数据库原理课程设计[实验八]

一、实验准备

某学校要求学生把校园卡与银行卡绑定，学生数据库STUDENT中有两张表，其中校园卡号是学生的学号。

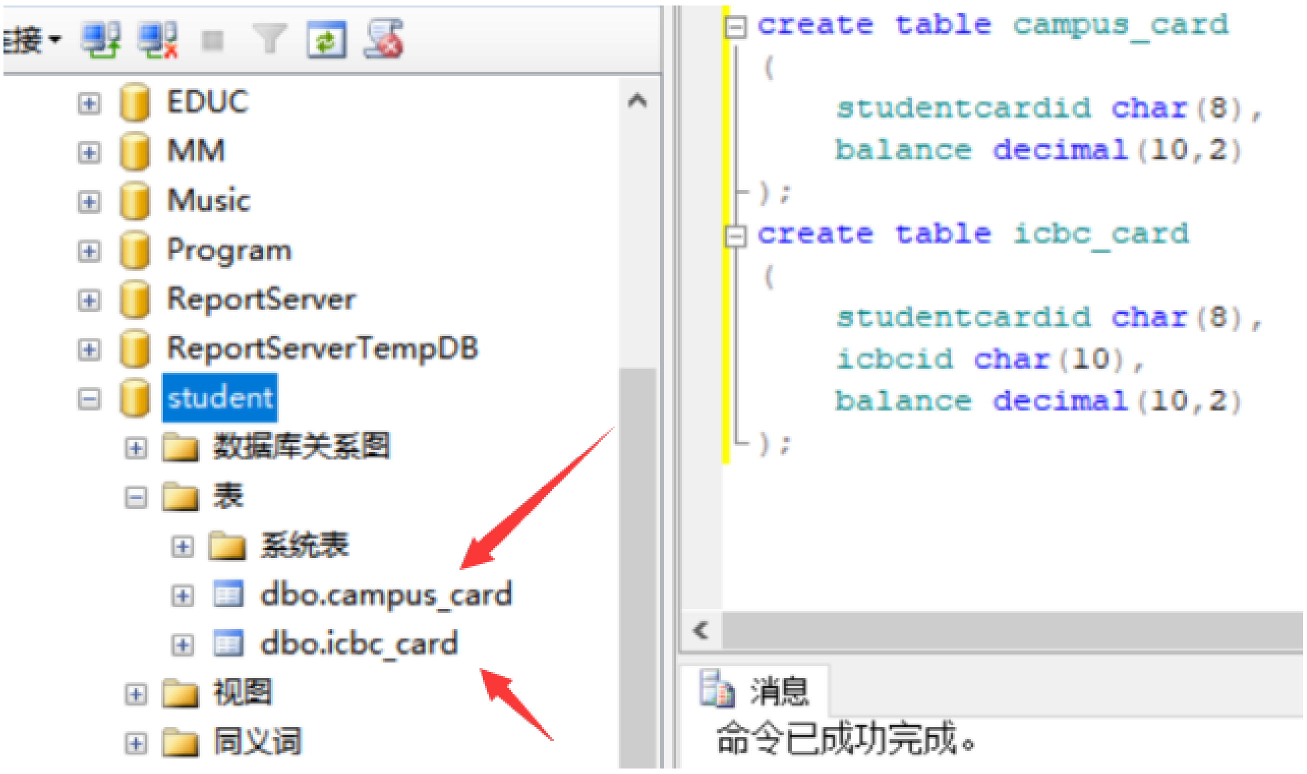
```
Icbc_card(studentcardid,icbcid,balance)

Campus_card(stuentcardid,balance)
```

1.建立数据库

```
create database [student] on primary
(name = N'student',FILENAME = N'E:\sql_data\student1.mdf', size=3072KB,
MAXSIZE = UNLIMITED,FILEGROWTH=1024KB )
LOG ON
(name = N'student_log',FILENAME = N'E:\sql_data\student_log1.ldf',
size=1024KB,
MAXSIZE = 2048GB,FILEGROWTH=10% )
GO
```

2.建立数据表

```
create table campus_card
(
    studentcardid char(8),
    balance decimal(10,2)
);
create table icbc_card
(
    studentcardid char(8),
    icbcid char(10),
    balance decimal(10,2)
);
```

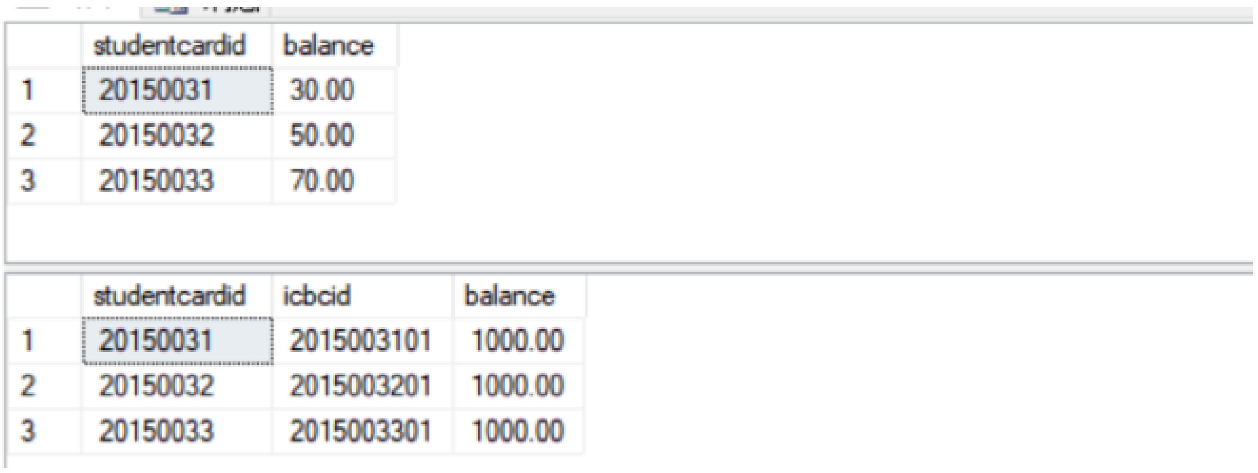


```
create table campus_card
(
    studentcardid char(8),
    balance decimal(10,2)
);
create table icbc_card
(
    studentcardid char(8),
    icbcid char(10),
    balance decimal(10,2)
);
```

```
命令已成功完成。
```

3.录入数据

```
insert INTO campus_card values ('20150031',30);
insert INTO campus_card values ('20150032',50);
insert INTO campus_card values ('20150033',70);
insert INTO icbc_card values ('20150031','2015003101',1000);
insert INTO icbc_card values ('20150032','2015003201',1000);
insert INTO icbc_card values ('20150033','2015003301',1000);
```



	studentcardid	balance
1	20150031	30.00
2	20150032	50.00
3	20150033	70.00

	studentcardid	icbcid	balance
1	20150031	2015003101	1000.00
2	20150032	2015003201	1000.00
3	20150033	2015003301	1000.00

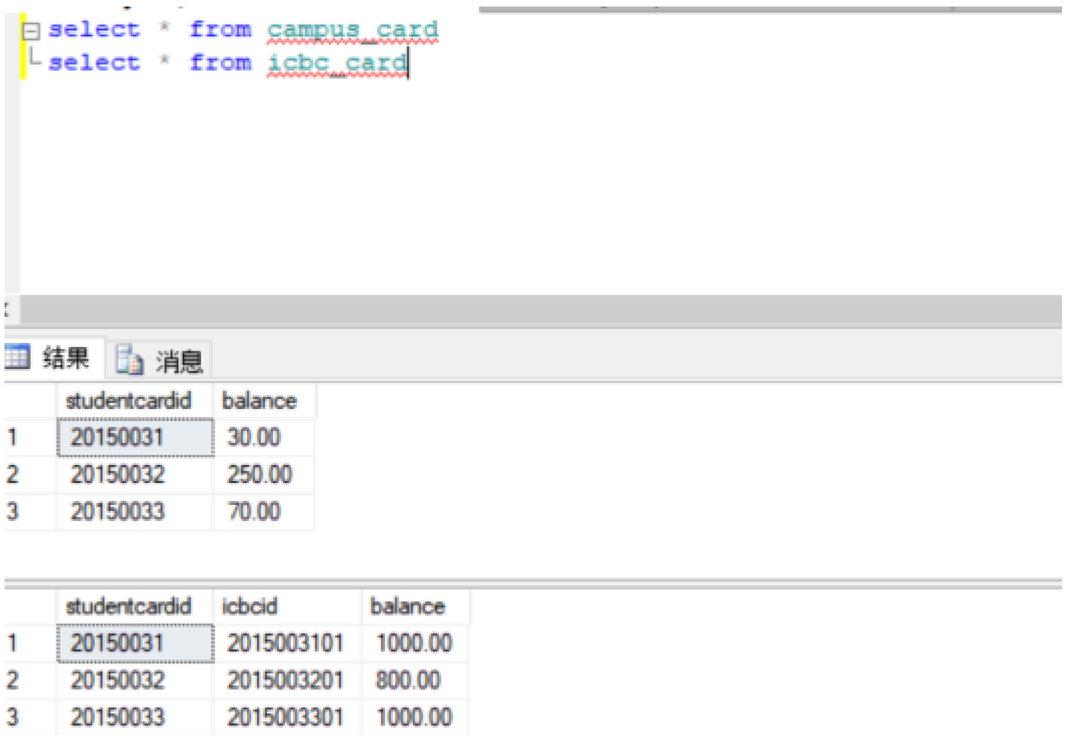
二、实验内容

1.转账事务

编写一个事务处理实现如下操作，学号为20150032的学生需要从银行卡转账两百元到自己的校园卡中，若过程中出现错误则回滚。

```
set transaction isolation level repeatable read
Begin transaction
use student
go

declare @x decimal(10,2)
select @x=balance
from icbc_card
where studentcardid='20150032'
set @x=@x-200
if(@x>=0)
  begin
    update icbc_card set balance =@x where studentcardid='20150032'
    update campus_card set balance=balance+200
    where studentcardid='20150032'
    commit tran
 end
else
  begin
    print'余额不足，不能转账'
    rollback tran
  end
```

结果如下:



```
select * from campus_card
select * from icbc_card
```

结果　消息

	studentcardid	balance
1	20150031	30.00
2	20150032	250.00
3	20150033	70.00

	studentcardid	icbcid	balance
1	20150031	2015003101	1000.00
2	20150032	2015003201	800.00
3	20150033	2015003301	1000.00

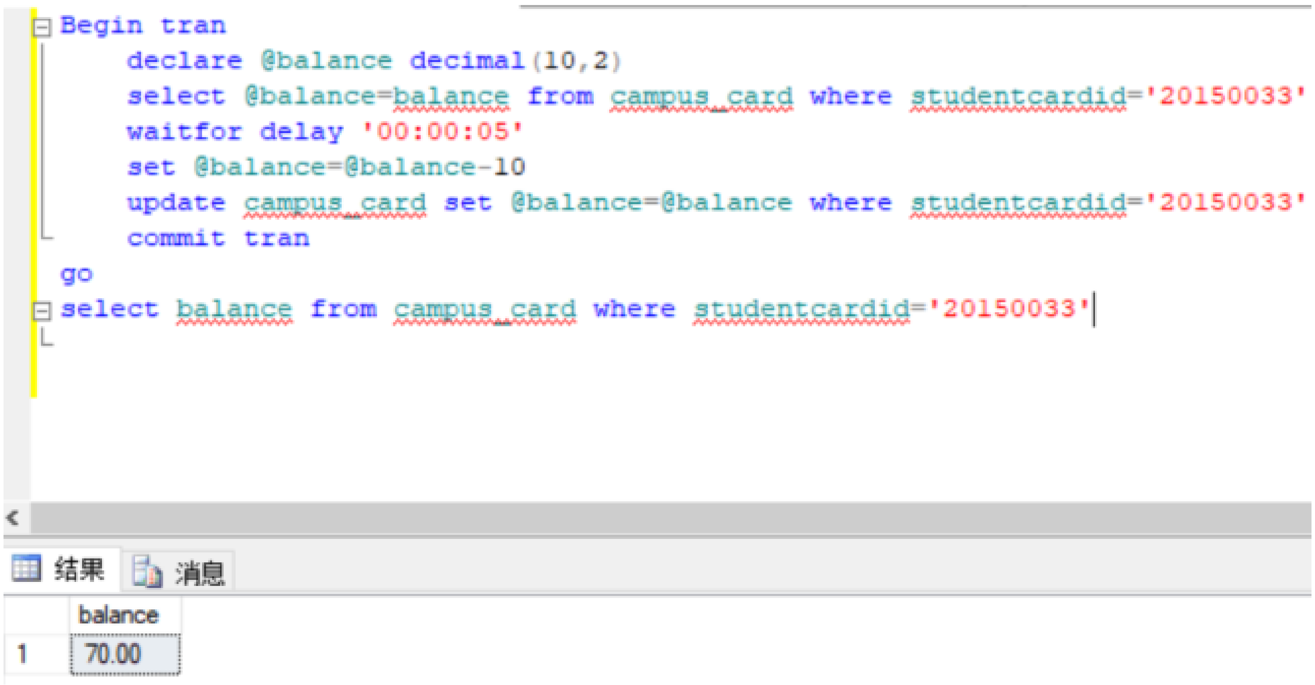
2.数据不一致模拟

基于当前数据库STUDENT，涉及样例展示四种数据不一致的问题，丢失修改，读脏数据，不可重复读和幻读(删除和插入).

2.1丢失修改

(1)事务一：

```
    Begin tran
     declare @balance decimal(10,2)
     select @balance=balance from campus_card where studentcardid='20150033'
     waitfor delay '00:00:05'
     set @balance=@balance-10
     update campus_card set @balance=@balance where studentcardid='20150033'
     commit tran
go
select balance from campus_card where studentcardid='20150033'
```



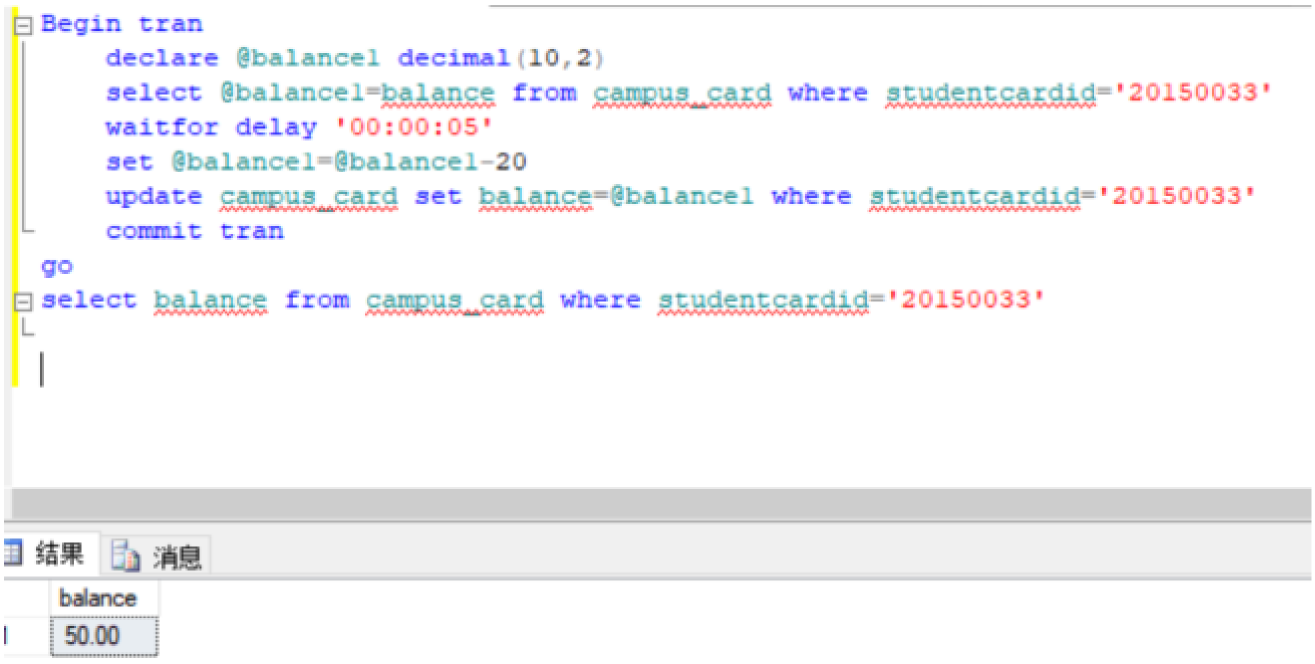
```
Begin tran
    declare @balance decimal(10,2)
    select @balance=balance from campus_card where studentcardid='20150033'
    waitfor delay '00:00:05'
    set @balance=@balance-10
    update campus_card set @balance=@balance where studentcardid='20150033'
    commit tran
go
select balance from campus_card where studentcardid='20150033'
```

结果 消息

```
   balance
1  70.00
```

(2)事务二:

```
Begin tran
     declare @balance1 decimal(10,2)
     select @balance1=balance from campus_card where studentcardid='20150033'
     waitfor delay '00:00:05'
     set @balance1=@balance1-20
     update campus_card set balance=@balance1 where studentcardid='20150033'
     commit tran
go
select balance from campus_card where studentcardid='20150033'
```



```
Begin tran
     declare @balance1 decimal(10,2)
     select @balance1=balance from campus_card where studentcardid='20150033'
     waitfor delay '00:00:05'
     set @balance1=@balance1-20
     update campus_card set balance=@balance1 where studentcardid='20150033'
     commit tran
go
select balance from campus_card where studentcardid='20150033'
```

结果 消息

```
  balance
1 50.00
```

最终事务2的结果覆盖了事务1的更改值，结果并非事务1和事务2叠加修改的预期值40，事务1的更改丢失了，现在结果为50.

2.2 读脏数据

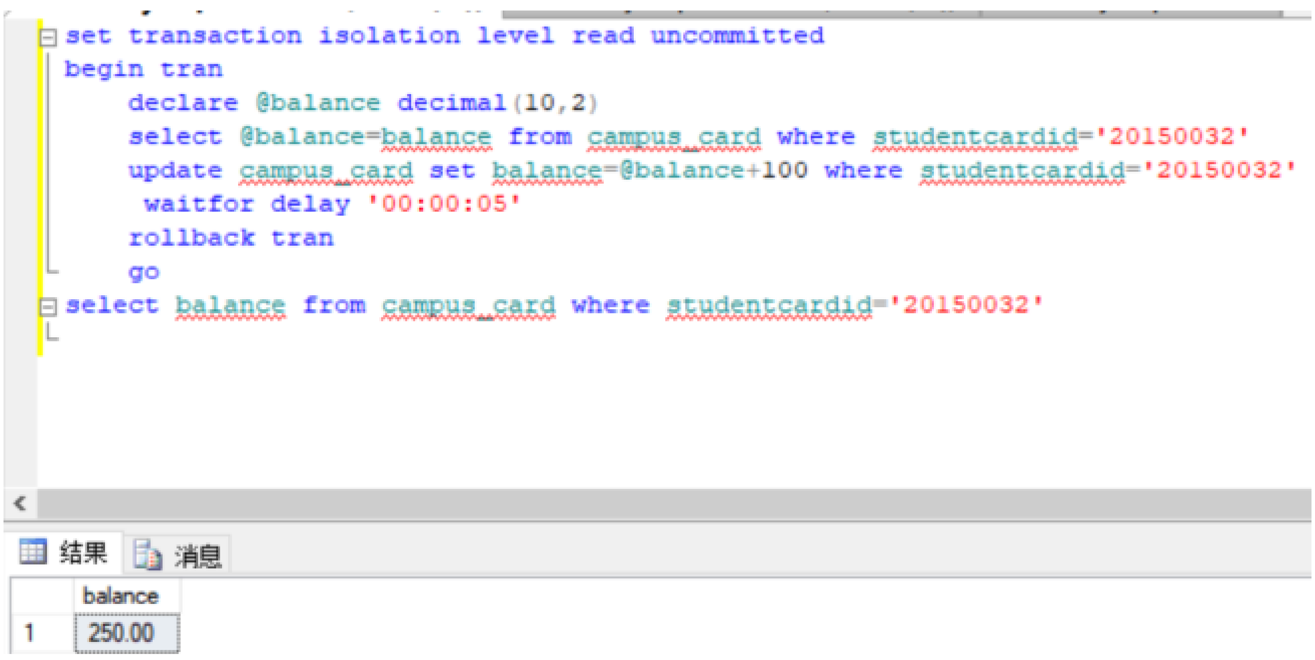
(1)事务一:

```
set transaction isolation level read uncommitted
---read uncommitted执行脏读，不发出共享锁，也不接受排他锁
begin tran
        declare @balance decimal(10,2)
        select @balance=balance from campus_card where
studentcardid='20150032'
        update campus_card set balance=@balance+100 where
studentcardid='20150032'
        waitfor delay '00:00:05'
        rollback tran
        go
select balance from campus_card where studentcardid='20150032'
```

(2)事务二:

```
set transaction isolation level read uncommitted
begin tran
        declare @balance decimal(10,2)
        select @balance=balance from campus_card where
studentcardid='20150032'
        update campus_card set balance=@balance+50 where
studentcardid='20150032'
         waitfor delay '00:00:05'
        rollback tran
        go
select balance from campus_card where studentcardid='20150032'
```

事务1更改了数据，事务2读取了表中更改后的值再进行操作，事务1回滚，最终的表存储了错误结果。



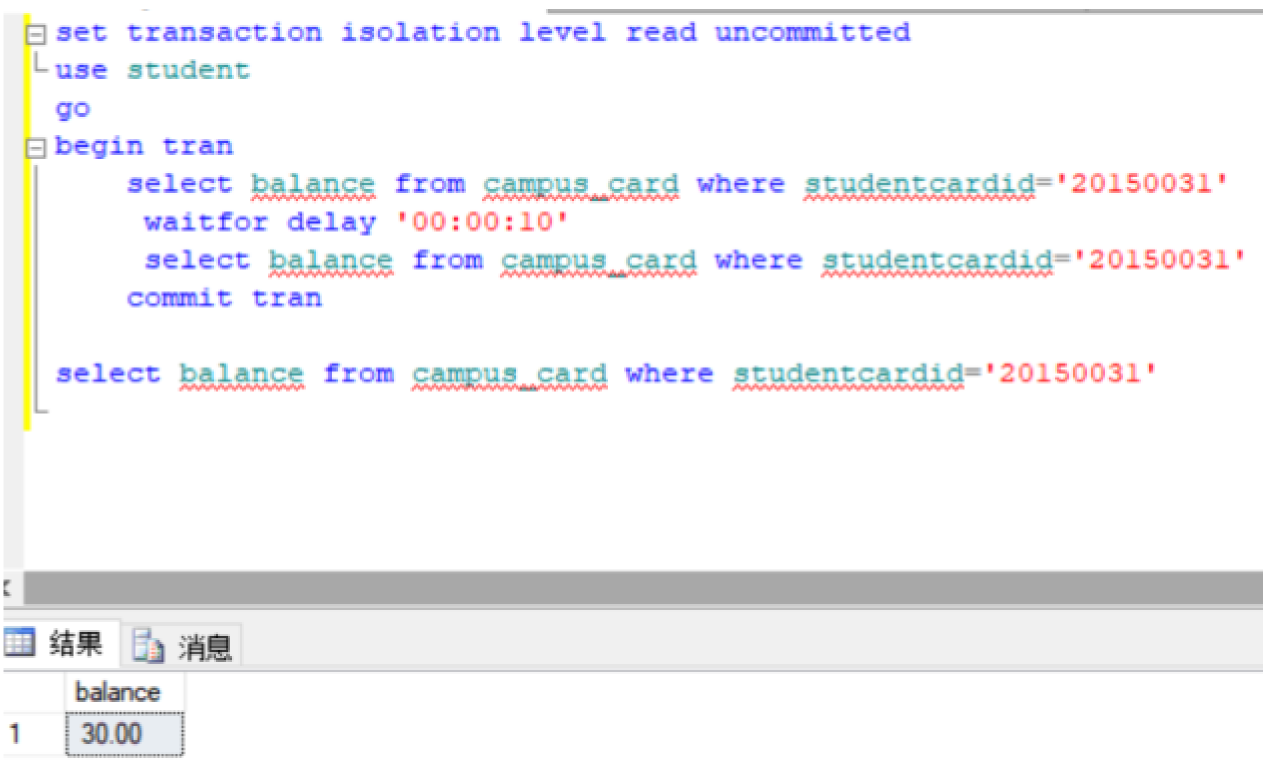
```
set transaction isolation level read uncommitted
begin tran
    declare @balance decimal(10,2)
    select @balance=balance from campus_card where studentcardid='20150032'
    update campus_card set balance=@balance+100 where studentcardid='20150032'
     waitfor delay '00:00:05'
    rollback tran
    go
select balance from campus_card where studentcardid='20150032'
```

```
  balance
1 250.00
```

2.3不可重复读

(1)事务一:

```
set transaction isolation level read uncommitted
use student
go
begin tran
    select balance from campus_card where studentcardid='20150031'
     waitfor delay '00:00:10'
     select balance from campus_card where studentcardid='20150031'
    commit tran
```

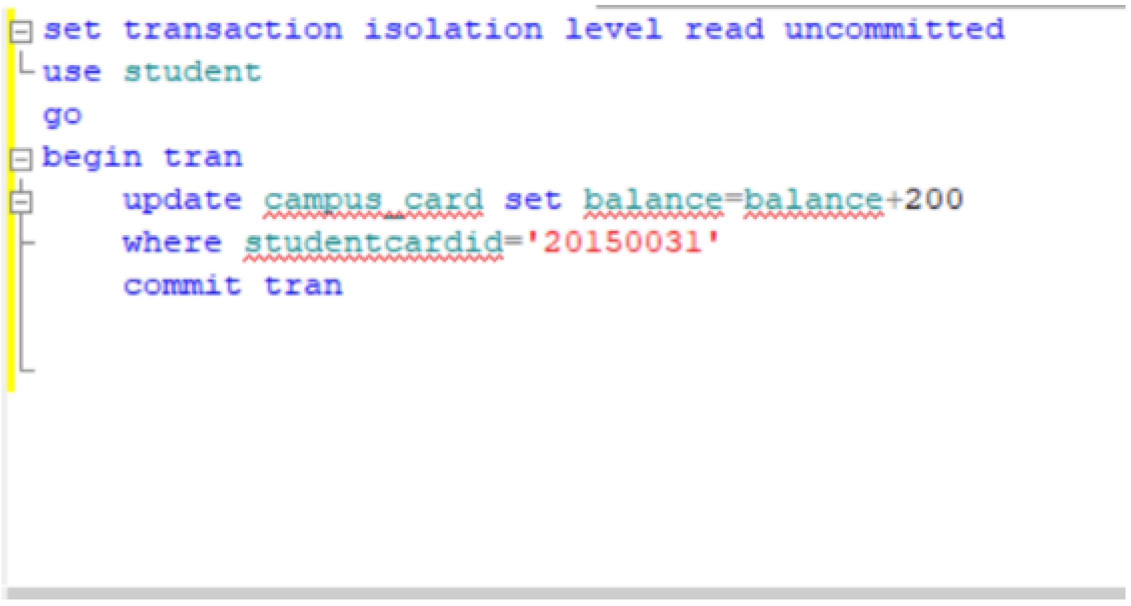


```
set transaction isolation level read uncommitted
use student
go
begin tran
    select balance from campus_card where studentcardid='20150031'
     waitfor delay '00:00:10'
     select balance from campus_card where studentcardid='20150031'
    commit tran

select balance from campus_card where studentcardid='20150031'
```

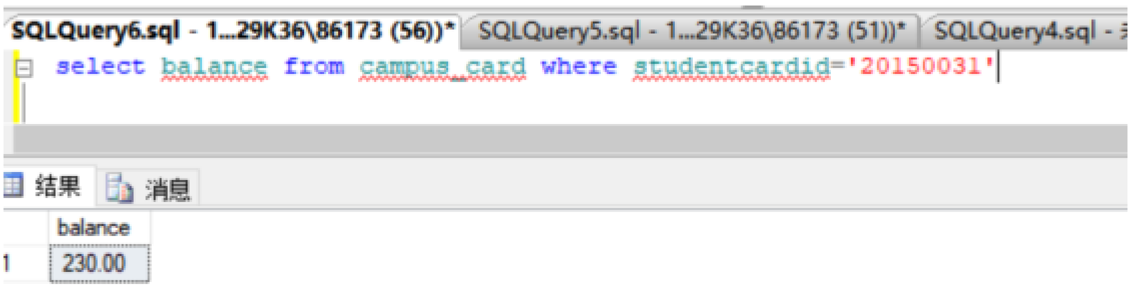
```
  balance
1 30.00
```

(2)事务二:

```
set transaction isolation level read uncommitted
use student
go
begin tran
     update campus_card set balance=balance+200
        where studentcardid='20150031'
commit tran
```



```
set transaction isolation level read uncommitted
use student
go
begin tran
    update campus_card set balance=balance+200
    where studentcardid='20150031'
    commit tran
```



SQLQuery6.sql - 1...29K36\86173 (56))*   SQLQuery5.sql - 1...29K36\86173 (51))*   SQLQuery4.sql -

```
select balance from campus_card where studentcardid='20150031'
```

结果   消息

```
   balance
1  230.00
```

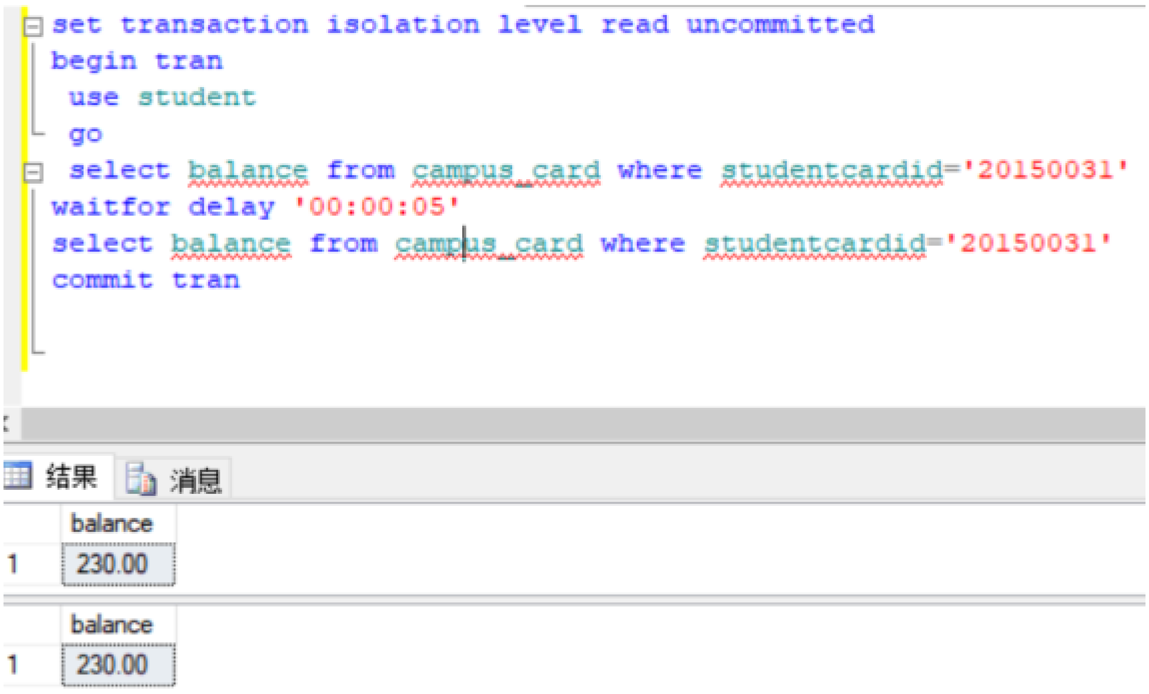
可以看到，事务一读取了数据，事务二更改了数据，事务一再读取数据，事务一两次读取的都不同。

2.4 幻读

2.4.1 插入数据

(1)事务一:

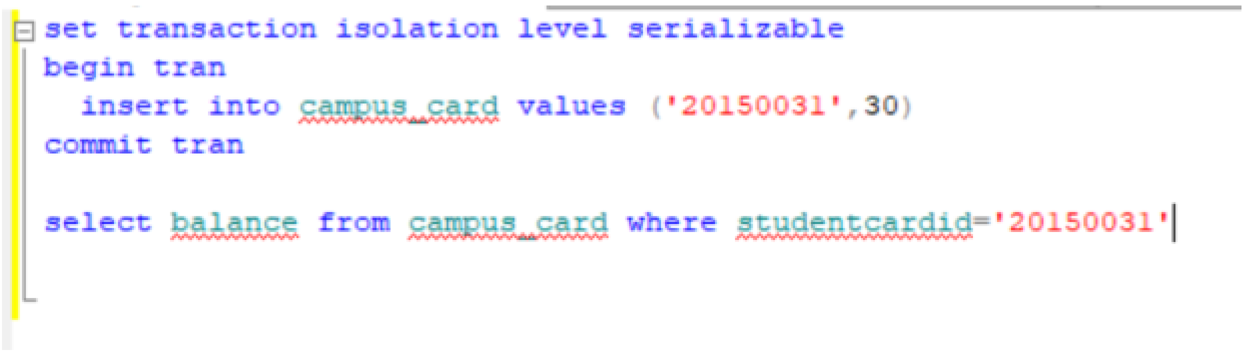
```
set transaction isolation level read uncommitted
begin tran
 use student
 go
    select balance from campus_card where studentcardid='20150031'
waitfor delay '00:00:05'
select balance from campus_card where studentcardid='20150031'
commit tran
```


```
set transaction isolation level read uncommitted
begin tran
 use student
 go
 select balance from campus_card where studentcardid='20150031'
waitfor delay '00:00:05'
select balance from campus_card where studentcardid='20150031'
commit tran
```

```
结果  消息
   balance
1  230.00

   balance
1  230.00
```

(2)事务二:

```
set transaction isolation level serializable
begin tran
    insert into campus_card values ('20150031',30)
commit tran
select balance from campus_card where studentcardid='20150031'
```


```
set transaction isolation level serializable
begin tran
  insert into campus_card values ('20150031',30)
commit tran

select balance from campus_card where studentcardid='20150031'
```

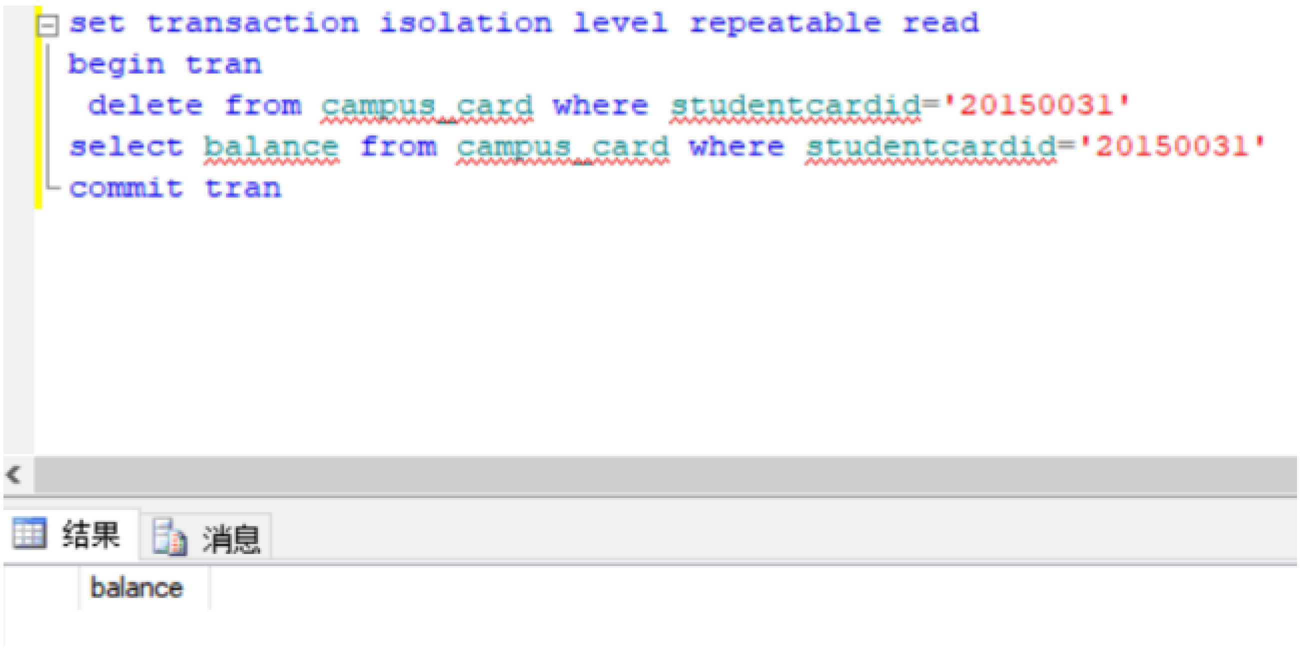
2.4.2 删除数据

(1)事务一:

```
set transaction isolation level read uncommitted
begin tran
 use student
 go
select balance from campus_card where studentcardid='20150031'
waitfor delay '00:00:05'
select balance from campus_card where studentcardid='20150031'
commit tran
```

(2)事务二:

```
set transaction isolation level repeatable read
begin tran
delete from campus_card where studentcardid='20150031'
select balance from campus_card where studentcardid='20150031'
commit tran
```



```
set transaction isolation level repeatable read
begin tran
 delete from campus_card where studentcardid='20150031'
select balance from campus_card where studentcardid='20150031'
commit tran
```

```
balance
```

3.解决方案

利用锁机、 数据库的隔离级别等知识， 设计方案分别解决上述丢失修改、 读脏数据和不可重复。

读（幻读）的数据不一致问题， 可以用sp_lock过程查看当前锁的状态。

修改隔离级别以确保数据的正确性：

丢失修改， 在SQL 语句前加未提交读：

```
SET TRAN ISOLATION LEVEL READ UNCOMMITTED
```

读脏数据， 在SQL语句前加已提交读：

```
Set tran isolation level read committed
```

不可重复读， 在SQL语句前加可重复读：

```
Set tran isolation level repeatable read
```

幻读， 在SQL语句前加可串行读：

```
Set tran isolation level read committed
```

4.构造出现死锁的情况

将锁的级别改为提交可读

```
Set tran isolation level read committed --事务1
Begin tran
Declare @read int Select @read=grade From sc
Where sno='95003' Waitfor delay'00:00: 10' Update sc
Set grade =@read-1 Where sno='95003'
——事务2
Begin tran
Declare @read int Select@read=grade From sc
Where sno='95003' Update sc
Set grade=@read-1 Where sno='95003'
```

5.利用DBCC log命令可以查看Student数据库的事务日志

```
DBCC LOG('Student',TYPE=2)
```