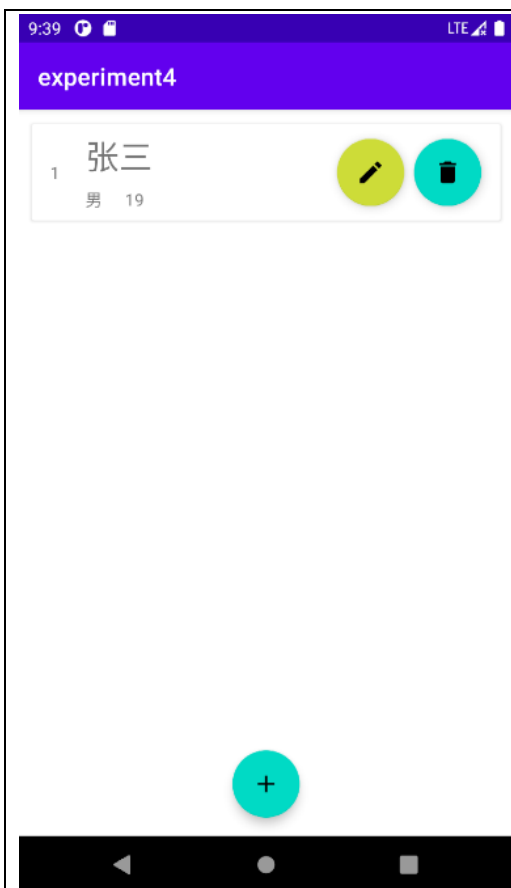
### 4.0 项目代码文件组织

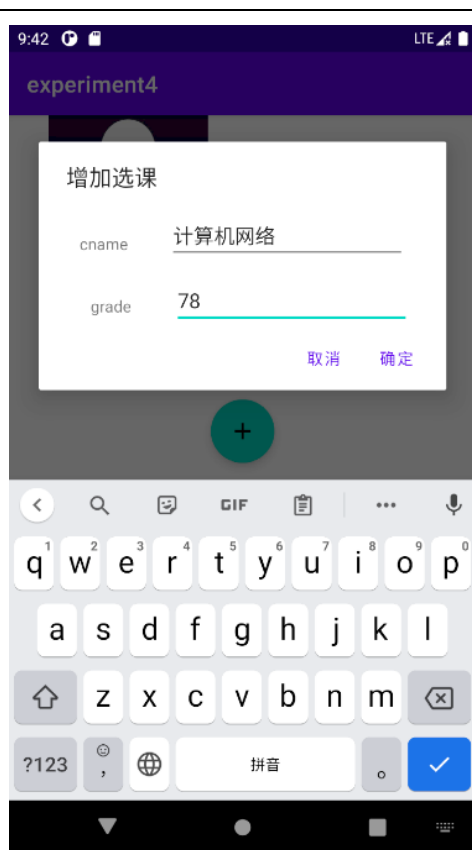
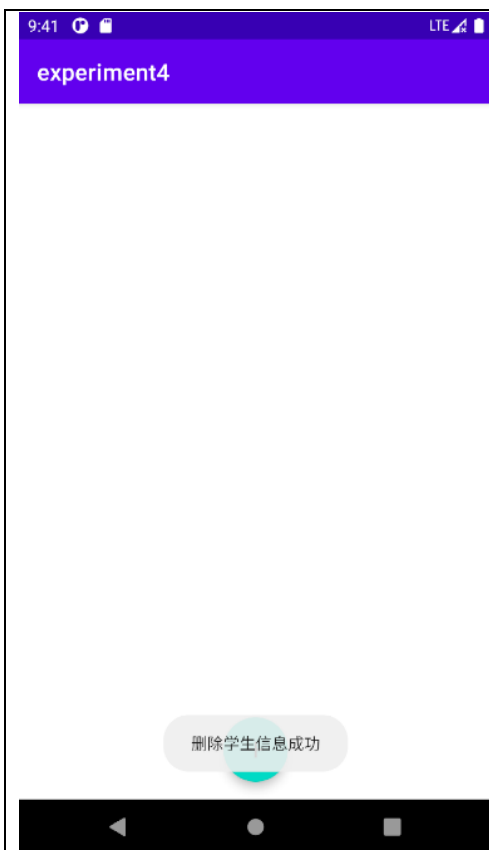


如上图所示这里 entity 层相当于数据库中的创建表，room 底层会帮我们去封装相应的 sql, database 就是数据库, 而 dao 层就是对表的增删改查操作, repository 层专门负责处理数据，这里使用了异步来对数据库进行操作，viewmodel 层是进行函数接口的提供，它调用 repository 层的接口，而真正对数据进行处理的是 adapter 下的一系列代码。

## 4.1 实验截图







## 4.2 实验思路

总体的实验思路是使用安卓的 room 框架(Room 提供了 SQLite 之上的一层抽象, 既允许流畅地访问数据库, 也充分利用了 SQLite.)实现对数据库的操作, 并配合上 viewmodel 的双向绑定(让视图更新操作更加方便, 我还是用来了 LiveData 这种特殊的数据结构, 它的 observe 方法十分有用), 使用它来实时的更新视图, 将后台的数据放到对应的位置, 让用户看到, 这里使用了三个表, student 表, course 表和 sc 表, 分别对应学生表课程表和选课表。

## 4.3 实验代码

### 4.3.1 Entity 的代码

如下代码 room 会完成 orm 的转换, 通过在数据库中维护一张和 student 类中完全一样的属性来对数据进行增删改查, 通过注解的方式实现主键, 外键等数据库约束的声明

Student 的代码

```
@Entity(tableName = "student")
class Student(
    @PrimaryKey(autoGenerate = true) var sno: Int? = 0,
    @ColumnInfo(name = "sname") var sname:String? = "",
    @ColumnInfo(name = "ssex") var ssex:String? = "",
    @ColumnInfo(name = "sage") var sage:Int? = 18
)
```

Sc 的代码

```

@Entity(tableName = "sc",
    primaryKeys = ["sno", "cno"]
)
class Sc (
    @ColumnInfo(name = "sno")
    var sno: Int = 0,
    @ColumnInfo(name = "cno")
    var cno : Int,
    @ColumnInfo(name = "cname")
    var cname : String,
    @ColumnInfo(name = "grade")
    var grade : Int = 100
)

```

Course 的代码

```

@Entity(tableName = "course")
class Course (
    @PrimaryKey(autoGenerate = true)
    var cno: Int = 0,
    @ColumnInfo(name = "cname")
    var cname : String = "",
    @ColumnInfo(name = "ccredit")
    var ccredit: String = ""
)

```

### 4.3.2dao 层

专门负责对于数据表的增删改查四种操作,

StudentDao

```

@Dao
interface StudentDao {
    @Insert
    fun insertStudent(vararg arg: Student)

    @Update
    fun updateStudent(vararg arg: Student)

    @Query("DELETE FROM student WHERE sno = :sno ")
    fun deleteStudentBySno(vararg sno:Int?)

    @Query("DELETE FROM student")
    fun deleteAllStudents()

    @Query("SELECT * FROM student ORDER BY sno DESC ")
    fun getAllStudentsLive(): LiveData<List<Student>>

    @Update()
    fun updateStudent(student:Student)
}

```



### 4.3.3 Repository 层

获取数据的层 就举一个 studentRepository 的例子

里边出现了 `AsyncTask` 这个类他是专门用于异步请求的

解释一下为什么需要通过四个内部类来实现 因为主线程不去做数据交互的事情

因为耗时 会让用户感到卡顿 所以 利用异步来去做就比较合适

// `StudentRepository` 这个类是专门负责数据处理的 很重要

```
class StudentRepository(var context: Context){
    private var allStudentsLive: LiveData<List<Student>>
    private var studentDao: StudentDao

    init {
        val wordDatabase: StudentDatabase = StudentDatabase.getStudentDatabase(context)!!
        studentDao = wordDatabase.getStudentDao()
        allStudentsLive = studentDao.getAllStudentsLive()
    }

    fun getAllStudentsLive(): LiveData<List<Student>>{
        return allStudentsLive
    }
    fun insertStudents(vararg param: Student){
        InsertAsyncTask(studentDao).execute(*param)
    }
    fun updateStudents(vararg param: Student){
        UpdateAsyncTask(studentDao).execute(*param)
    }
    fun deleteAllStudents(){
        DeleteAllAsyncTask(studentDao).execute()
    }
    fun deleteStudentBySno(sno: Int){
        DeleteBySnoAsyncTask(studentDao).execute(sno)
    }

    class DeleteBySnoAsyncTask(var studentDao: StudentDao): AsyncTask<Int, Void, Void>() {
        override fun doInBackground(vararg params: Int?): Void? {
            studentDao.deleteStudentBySno(*params)
            return null
        }
    }
    class InsertAsyncTask(var studentDao: StudentDao): AsyncTask<Student, Void, Void>() {
        override fun doInBackground(vararg params: Student): Void? {
            studentDao.insertStudent(*params)
            return null
        }
    }
    class UpdateAsyncTask(var studentDao: StudentDao): AsyncTask<Student, Void, Void>() {
        init {
            this.studentDao = studentDao
        }
    }
}
```

```

    }
    override fun doInBackground(vararg param: Student): Void? {
        studentDao.updateStudent(*param)
        return null
    }
}
class DeleteAllAsyncTask(var studentDao: StudentDao): AsyncTask<Void, Void, Void>() {
    override fun doInBackground(vararg params: Void?): Void? {
        studentDao.deleteAllStudents()
        return null
    }
}
}
}

```

#### 4.3.4 ViewModel 层

负责抽象接口的封装 举个例子 studentViewModel

```

class StudentViewModel(application: Application) : AndroidViewModel(application) {
    private var allStudentsLive: LiveData<List<Student>>
    private var studentRepository: StudentRepository = StudentRepository(context = application)

    fun getAllStudentsLive(): LiveData<List<Student>>{
        return allStudentsLive
    }
    init {
        allStudentsLive = studentRepository.getAllStudentsLive()
    }
    fun insertStudents(vararg param: Student){
        studentRepository.insertStudents(*param)
    }

    fun updateStudents(vararg param: Student){
        studentRepository.updateStudents(*param)
    }

    fun deleteAllStudents(){
        studentRepository.deleteAllStudents()
    }

    fun deleteStudentBySno(sno: Int){
        studentRepository.deleteStudentBySno(sno)
    }
}

```

#### 4.3.5 Adapter 层

这个层是直接和前端打交道的层，主要是用于 recyclerview 的填充数据等操作，获取按钮监

听点击事件等等

StudentAdapter

```
class StudentAdapter(val application: Application, val StudentList: LiveData<List<Student>>): RecyclerView.Adapter<StudentAdapter.MyViewHolder>() {

    var allStudents :List<Student> = ArrayList<Student>()
    private var studentViewModel: StudentVieModel =
        ViewModelProvider.AndroidViewModelFactory(application).create(StudentVieModel::class.java)
    fun setAllStudents( abc : ArrayList<Student>){
        allStudents = abc
    }

    override fun onCreateViewHolder(parent: ViewGroup, viewType: Int): MyViewHolder {
        val inflater: LayoutInflater = LayoutInflater.from(parent.context)
        val itemView:View = inflater.inflate(R.layout.cell_card_student, parent, false)
        return MyViewHolder(itemView)
    }

    override fun onBindViewHolder(holder: MyViewHolder, position: Int)
    {
        val student: Student = allStudents.get(position)
        holder.textViewSno.text = (position + 1).toString()
        holder.textViewSname.text = student.sname
        holder.textViewSsex.text = student.ssex
        holder.textViewSage.text = student.sage.toString()
        val thisContext = holder.itemView.context
        holder.itemView.setOnClickListener {
            ScActivity.actionStart(thisContext,student.sno!!,student.sname!!,student.ssex!!,student.sage!! )
        }

        holder.modify_student_btn.setOnClickListener {
            val dialogView: View = LayoutInflater.from(thisContext).inflate(R.layout.add_student_dialog, null)
            val snameEditText = dialogView.findViewById<EditText>(R.id.snameEditText)
            val ssexEditText = dialogView.findViewById<EditText>(R.id.ssexEditText)
            val sageEditText = dialogView.findViewById<EditText>(R.id.sageEditText)
            snameEditText.setText(student.sname.toString())
            ssexEditText.setText(student.ssex.toString())
            sageEditText.setText(student.sage.toString())
            AlertDialog.Builder(thisContext).setView(dialogView).apply {
                // 弹出对话框 如果点击确认会启动 answerActivity
                setTitle("修改学生信息")
                setCancelable(false)
                setPositiveButton("确定", DialogInterface.OnClickListener { dialogInterface, i ->
                    val studentUpdateTemp = Student(student.sno,snameEditText.text.toString(),ssexEditText.text.toString(),sageEditText.text.toString()).toInt()
                })
            }
        }
    }
}
```

```

        studentViewModel.updateStudents(studentUpdateTemp)
        Toast.makeText(thisContext, "修改学生信息成功", Toast.LENGTH_SHORT).show()

//        studentViewModel.deleteAllStudents()
    })
    setNegativeButton("取消", DialogInterface.OnClickListener { dialogInterface, i ->
    })
    show()
}
}
holder.delete_student_btn.setOnClickListener {
    AlertDialog.Builder(thisContext).apply { // 弹出对话框 如果点击确认会启动 answerActivity
        setTitle("删除确认")
        setCancelable(false)
        setPositiveButton("确定", DialogInterface.OnClickListener { dialogInterface, i ->
            studentViewModel.deleteStudentBySno(student.sno!!)
            Toast.makeText(thisContext, "删除学生信息成功", Toast.LENGTH_SHORT).show()
        })
        setNegativeButton("取消", DialogInterface.OnClickListener { dialogInterface, i ->
        })
        show()
    }
}

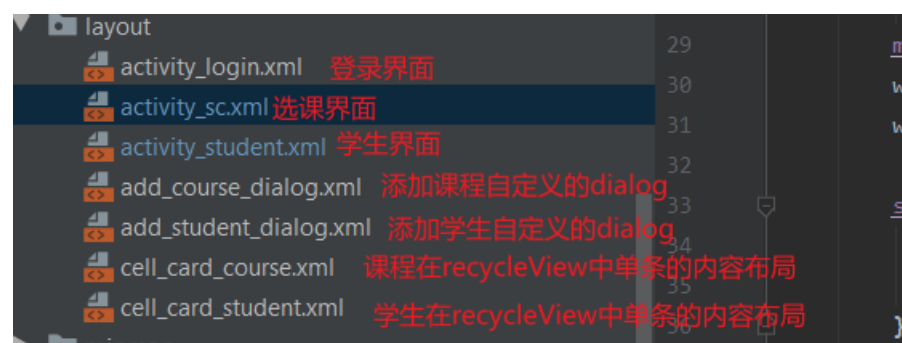
}

override fun getItemCount(): Int {
    return allStudents.size
}

inner class MyViewHolder(itemView: View) : RecyclerView.ViewHolder(itemView){
    var textViewSno:TextView = itemView.findViewById(R.id.textView_course_sno)
    var textViewSname:TextView = itemView.findViewById(R.id.textView_student_sname)
    var textViewSsex:TextView = itemView.findViewById(R.id.textView_student_ssex)
    var textViewSage:TextView = itemView.findViewById(R.id.textView_student_sage)
    var modify_student_btn:FloatingActionButton = itemView.findViewById(R.id.modify_student_btn)
    var delete_student_btn:FloatingActionButton = itemView.findViewById(R.id.delete_student_btn)
}
}

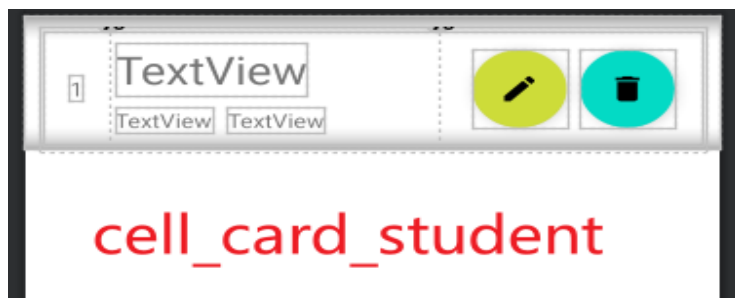
```

### 4.3.6 layout



sname	<input type="text" value="sname"/>
ssex	<input type="text" value="seex"/>
sage	<input type="text" value="sage"/>

add\_student\_dialog



## 核心代码

### Activity\_student

```
<?xml version="1.0" encoding="utf-8"?>
<FrameLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".activity.MainActivity">

    <androidx.recyclerview.widget.RecyclerView
        android:id="@+id/wordRecyclerView"
        android:layout_width="match_parent"
        android:layout_height="match_parent" />

    <com.google.android.material.floatingactionbutton.FloatingActionBut
ton
```

```

        android:id="@+id/add_student_btn"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_gravity="bottom|center"
        android:layout_marginBottom="15dp"
        android:clickable="true"
        android:src="@drawable/white_add" />
    </FrameLayout>

```

## Activity\_sc

```

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".activity.ScActivity">

    <androidx.constraintlayout.widget.Guideline
        android:id="@+id/guideline"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:orientation="horizontal"
        app:layout_constraintGuide_percent="0.35" />

    <ImageView
        android:id="@+id/imageView"
        android:layout_width="140dp"
        android:layout_height="150dp"
        android:background="@drawable/touxiang"
        app:layout_constraintBottom_toTopOf="@+id/guideline"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.129"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.575" />

    <TextView
        android:id="@+id/textView10"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="32dp"
        android:text="学号: "
        android:textColor="#000000"
        android:textSize="18sp"
        app:layout_constraintBottom_toTopOf="@+id/textView7"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.588"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

```

```

<TextView
    android:id="@+id/textView9"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="年龄: "
    android:textColor="#000000"
    android:textSize="18sp"
    app:layout_constraintBottom_toTopOf="@+id/guideline"
    app:layout_constraintStart_toStartOf="@+id/textView8"
    app:layout_constraintTop_toBottomOf="@+id/textView8" />

<TextView
    android:id="@+id/textView8"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="性别: "
    android:textColor="#000000"
    android:textSize="18sp"
    app:layout_constraintBottom_toTopOf="@+id/textView9"
    app:layout_constraintStart_toStartOf="@+id/textView7"
    app:layout_constraintTop_toBottomOf="@+id/textView7" />

<TextView
    android:id="@+id/textView7"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="姓名: "
    android:textColor="#000000"
    android:textSize="18sp"
    app:layout_constraintBottom_toTopOf="@+id/textView8"
    app:layout_constraintStart_toStartOf="@+id/textView10"
    app:layout_constraintTop_toBottomOf="@+id/textView10" />

<TextView
    android:id="@+id/textView_course_sno"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="32dp"
    android:text="TextView"
    app:layout_constraintBottom_toTopOf="@+id/textView_course_sname"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.815"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent" />

<TextView
    android:id="@+id/textView_course_sname"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="TextView"
    app:layout_constraintBottom_toTopOf="@+id/textView_course_ssex"
    app:layout_constraintStart_toStartOf="@+id/textView_course_sno"
    app:layout_constraintTop_toBottomOf="@+id/textView_course_sno"
/>

<TextView

```



```

        android:id="@+id/textView_course_ssex"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="TextView"
        app:layout_constraintBottom_toTopOf="@+id/textView_course_ssage"
"
        app:layout_constraintStart_toStartOf="@+id/textView_course_sname"
e"
        app:layout_constraintTop_toBottomOf="@+id/textView_course_sname"
" />

<TextView
    android:id="@+id/textView_course_ssage"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="TextView"
    app:layout_constraintBottom_toTopOf="@+id/guideline"
"
    app:layout_constraintStart_toStartOf="@+id/textView_course_ssex"

    app:layout_constraintTop_toBottomOf="@+id/textView_course_ssex"
/>

<FrameLayout
    android:layout_width="match_parent"
    android:layout_height="0dp"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintTop_toTopOf="@+id/guideline">

    <androidx.recyclerview.widget.RecyclerView
        android:id="@+id/recyclerViewOfCourse"
        android:layout_width="match_parent"
        android:layout_height="match_parent" />

    <com.google.android.material.floatingactionbutton.FloatingActio
nButton
        android:id="@+id/add_course_btn"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_gravity="bottom|center"
        android:layout_marginBottom="15dp"
        android:clickable="true"
        android:contentDescription="TODO"
        app:srcCompat="@drawable/white_add" />

</FrameLayout>
</androidx.constraintlayout.widget.ConstraintLayout>

```

## cell\_card\_student

```

<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
"
    xmlns:app="http://schemas.android.com/apk/res-auto"

```

```

xmlns:tools="http://schemas.android.com/tools"
android:layout_width="match_parent"
android:layout_height="wrap_content"
android:clickable="true"
android:orientation="vertical">

<androidx.cardview.widget.CardView

    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:layout_marginStart="8dp"
    android:layout_marginLeft="8dp"
    android:layout_marginTop="8dp"
    android:layout_marginEnd="8dp"
    android:layout_marginRight="8dp"
    android:layout_marginBottom="0dp"
    app:cardBackgroundColor="@color/design_default_color_on_primary
"

    app:cardElevation="2dp"
    app:cardUseCompatPadding="true">

<androidx.constraintlayout.widget.ConstraintLayout
    android:background="?attr/selectableItemBackground"
    android:layout_width="match_parent"
    android:layout_height="match_parent">

    <androidx.constraintlayout.widget.Guideline
        android:id="@+id/guideline7"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:orientation="vertical"
        app:layout_constraintGuide_percent="0.1" />

    <androidx.constraintlayout.widget.Guideline
        android:id="@+id/guideline8"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:orientation="vertical"
        app:layout_constraintGuide_percent="0.6" />

    <TextView
        android:id="@+id/textView_course_sno"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="1"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toStartOf="@+id/guideline7"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <TextView
        android:id="@+id/textView_student_sname"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="8dp"
        android:text="TextView"
        android:textSize="28sp"
        app:layout_constraintBottom_toTopOf="@+id/textView_stud

```

```

ent_ssex"
    app:layout_constraintEnd_toStartOf="@+id/guideline8"
    app:layout_constraintHorizontal_bias="0.041"
    app:layout_constraintStart_toStartOf="@+id/guideline7"
    app:layout_constraintTop_toTopOf="parent" />

    <TextView
        android:id="@+id/textView_student_ssex"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="8dp"
        android:layout_marginBottom="8dp"
        android:text="TextView"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintStart_toStartOf="@+id/textView_stu
dent_sname"
        app:layout_constraintTop_toBottomOf="@+id/textView_stud
ent_sname" />

    <TextView
        android:id="@+id/textView_student_sage"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="8dp"
        android:text="TextView"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toStartOf="@+id/guideline8"
        app:layout_constraintHorizontal_bias="0.118"
        app:layout_constraintStart_toEndOf="@+id/textView_stude
nt_ssex"
        app:layout_constraintTop_toBottomOf="@+id/textView_stud
ent_sname"
        app:layout_constraintVertical_bias="0.0" />

    <com.google.android.material.floatingactionbutton.FloatingA
ctionButton
        android:id="@+id/modify_student_btn"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:clickable="true"
        android:contentDescription="TODO"
        app:backgroundTint="#CDDC39"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.2"
        app:layout_constraintStart_toStartOf="@+id/guideline8"
        app:layout_constraintTop_toTopOf="parent"
        app:srcCompat="@drawable/white_edit" />

    <com.google.android.material.floatingactionbutton.FloatingA
ctionButton
        android:id="@+id/delete_student_btn"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginEnd="16dp"
        android:layout_marginRight="16dp"
        android:clickable="true"
        app:layout_constraintBottom_toBottomOf="parent"

```

```
btn"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="1.0"
        app:layout_constraintStart_toEndOf="@+id/modify_course_

        app:layout_constraintTop_toTopOf="parent"
        app:srcCompat="@drawable/white_delete" />

    </androidx.constraintlayout.widget.ConstraintLayout>
</androidx.cardview.widget.CardView>
</LinearLayout>
```