

Bringing British
Education to You
www.nccedu.com

Database Design and
Development

Topic 4:
Data Retrieval (1)

V1.0


© NCC Education Limited

Data Retrieval (1) Topic 4 - 4.2

Scope and Coverage

This topic will cover:

- Table and view structure in a relational database
- Data types
- Null values
- Retrieving data using SQL



Bringing British
Education to You
www.nccedu.com

V1.0


© NCC Education Limited

Data Retrieval (1) Topic 4 - 4.3

Learning Outcomes

By the end of this topic students will be able to:

- Implement more complex relationships
- Describe how to retrieve data from one or more tables using SQL
- Recognise and identify different data-types in SQL



Bringing British
Education to You
www.nccedu.com

V1.0

© NCC Education Limited

Creating Tables from Entities
(some further issues)

- Representing tables
- Representing relationships
 - One-to-many relationships
 - One-to-many recursive relationships
 - One-to-one relationships

Bringing British
Education to You

V1.0

© NCC Education Limited

One-to-Many Relationship

Module

Attributes:
Module Code(PK)
Module Name

1

0...*

Student on
Module

Attributes:
Module Code (FK)
Student No (FK)

0...*

Student

Attributes:
Student No(PK)
Student Name

1

Module Code	Module Name
OB210	Business Database Applications
OB251	User Centred Systems Analysis
OB313	Advanced Business Database Applications

Module Code	Student ID
OB210	M00002
OB210	M00003
OB251	M00002

Student No	Student Name
M00001	Amina Bequm
M00002	Sarah Aka
M00003	Dave Smith

Bringing British
Education to You

V1.0

© NCC Education Limited

One-to-Many Recursive Relationship
- 1

Student

0...*

1

A student is a mentor to
potentially many other
students.

StudentID	Surname	FirstName	MentorID
22	Smith	Dave	
55	Singh	Jagpal	22
76	May	Emily	22

Bringing British
Education to You

V1.0

© NCC Education Limited

V1.0

Visuals Handout – Page 2

One-to-Many Recursive Relationship

A student is a mentor
potentially many other
students.

StudentID	Surname	FirstName	MentorID
22	Smith	Dave	22
55	Singh	Jagpal	
76	May	Emily	22

Dave Smith is a mentor
to two other students

Student (StudentID, Surname, FirstName, MentorID)
 Primary Key StudentID
 Foreign Key MentorID references Student(StudentID)

One-to-One Relationship



1. Mandatory on both sides
2. Mandatory on one side
3. Optional on both sides

Mandatory on Both Sides

Student (StudentID, Surname, FirstName, MentorID, **PortfolioID, PortfolioDate, PortfolioGrade**)

The attributes belonging to the portfolio are in bold.

Mandatory on one Side of 1:1

- Entity that has optional participation is designated parent entity.
- Student (StudentID, Surname, FirstName, MentorID, PortfolioID)
- Portfolio(PortfolioID, PortfolioDate, PortfolioGrade)

Optional on Both Sides

- Arbitrary. Depends on semantics.



A student may have the use of a single studio. A studio might be used by a single student. Where does the FK go?

Objectives of SQL

- Create the database and relation structures
- Perform basic tasks such as inserts, updates and deletes
- Simple and complex queries

Structured Query Language

Data Definition Language DDL

- For defining database structures and controlling access to data
 - CREATE TABLE, CREATE INDEX, CREATE SEQUENCE, GRANT ACCESS etc.
- Data Manipulation Language DML
 - For retrieving and updating data
 - SELECT, INSERT, UPDATE, DELETE

Data Manipulation Language DML

- For retrieving and updating data
- SELECT
- INSERT
- UPDATE
- DELETE

```
Select branchID, Count(staff_id)
From workers
Where branchType = 'Main'
Group by branchID
Having Count (staff_id) > 1
Order by branchID
```

Data Retrieval (1) Topic 4 - 4.16

What columns will appear

Select branchID, Count(staff_id)

From workers

Where branchType = 'Main'

Group by branchID

Having Count (staff_id) > 1

Order by branchID


Which table

Condition

Groups by some column Value

Restricts what will Be grouped

Specifies the order of the result

 Bringing British Education to You
www.nccedu.com


V1.0 © NCC Education Limited

Data Retrieval (1) Topic 4 - 4.17

Literals

Insert into Student (Stu_id, First_name, Last_name)
Values (1,'Satpal','Singh');

Non-numeric in single quotes.
Numeric NOT in quotes


 Bringing British Education to You
www.nccedu.com

V1.0 © NCC Education Limited

Data Retrieval (1) Topic 4 - 4.18

Select

SELECT first_name
FROM Students
WHERE Student_type = 'Overseas';

 Bringing British Education to You
www.nccedu.com

V1.0 © NCC Education Limited

All the Columns or some of them

Select *
from Students
Where student_type = 'Overseas';

```
Select student_id, first_name, last_name,  
From Students  
Where student_type = 'Overseas';
```

Order by

```
Select first_name, last_name, stu_id
From Students
Where student_type = 'Overseas'
Order by last_name;
```

Order by

```
Select first_name, last_name, stu_id  
From Students  
Where student_type = 'Overseas'  
Order by last_name desc;
```

Aggregate Functions - 1

- Count
- Sum
- Avg
- Min
- Max

Aggregate Functions - 2

- Count – returns number of values in a column
- Sum – returns the sum total of values of a column
- Avg – returns the mean average of values in column
- Min – returns the lowest value in a column
- Max – returns the highest value in a column

Example of Aggregate Function

```
Select branchID, Count(staff_id)
From workers
Where branchType = 'Main'
Group by branchID
Having Count (staff_id) > 1
Order by branchID
```

- This counts the number of members of staff in main branches where there are more than 1 staff. It groups them by the branchID.

Group By

- As shown in the previous slide...
- This clause is used with an aggregate function and groups the results by some attribute

Having Clause

- Modifies the group by clause
 - Select branchID, Count(staff_id)
From workers
Where branchType = 'Main'
Group by branchID
Having Count (staff_id) > 1
Order by branchID
- In this case only selecting groups where it has been calculated by the count function that there are more than one member of staff.

Sub-Queries

```
Select d.department_name, d.location
From departments d, workers w
Where d.dept_no = w.dept_no
And w.age =
(select max(w2.age)
From workers w2);
```

Joins

```
Select d.department_name, w.first_name,
w.last_name
From departments d, workers w
Where d.dept_no = w.dept_no;
```

Fixing Errors

- Not specifying join condition properly
- Syntax errors
- Spelling errors for keywords
- Columns not existing on tables
- Data-types being mixed up

Datatypes

- What is a datatype?
- What is a domain?

String Datatypes

- Character or Char
- Varying Character or Varchar
- Bit (N)

Char or Varchar

- 'Gary__' a 6 long Char
- 'Gary' a 6 long varchar

Numeric Datatypes

- Numeric or Decimal e.g. 8.23 with point set
- Integer e.g. 8
- Float e.g. 8.23 but could also be changed so that point moves when needed

Data Retrieval (1) Topic 4 - 4.34

Datetime Types

- Date
- Time
- Timestamp
- Interval

Bringing British Education to You
 www.nccedu.com

V1.0

© NCC Education Limited

Data Retrieval (1) Topic 4 - 4.35

Null Values

- What are null values?
- Activity: think of all the different things that null could represent.

Bringing British Education to You
 www.nccedu.com

V1.0

© NCC Education Limited

Data Retrieval (1) Topic 4 - 4.36

Learning Outcomes

By the end of this topic students will be able to:

- Implement more complex relationships
- Describe how to retrieve data from one or more tables using SQL
- Recognise and identify different data-types in SQL

Bringing British Education to You
 www.nccedu.com

V1.0

© NCC Education Limited

References

- Connolly, T. and Begg, C. (2004) *Database Solutions: A step-by-step guide to building database*, 2nd Edition Addison-Wesley - **Chapters 9 and 10**
- Connolly, T. and Begg, C. (2004). *Database Systems: A Practical Approach to Design, Implementation, and Management*, 4th Edition. Addison Wesley - **Chapters 5, 6 and 7**
- Benyon-Davies, P. (2003). *Database Systems*, 3rd Revised Edition. Palgrave Macmillan – **Chapters 11, 12 and 13**
- Dietrich, Suzanne W. (2001) *Understanding Relational Database Query Languages* - **Chapter 5**



© NCC Education Limited

Topic 4 – Data Retrieval (1)

Any Questions?



Bringing British
Education to You
www.nccedu.com

