

ADO .NET (1)

These slides are meant to be for teaching purposes only and only for the students that are registered in CSE4413 and should not be published as a book or in any form of commercial product, unless written permission is obtained.

ADO .NET (ActiveX Data Objects)

- ADO.NET is a component of .NET that allows access to relational databases from within C# (and other languages) programs.
- A database is
 - Integrated collection of data
 - Database management system (DBMS)
 - Provides mechanisms for storing and organizing data in a way that is consistent with database's format
 - Allows storage and access to database without knowledge of internal representation
 - Relational Databases most popular
 - Use Structured Query Language (SQL) to perform queries (search) and manipulate data
 - Programming languages need an interface to interact with relational databases

Relational data bases overview

- Logical representation of data:
 - Relationships can be considered without concern for physical structure of data
- Composed of tables
 - Rows called records
 - Columns called fields
 - Primary key: field that contains unique data
 - Each record can be identified by at least one distinct value
 - New sets made from queries called result sets

Example. A students data base in MS Access.

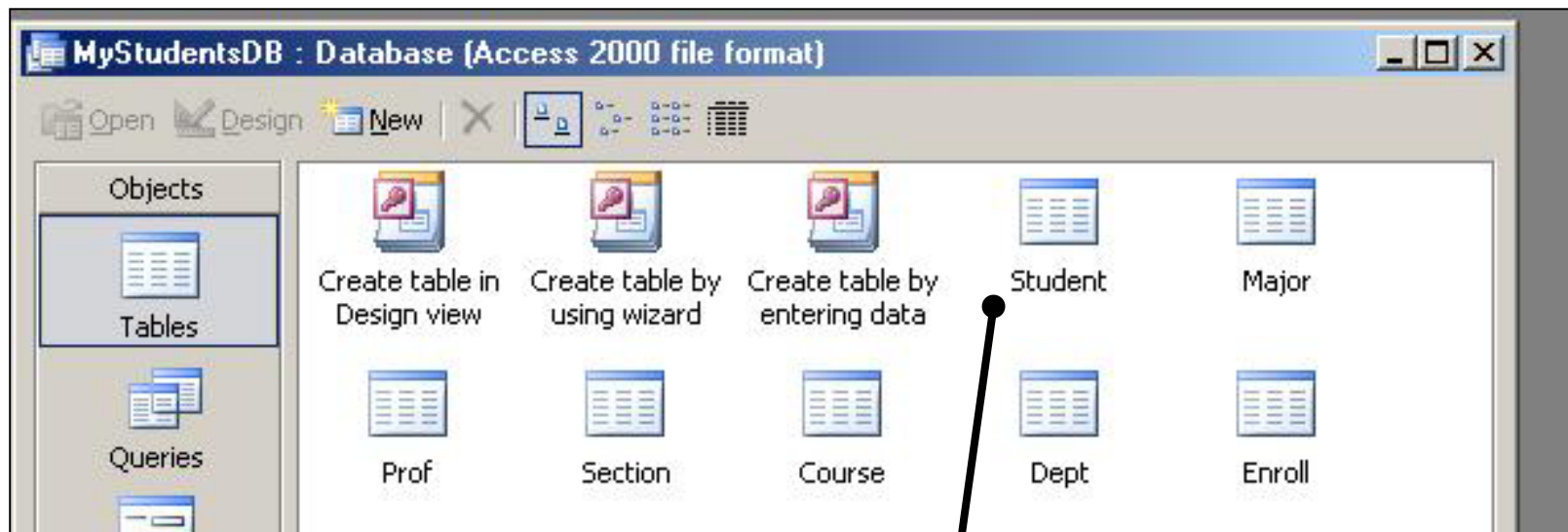


Table
Student

A table

| Student : Table | | | | | | |
|-----------------|-----|---------------------|-----|-----|------|-----|
| | sid | sname | sex | age | year | gpa |
| ▶ | 1 | Jacobs, T. | m | 29 | 5 | 3.6 |
| | 2 | Pierson, E. | m | 32 | 5 | 3.5 |
| | 3 | Zeene, Ben N. | m | 21 | 5 | 3.9 |
| | 4 | Sulfate, Barry M. | m | 19 | 2 | 2.8 |
| | 5 | Form, Clara O. | f | 18 | 1 | 3.3 |
| | 6 | Scott, Kim J. | m | 20 | 1 | 3.8 |
| | 7 | Sather, Roberto B. | m | 22 | 4 | 2.2 |
| | 8 | Stanley, Leatha T. | m | 21 | 3 | 3.6 |
| | 9 | Smith, Joyce A. | f | 21 | 4 | 2 |
| | 10 | Jones, David S. | m | 19 | 2 | 3.5 |
| | 11 | Paul, Mary W. | f | 23 | 5 | 3.6 |
| | 12 | Soong, V. | f | 24 | 5 | 3.5 |
| | 13 | Kellerman, S. | f | 21 | 3 | 2.9 |
| | 14 | Cheong, R. | m | 25 | 4 | 3 |
| | 15 | Borchart, Sandra L. | f | 26 | 5 | 3.9 |
| | 16 | Alsberg, David J. | m | 25 | 5 | 3.5 |
| | 17 | Thorton, James Q. | m | 28 | 4 | 2.7 |
| | 18 | Gooch | m | 26 | 1 | 1.4 |

Queries

- We can access and modify data stored in a relational database using a query language.
- The primary query language used nowadays is SQL (Structured Query Language).
- SQL allows
 - Extracting data from a database.
 - Modifying data in the database.
 - And other things.

ADO .NET

- ADO .NET provides an API for accessing database systems from within programs written in one of the .NET languages (such as C#).

ADO process and some related classes

- Establish connection to a desired DB

- **OleDbConnection**



- Create a SQL query

- **OleDbCommand**

- Send query to DB and retrieve data

- **OleDbDataAdapter**



- Store retrieved data (in memory)

- **DataSet**



- Display data on GUI

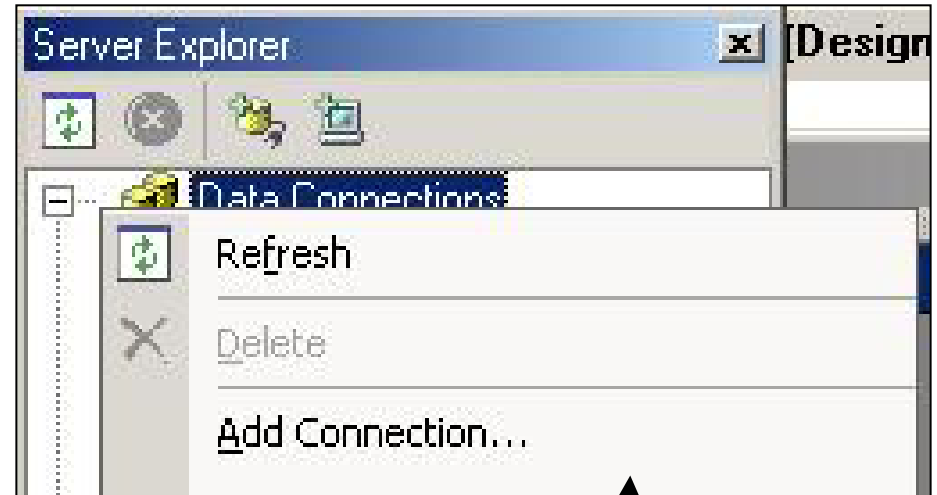
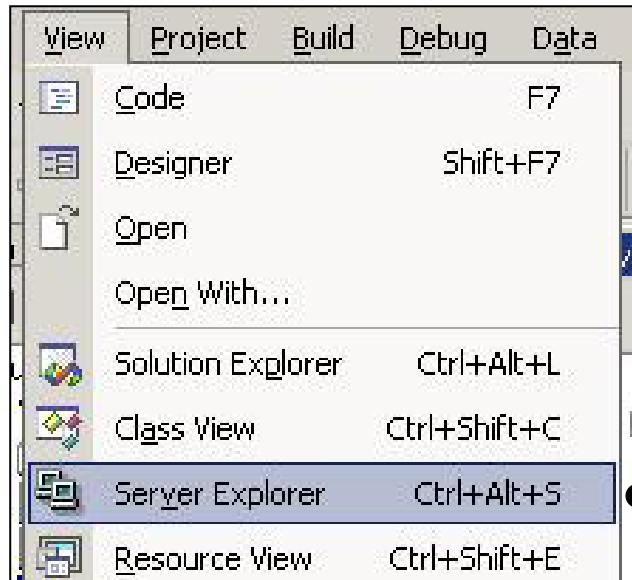
- **DataGrid**.



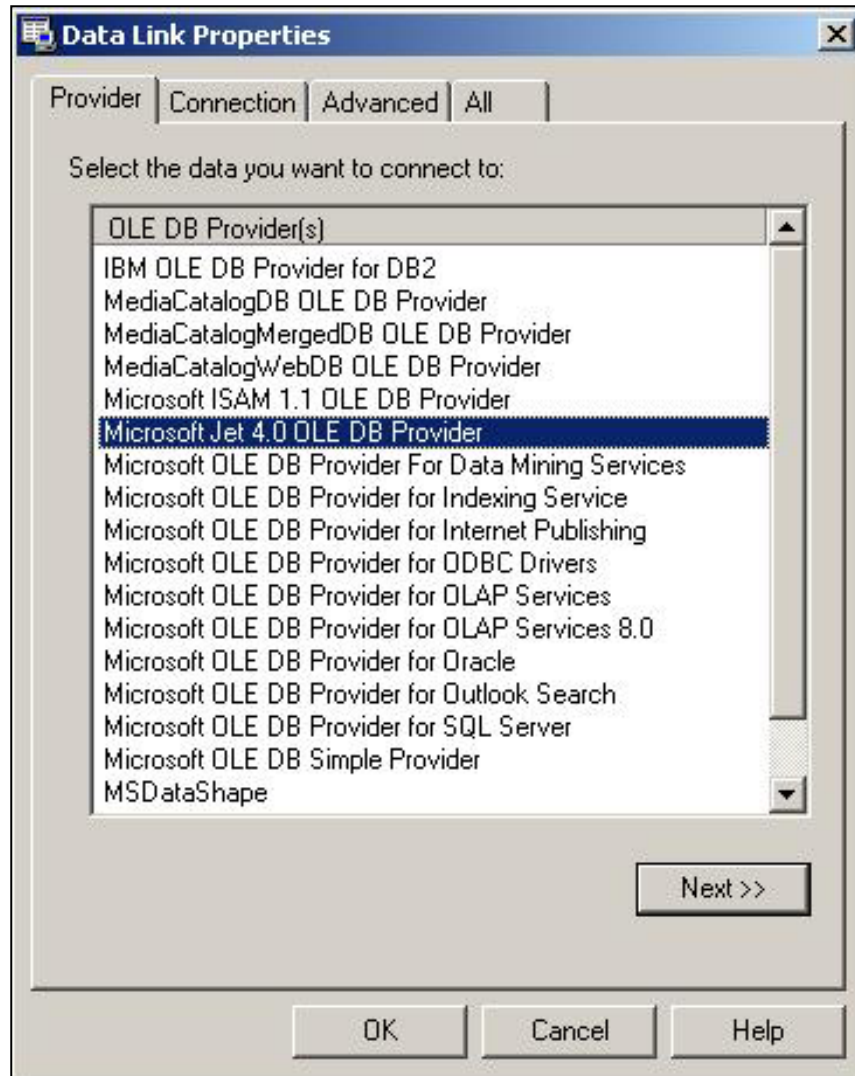
- Work with individual values from retrieved data

- **DataTable**, **DataRow**, **DataColumn**.

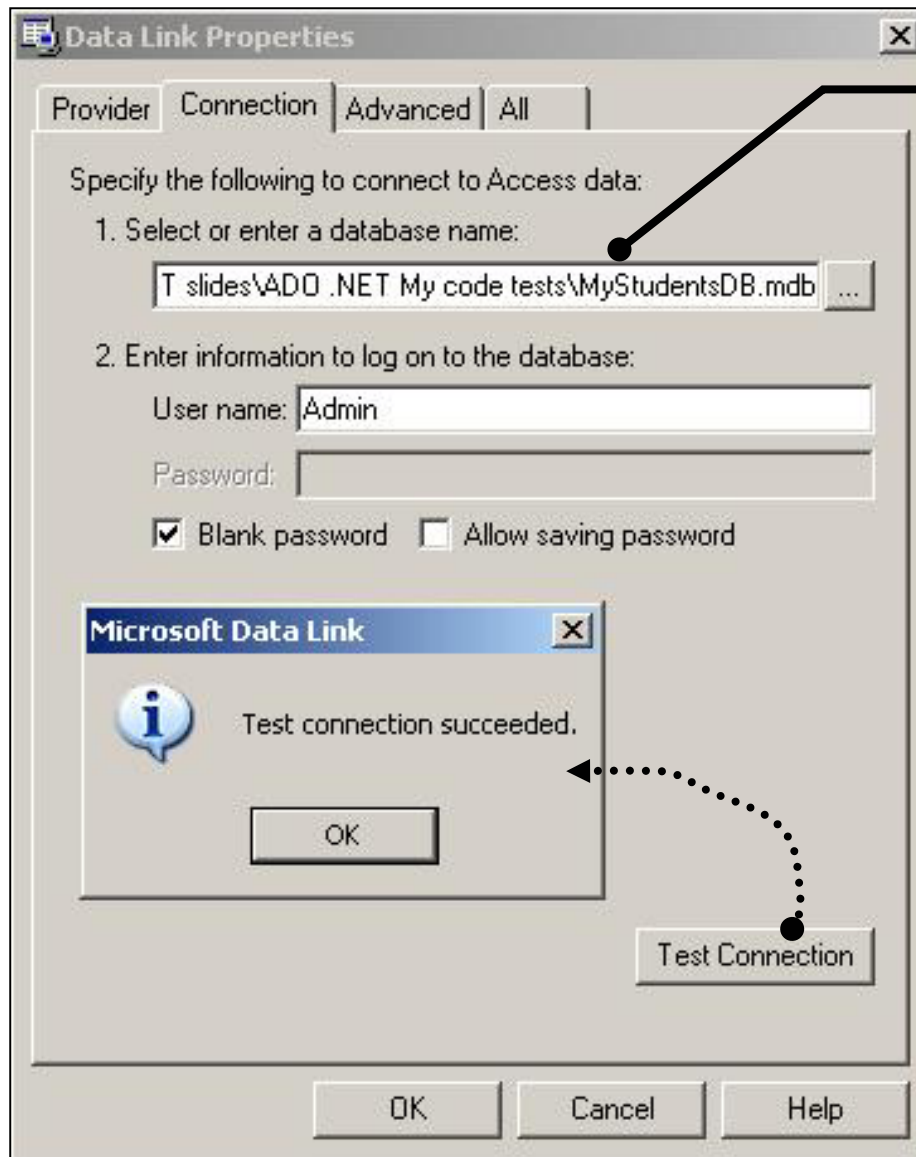
How to connect to a database



How to connect to a database ...



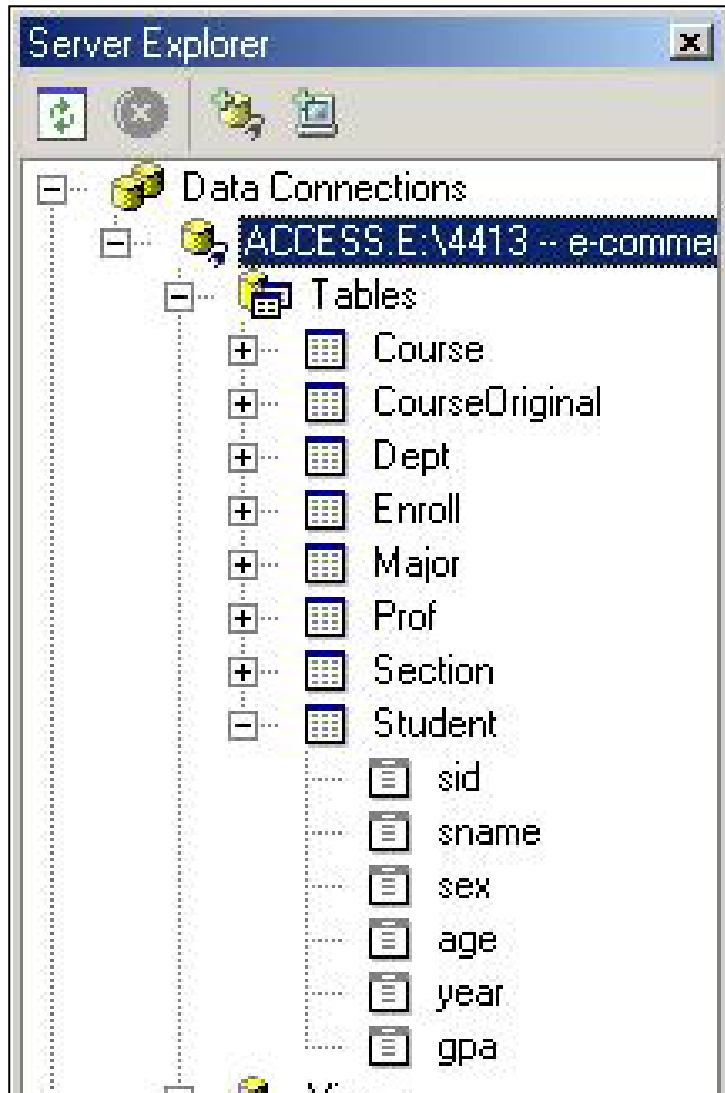
How to connect to a database ...



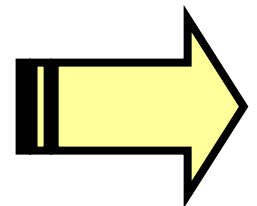
Navigate and find the desired DB

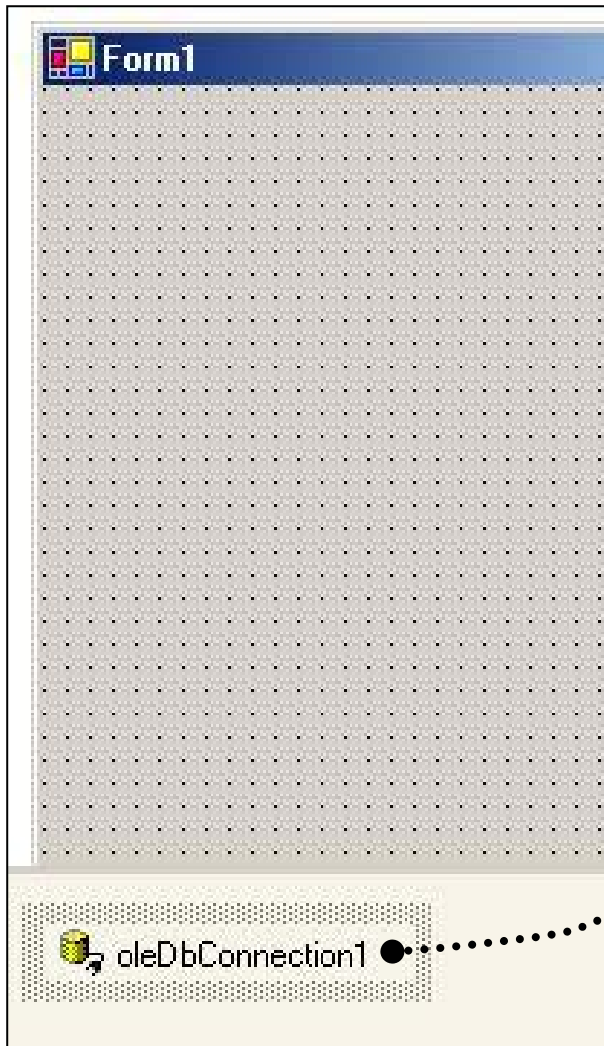


How to connect to a database .../



Drag and drop this in your GUI ... creates an OleDbConnection that is capable to connecting to the DB as soon as you start the program.





Properties

oleDbConnection1 System.Data.OleDb.OleDbConnection

Configurations

(DynamicProperties)

(Advanced)

ConnectionString (None)

Data

ConnectionString ● **Jet OLEDB:Global Partial Bul**

Design

(Name) **oleDbConnection1**

Modifiers Private

Misc

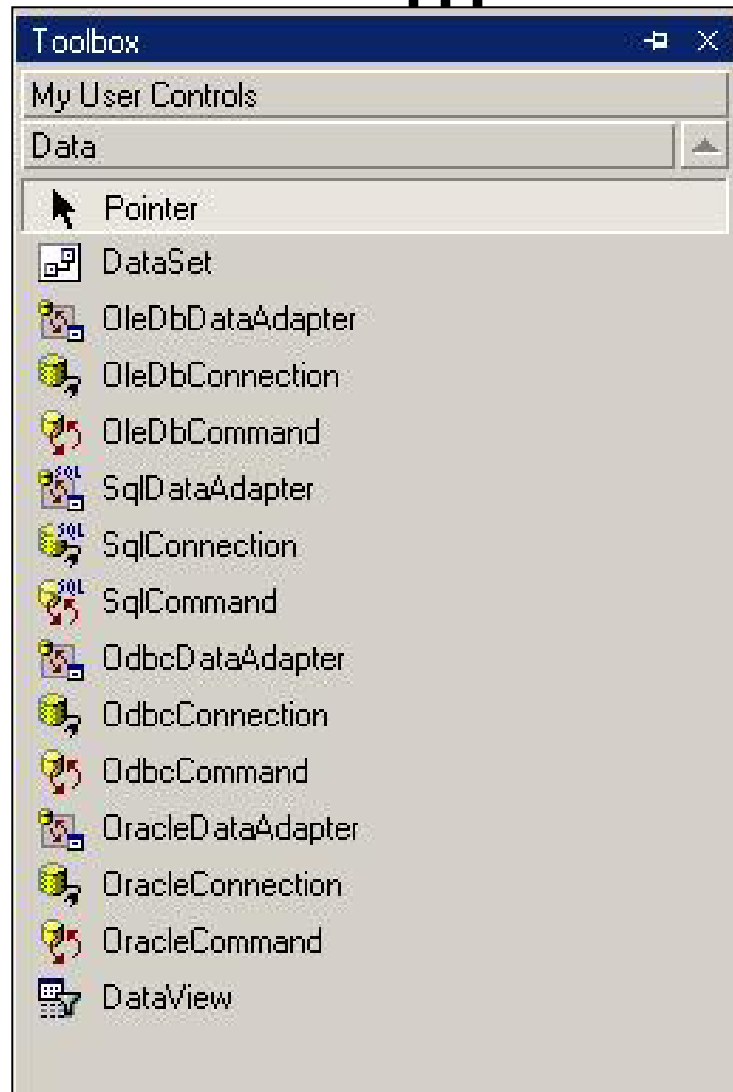
ConnectionTimeout 15

ConnectionString **pt Database=False**

Design

(Name) ACCESS.E:\4413 -- e-cor
<New Connection...>

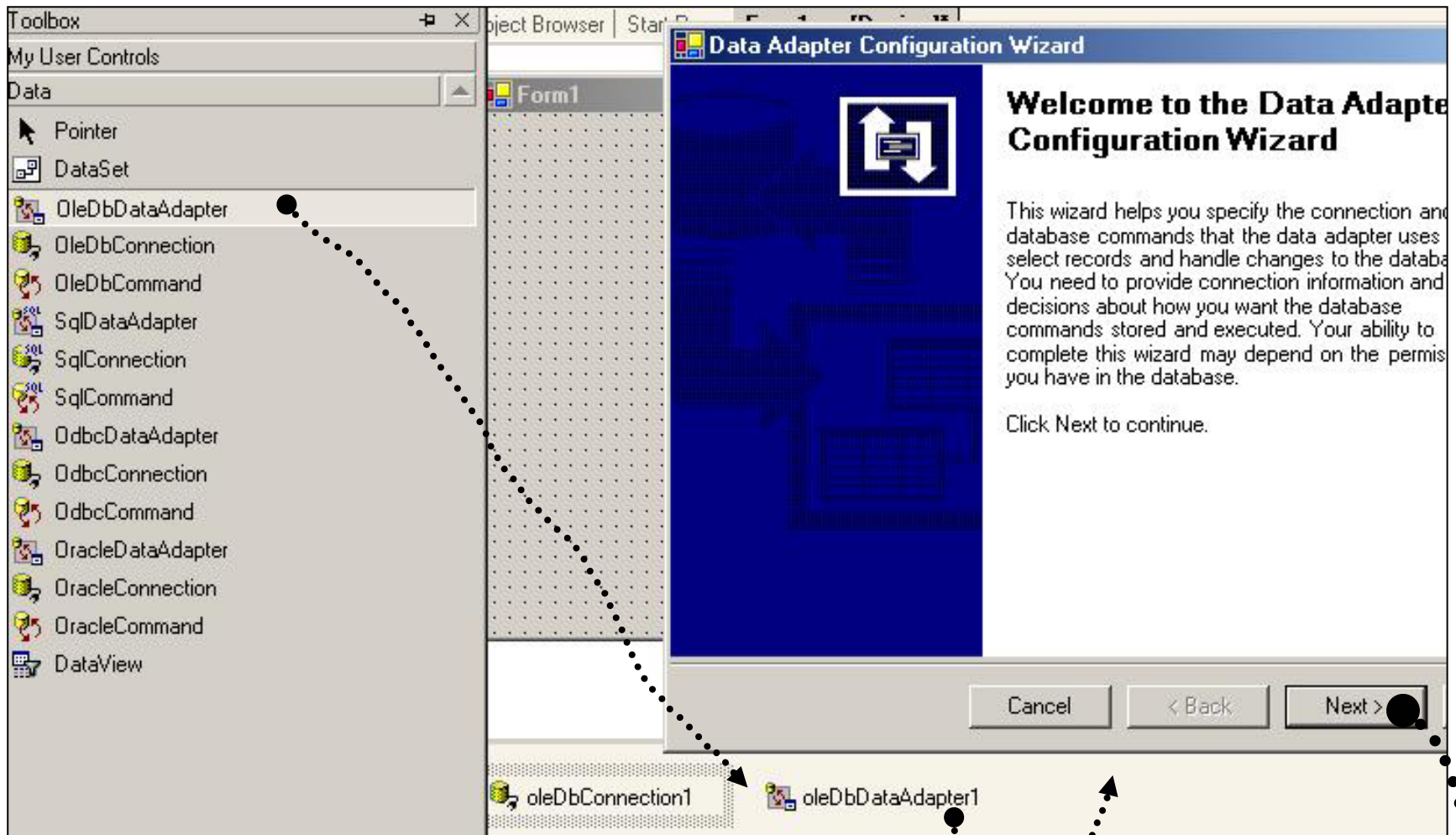
Data from ToolBox has related buttons



Next ... need to add an OleDbDataAdapter.

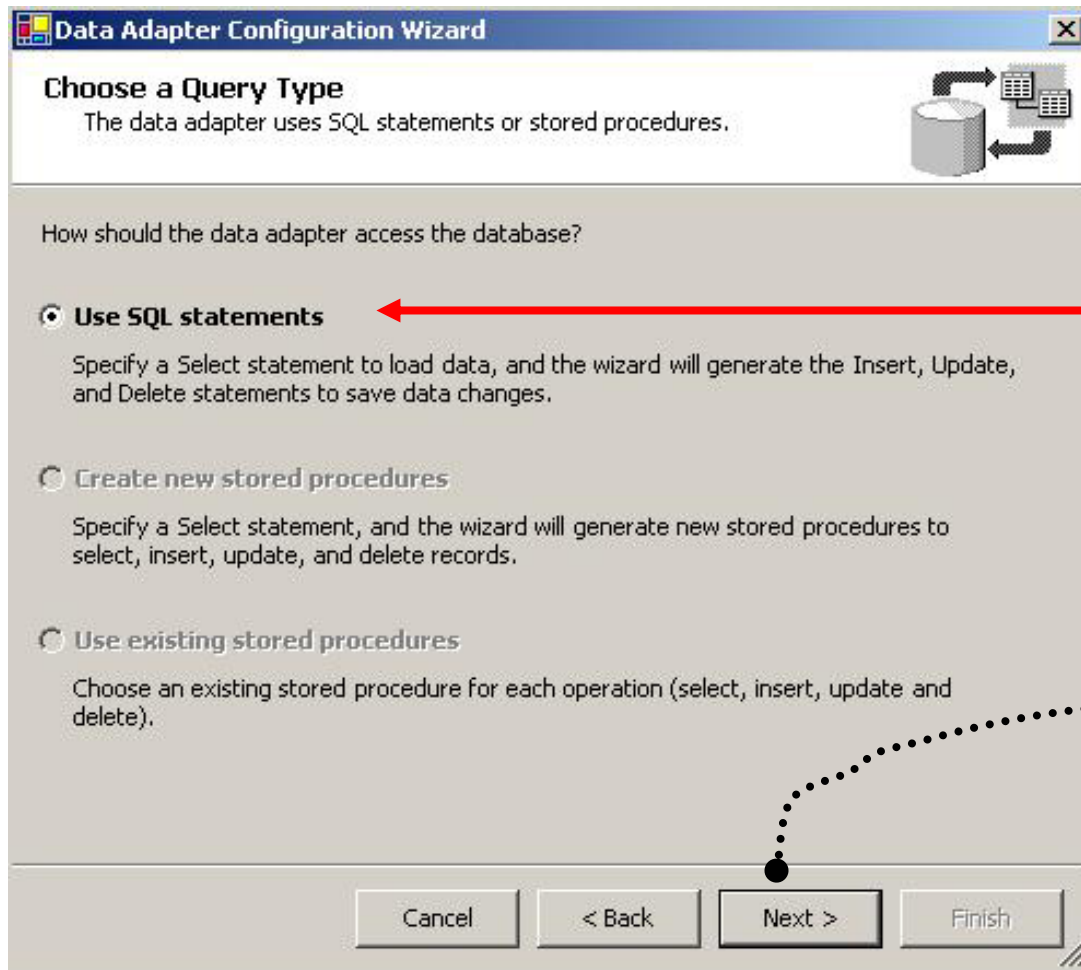
- The OleDbDataAdapter allows to create a query (and submit it to the DB).

Adding an OleDbDataAdapter

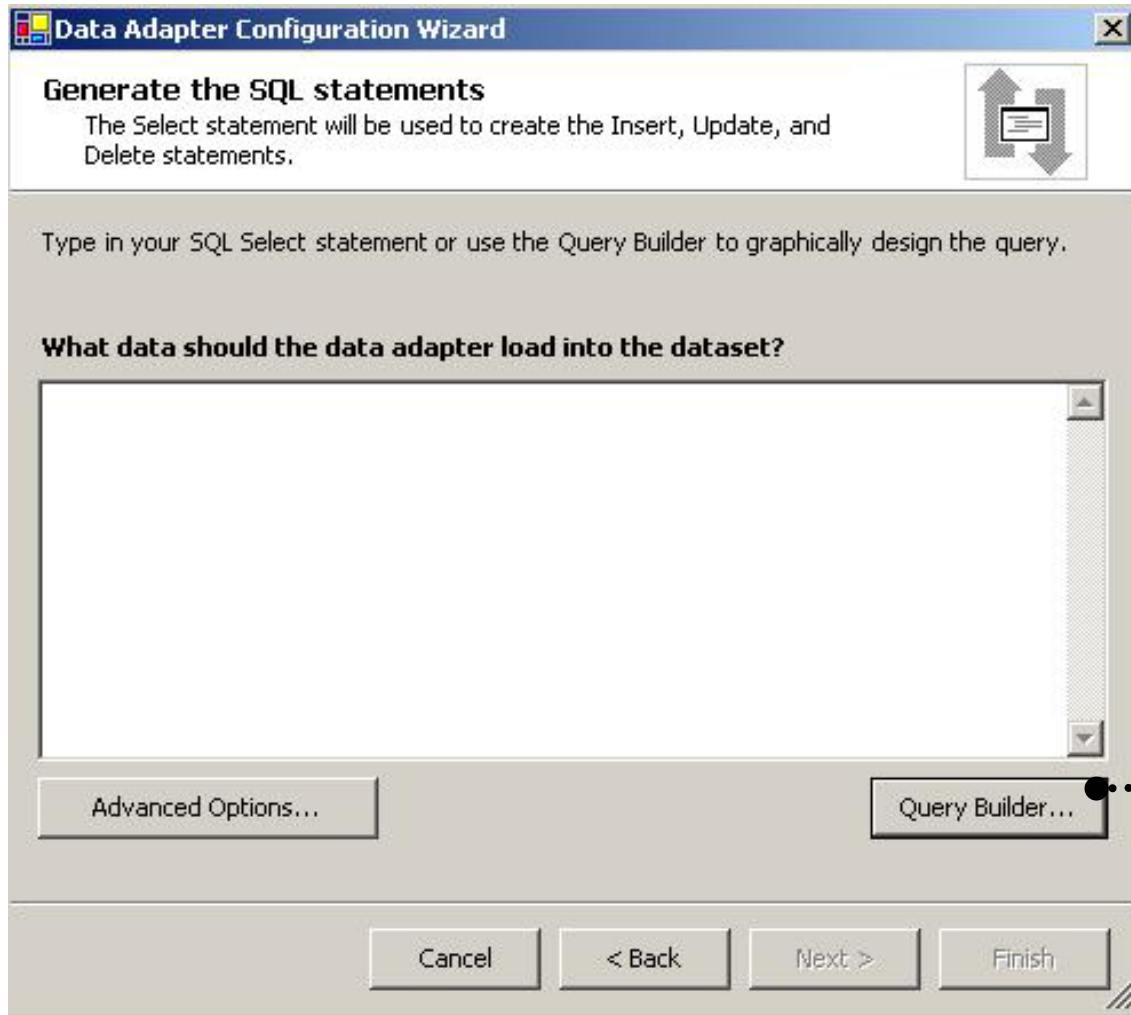


As soon as the data adapter is dropped, the Configuration Wizard opens.

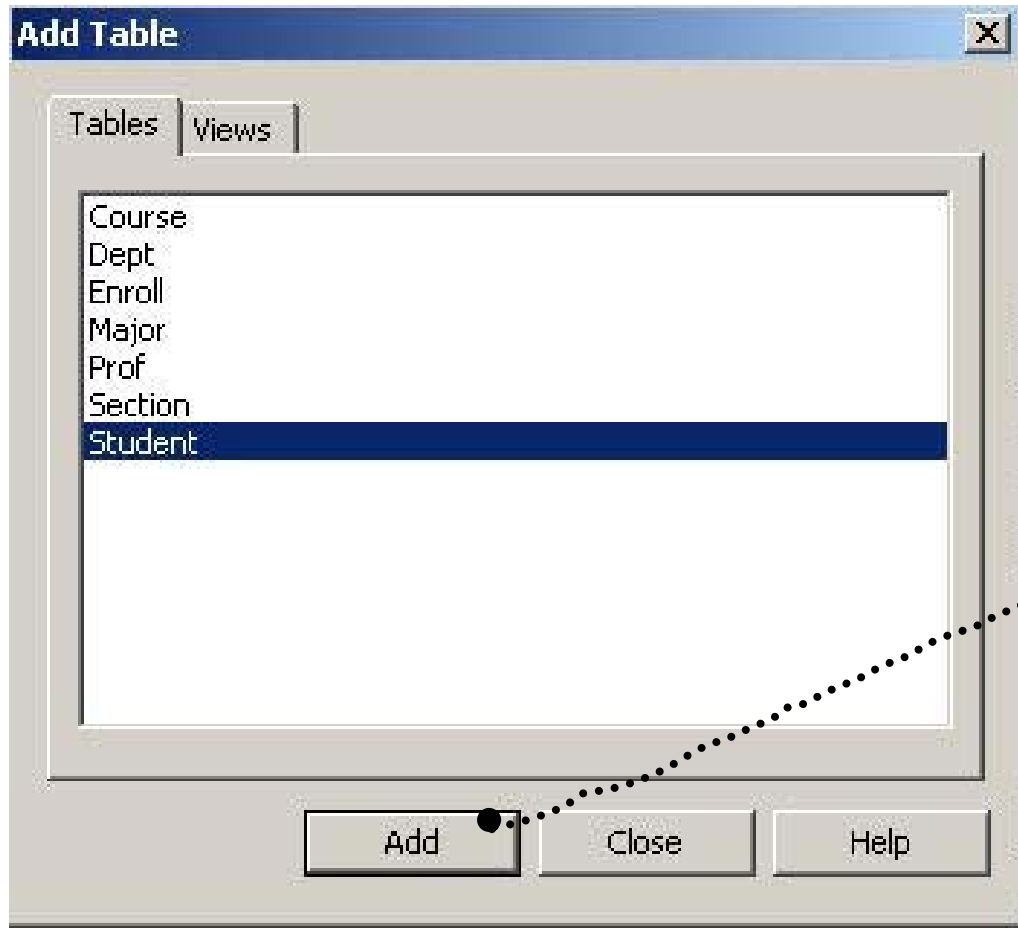
Setting up a query



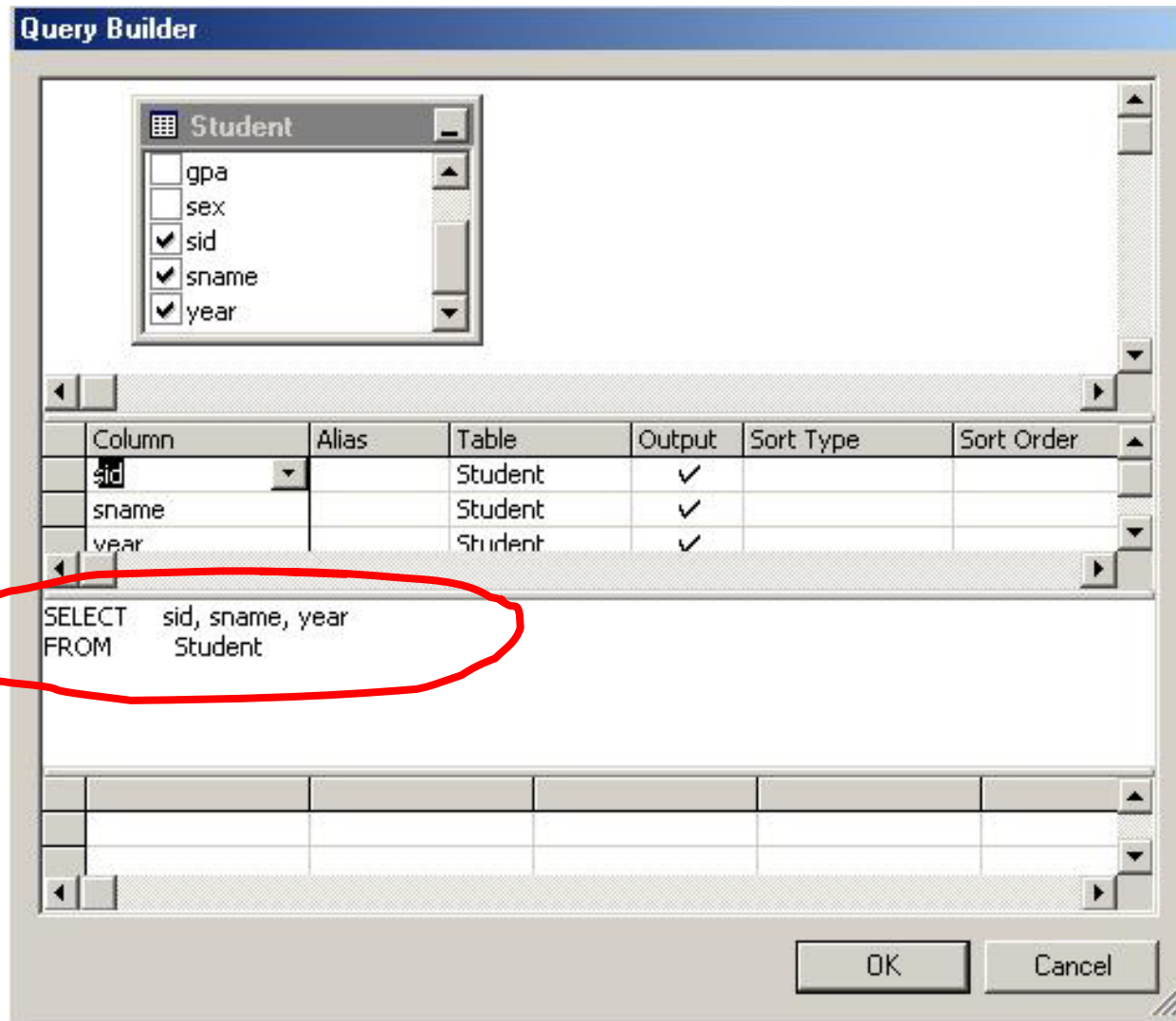
Setting up a query ...



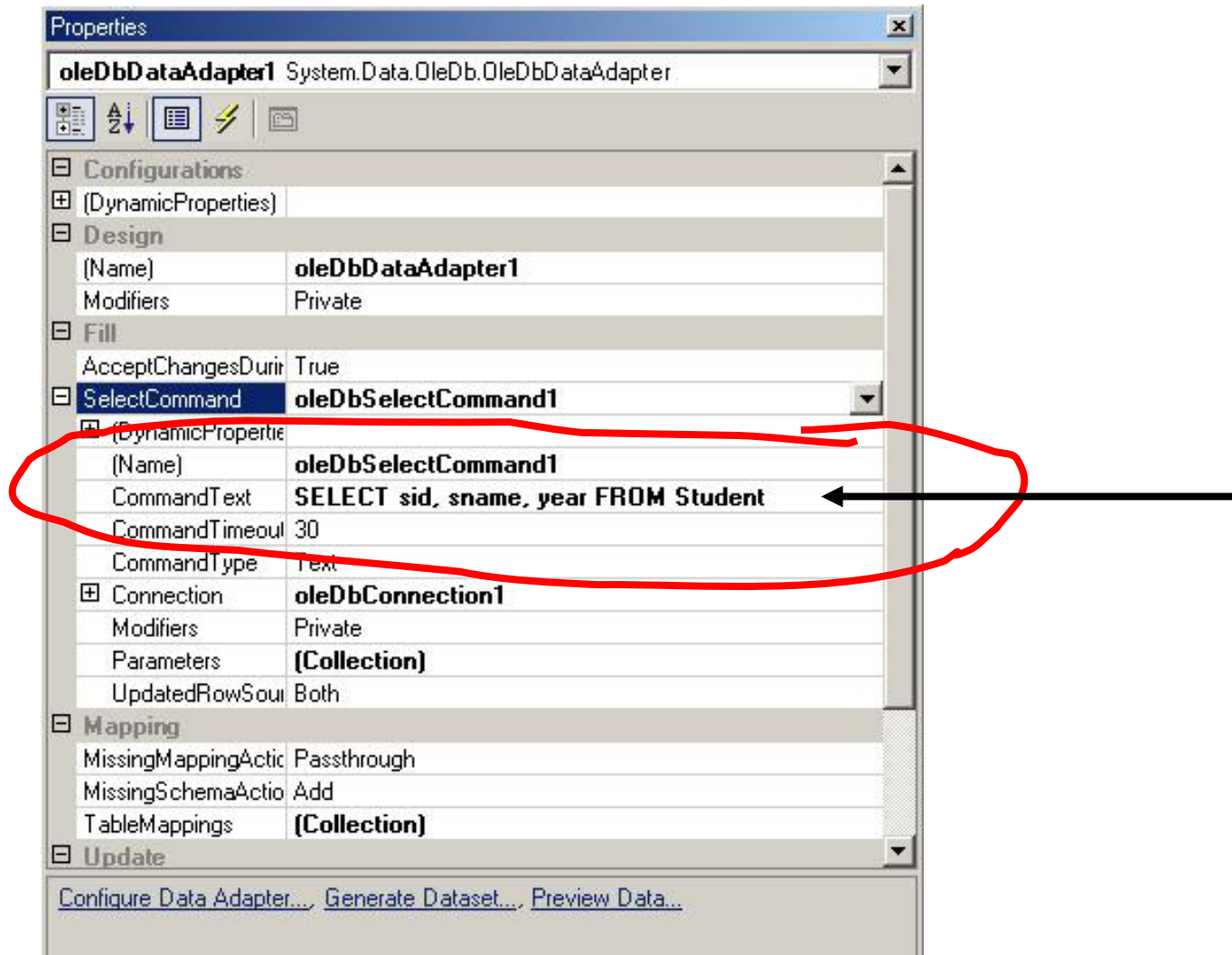
Setting up a query ... select tables involved.



Setting up a query ...write your query



Once the data adapter wizard is finished, its properties reflect the set query.



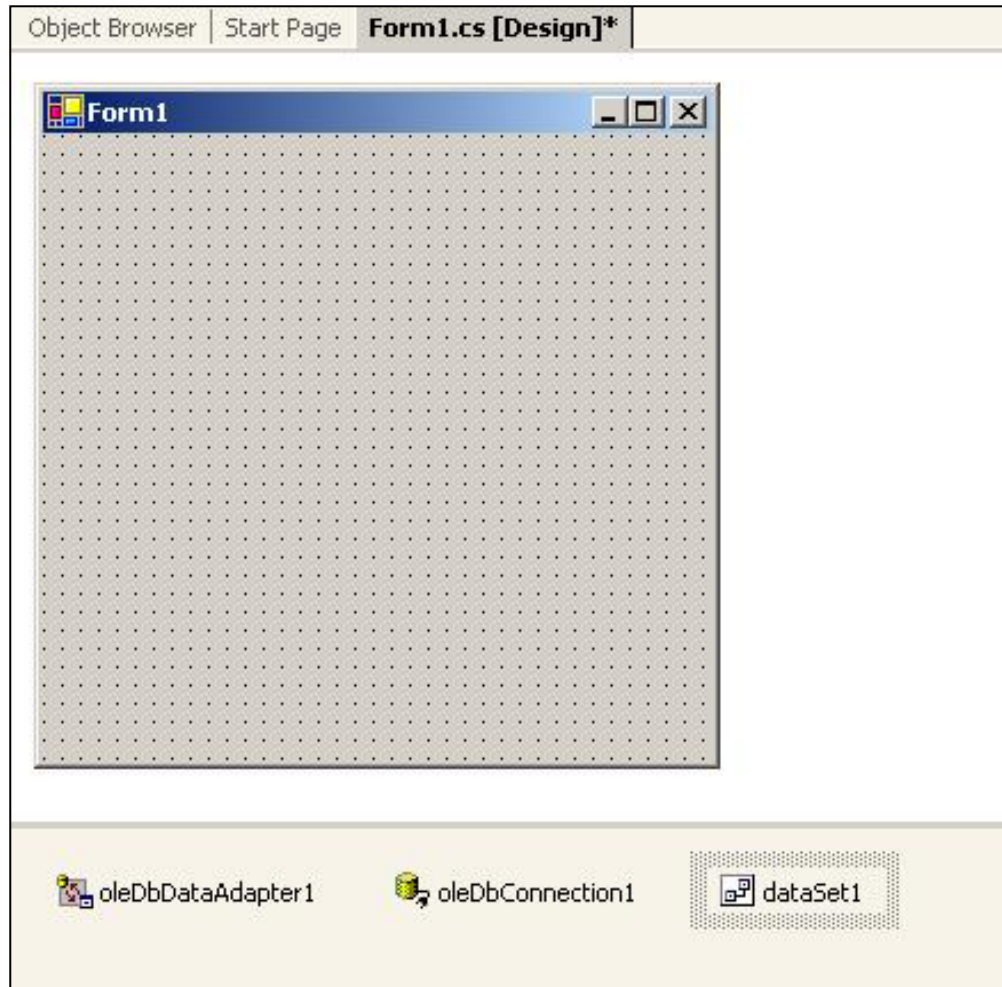
Next ... need to add a DataSet.

- The data adapter retrieves the data and the dataSet captures the retrieved data and holds it in memory. (after that we can display this data on a DataGridView).

Attempting to drop a DataSet in the designer view, it opens the “Add Dataset” wizard.

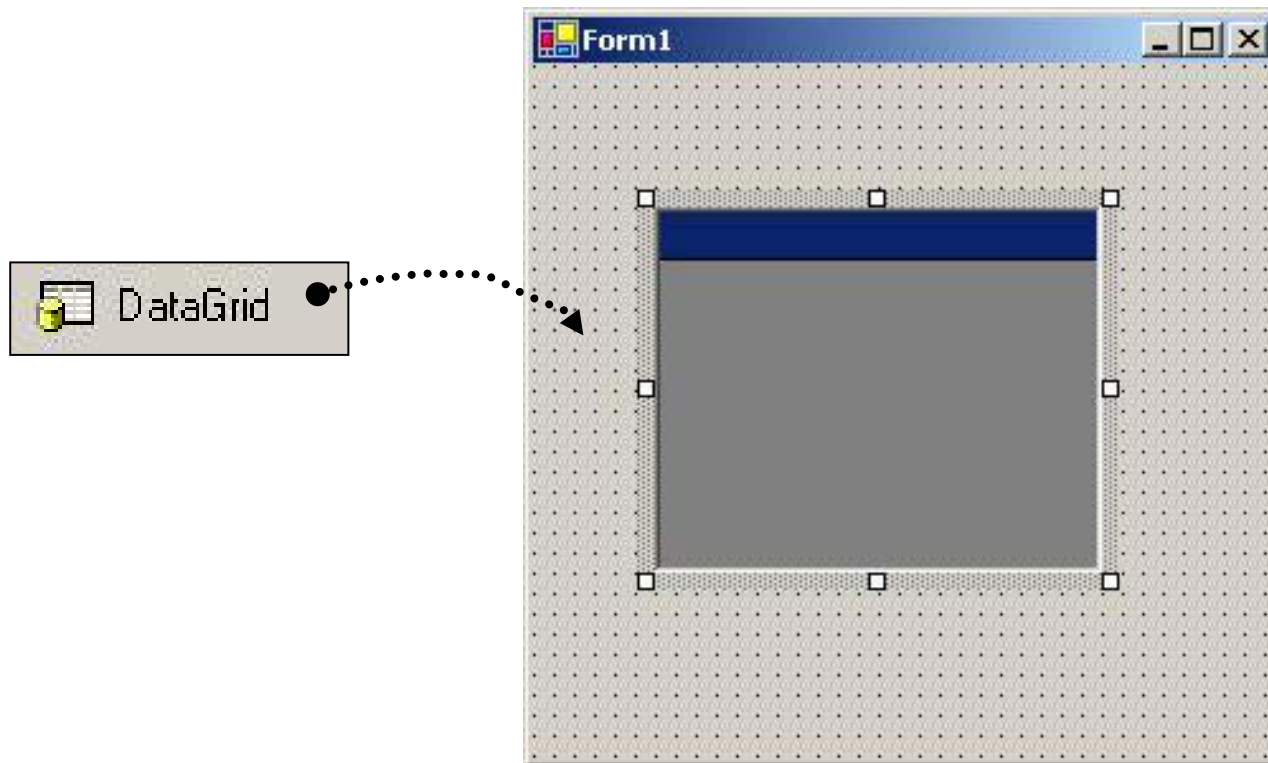
Select “Untyped” dataset”.

DataSet added.



Next ... we need to add a DataGrid.

- A DataGrid is used to display in the GUI, the data that is held in a DataSet.



Finally ... we need to write the code to “connect” the DataAdapter to the DataSet and the DataSet to the dataGrid.

The screenshot displays the Visual Studio IDE with two panes. The left pane, titled 'Class View - WindowsApplication0ADO', shows a tree view of the project structure. Under 'windowsapplication0ado', there is a 'WindowsApplication0ADO' namespace containing 'Form1'. Under 'Form1', there is a 'Bases and Interfaces' section and a list of methods: 'Dispose(bool)', 'Form1()', 'InitializeComponent()', 'Main()', 'components', 'dataGrid1', 'dataSet1', 'oleDbConnection1', 'oleDbDataAdapter1', 'oleDbInsertCommand1', and 'oleDbSelectCommand1'. The right pane, titled 'Object Browser | Start Page | Form1.cs [Design]', shows the code for the 'Form1' class. The code includes several private fields of type 'System.Data...', a summary comment, and a 'public Form1()' constructor. The constructor body contains a 'InitializeComponent()' call and a 'TODO: Add any' comment. A red arrow points from the 'TODO: Add any' comment to a yellow box on the right.

Add code here.

Writing the code ..

The image shows a code editor window with two dropdown menus for code completion. The first menu is triggered by typing `OleDbDataAdapter1.` and lists methods such as `AcceptChangesDuringFill`, `Container`, `ContinueUpdateOnError`, `CreateObjRef`, `DeleteCommand`, `Dispose`, `Disposed`, `Equals`, `Fill` (highlighted), and `FillError`. The second menu is triggered by typing `OleDbDataAdapter1.Fill(dataSet1, "St` and lists parameters for the `Fill` method, including `SelectionBackColor`, `SelectionForeColor`, `SelectNextControl`, `SendToBack`, `SetBounds`, `SetDataBinding` (highlighted), `Show`, `ShowParentDetailsButtonClick`, `Site`, and `Size`.

```
//  
OleDbDataAdapter1.  
  
<summary>  
  
ucceeded, 0 failed,  
  
ucceeded, 0
```

```
OleDbDataAdapter1.Fill( dataSet1, "St  
dataGrid1.
```

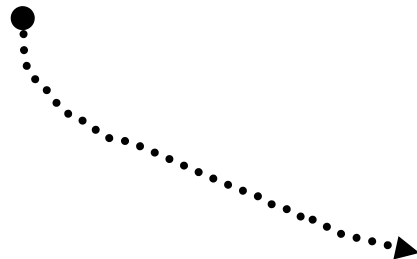
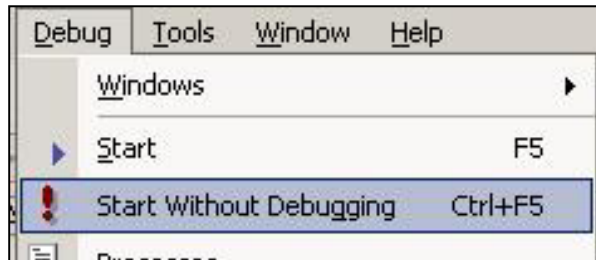
Writing the code .../

“execute the query that is defined in oleDbDataAdapter1, and put the retrieved data into dataSet1”. Have a reference name “someStorage” for this data.

```
oleDbDataAdapter1.Fill( dataSet1, "someStorage");  
dataGrid1.SetDataBinding( dataSet1, "someStorage");
```

“Take a data that is held in dataSet1 and put it in dataGrid1.”

Running ..



A screenshot of a window titled 'Form1' containing a table with the following data:

| | sid | sname | year |
|---|-----|----------------|------|
| ▶ | 1 | Jacobs, T. | 5 |
| | 2 | Pierson, E. | 5 |
| | 3 | Zeene, Ben N | 5 |
| | 4 | Sulfate, Barry | 2 |
| | 5 | Form, Clara | 1 |
| | 6 | Scott, Kim J. | 1 |
| | 7 | Sather, Robe | 4 |
| | 8 | Stanley, Leot | 3 |

Another example ...

Form1

Student Table

| | age | gpa | sex | sid | sname | year |
|---|-----|-----|-----|-----|------------------|------|
| ▶ | 29 | 3.6 | m | 1 | Jacobs, T. | 5 |
| | 32 | 3.5 | m | 2 | Pierson, E. | 5 |
| | 21 | 3.9 | m | 3 | Zeene, Ben N. | 5 |
| | 19 | 2.8 | m | 4 | Sulfate, Barry M | 2 |
| | 18 | 3.3 | f | 5 | Form, Clara D. | 1 |
| | 20 | 3.8 | m | 6 | Scott, Kim J. | 1 |
| | 22 | 2.2 | m | 7 | Sather, Roberto | 4 |
| | 21 | 3.6 | m | 8 | Stanley, Leotha | 3 |
| | 21 | 2 | f | 9 | Smith, Joyce A. | 4 |
| | 19 | 3.5 | m | 10 | Jones, David S. | 2 |
| | 23 | 3.6 | f | 11 | Paul Maru W | 5 |

All Department Names

| | dname |
|---|---------------------|
| ▶ | Chemical Enginee |
| | Civil Engineering |
| | Computer Science |
| | Industrial Engineer |
| | Mathematics |
| | Sanitary Engineeri |
| * | |

All 4th year Computer Sciences students

| sid | sname | year | dname |
|-----|------------------|------|-------------------|
| 41 | Fisher, C. | 4 | Computer Sciences |
| 44 | Moeri, S. | 4 | Computer Sciences |
| 68 | Crist, J. | 4 | Computer Sciences |
| 69 | Heilskov, G. | 4 | Computer Sciences |
| 69 | Heilskov, G. | 4 | Computer Sciences |
| 71 | Mark, B. | 4 | Computer Sciences |
| 77 | Paull, Thomas H. | 4 | Computer Sciences |
| 86 | Gonring, J. | 4 | Computer Sciences |

Entire table

Projection on table Dept

Join of two tables (Student and Enroll)

Tables Student, Dept, Enroll

| Student : Table | | | | | | |
|-----------------|-------------------|-----|-----|------|-----|--|
| sid | sname | sex | age | year | gpa | |
| 1 | Jacobs, T. | m | 29 | 5 | 3.5 | |
| 2 | Pierson, E. | m | 32 | 5 | 2.5 | |
| 3 | Zeene, Ben N. | m | 21 | 5 | 3.5 | |
| 4 | Sulfate, Barry M. | m | 19 | 2 | 3.5 | |
| 5 | Form, Clara O. | f | 18 | 1 | 3.5 | |
| 6 | Scott, Kim | f | 20 | 2 | 3.5 | |
| 7 | Sather, Rob | m | 20 | 2 | 3.5 | |
| 8 | Stanley, Le | m | 20 | 2 | 3.5 | |
| 9 | Smith, Joyc | f | 20 | 2 | 3.5 | |
| 10 | Jones, Davi | m | 20 | 2 | 3.5 | |

| Dept : Table | |
|----------------------|---------|
| dname | numphds |
| Sanitary Engineering | 3 |
| Chemical Engineering | 32 |
| | 41 |
| | 47 |
| | 88 |
| | 129 |

| Enroll : Table | | | | | |
|----------------|-------|-------------------|-----|-------|--|
| sid | grade | dname | cno | secno | |
| 31 | 3.5 | Computer Sciences | 302 | 1 | |
| 52 | 1 | Computer Sciences | 302 | 1 | |
| 22 | 3 | Computer Sciences | 302 | 1 | |
| 24 | 4 | Computer Sciences | 302 | 2 | |
| 25 | 3.5 | Computer Sciences | 302 | 1 | |
| 69 | 3.5 | Computer Sciences | 302 | 2 | |
| 13 | 2.5 | Computer Sciences | 302 | 2 | |
| 12 | 2.5 | Computer Sciences | 302 | 2 | |
| 11 | 3 | Computer Sciences | 302 | 2 | |
| 20 | 2.5 | Computer Sciences | 302 | 1 | |
| 10 | 2 | Computer Sciences | 302 | 1 | |

Designer view

Object Browser | Start Page | **Form1.cs [Design]** | Form1.cs

Student Table | **All Department Names**

Auto Format

Formats:

- Default
- Professional 1
- Professional 2
- Professional 3
- Professional 4
- Classic
- Simple
- Colorful 1
- Colorful 2

Preview:

Sample Data Grid

| | First Name | First Name |
|---|------------|------------|
| ▶ | Robert | Brown |
| | Nate | Sun |
| | Carole | Poland |
| * | | |

OK | Cancel

All 4th year Computer Sciences students

Right-click ...

Use 3 adapters and 3 datasets.

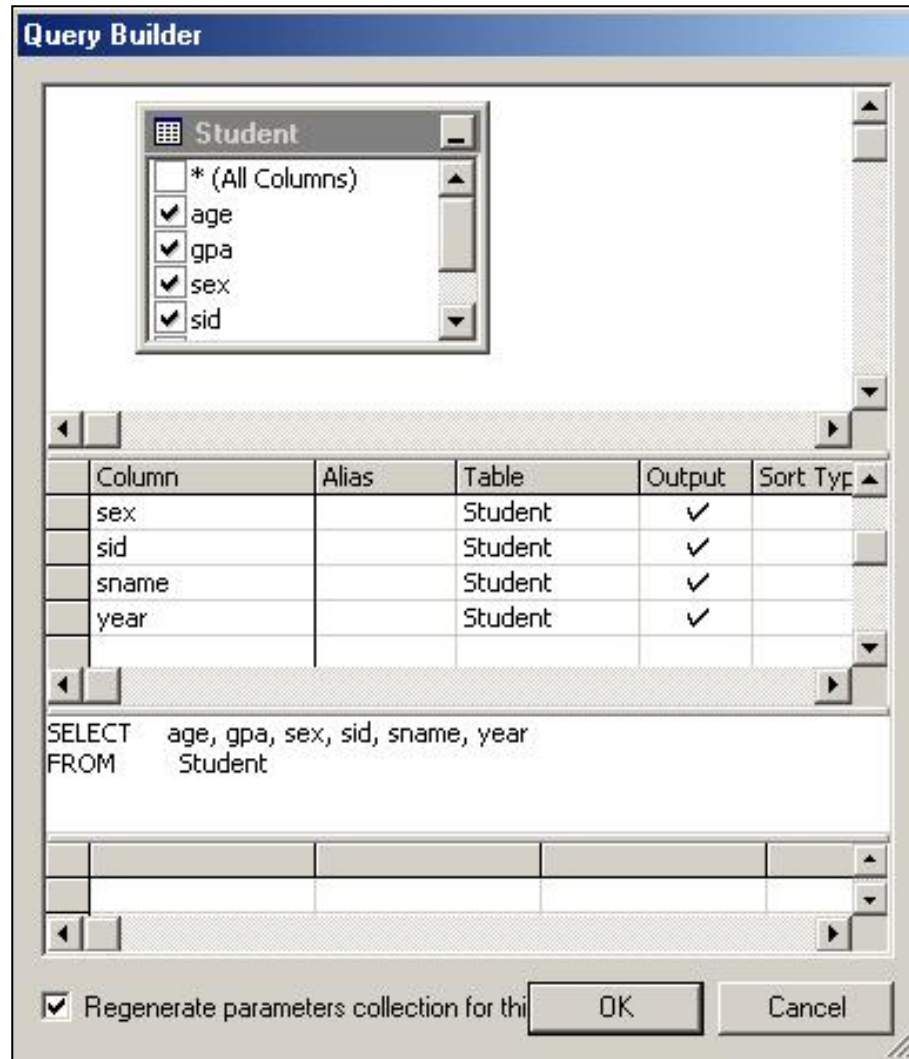
oleDbConnection1 | dataSet1 | dataSet2 | dataSet3
oleDbDataAdapter1 | oleDbDataAdapter2 | oleDbDataAdapter3

Adapter 1 properties

The screenshot shows the Properties window for an `OleDbDataAdapter1` object. The `CommandText` property is highlighted with a red circle. The `CommandText` value is `SELECT age, gpa, sex, sid, sname, year FROM Stu`.

| Property | Value |
|-----------------|--|
| AcceptChangesDu | True |
| SelectCommand | oleDbSelectCommand1 |
| (DynamicProper | |
| (Name) | oleDbSelectCommand1 |
| CommandText | SELECT age, gpa, sex, sid, sname, year FROM Stu |

Adapter 1 query builder

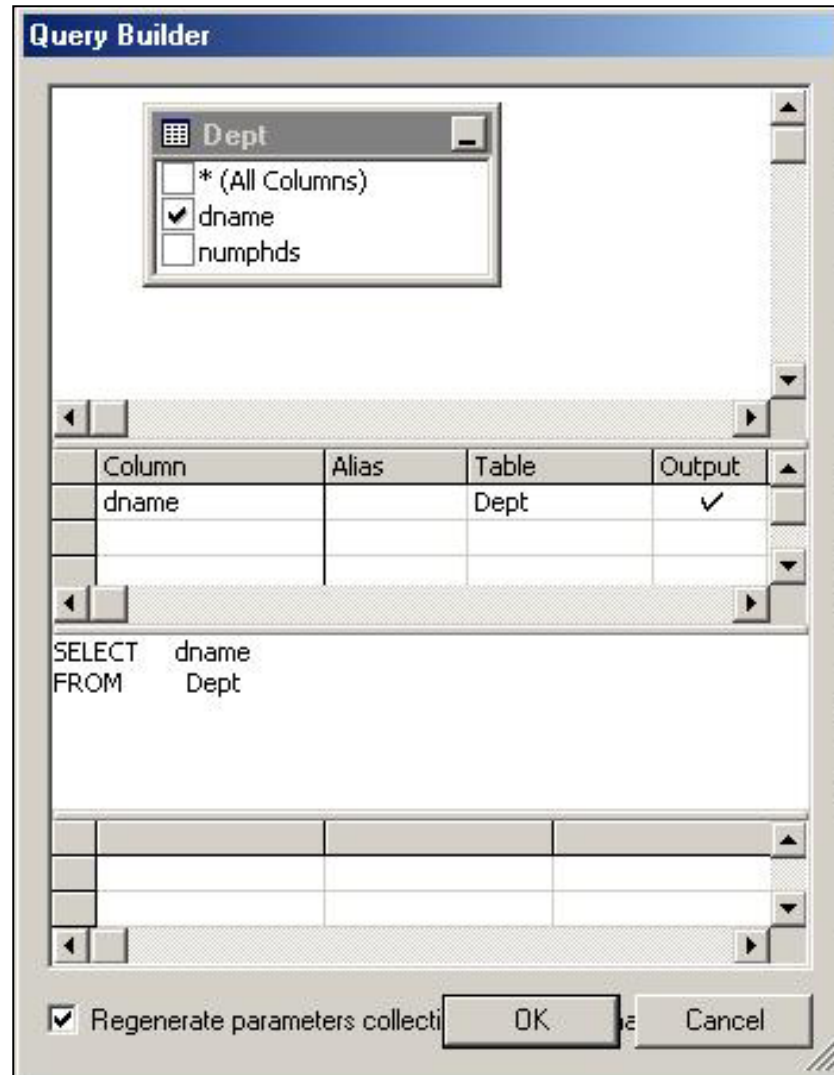


Adapter 2 properties

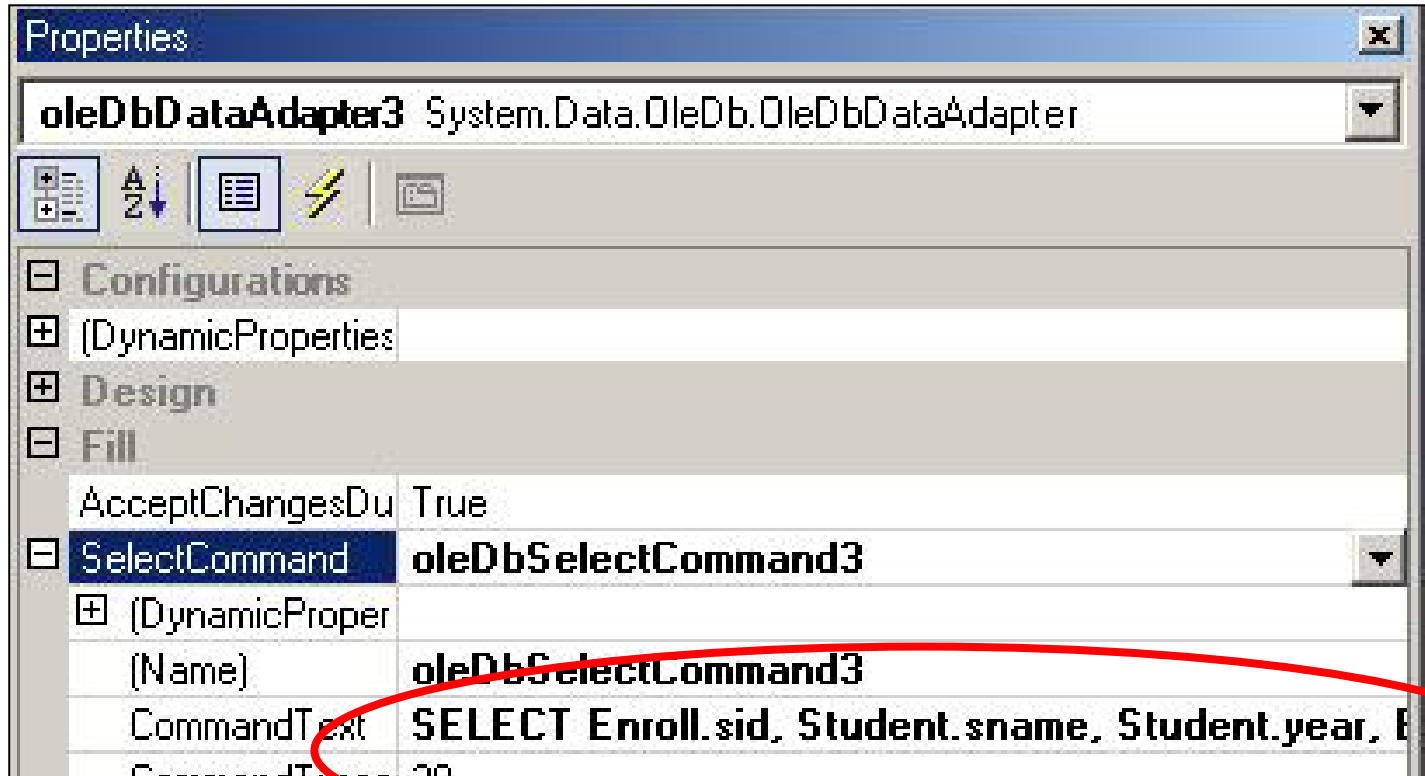
The screenshot shows the Properties window for an `OleDbDataAdapter2` control. The `SelectCommand` property is expanded, showing its value as `SELECT dname FROM Dept`. A red circle highlights the `SelectCommand` property name and its value.

| | |
|-----------------|------------------------|
| AcceptChangesDu | True |
| SelectCommand | oleDbSelectCommand2 |
| (DynamicProper | |
| (Name) | oleDbSelectCommand2 |
| CommandText | SELECT dname FROM Dept |

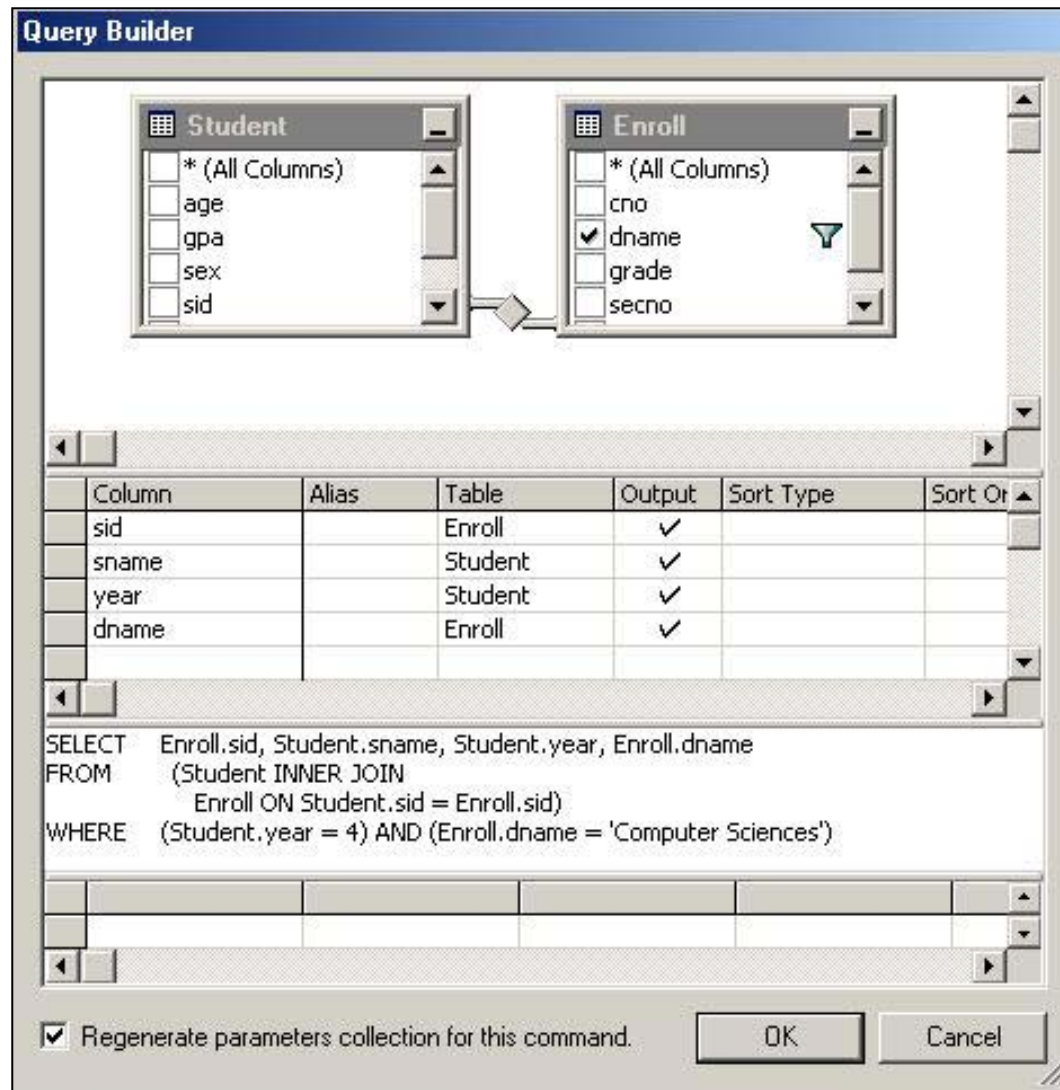
Adapter 2 query builder



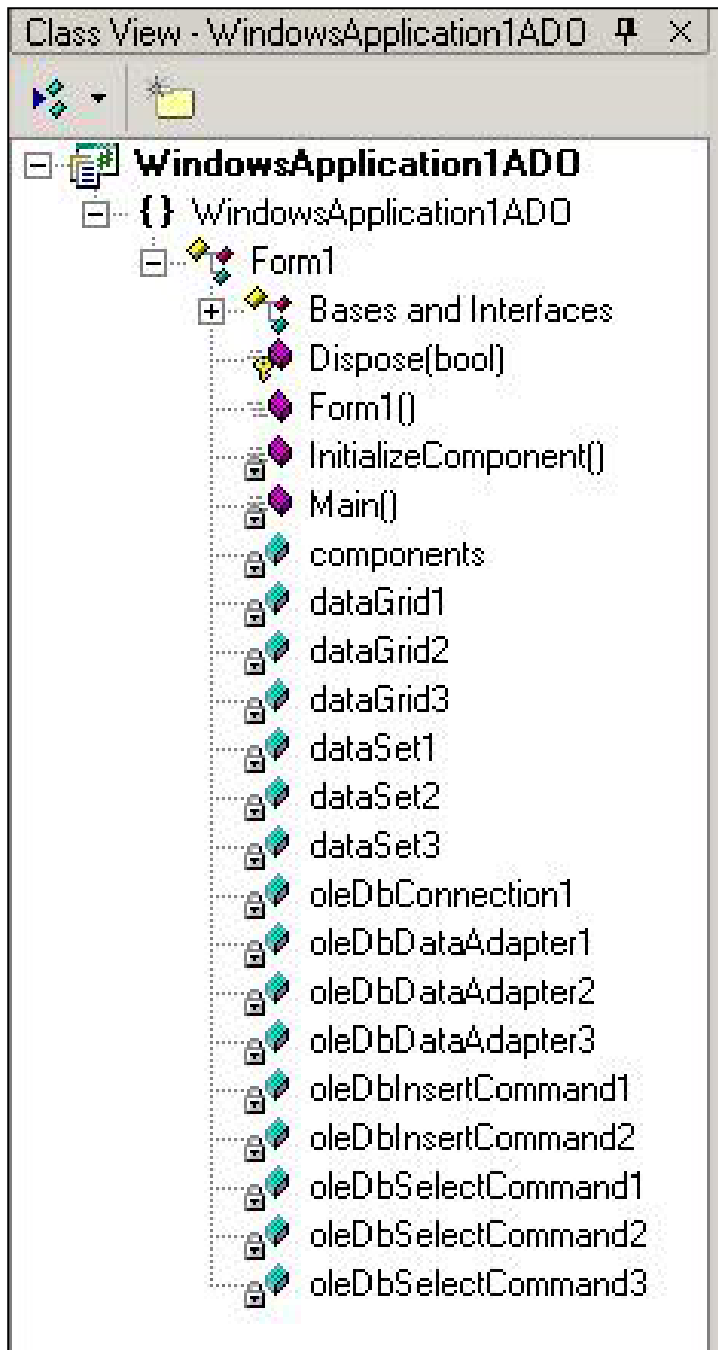
Adapter 3 properties



Adapter 3 query builder



The code



The related code

```
public Form1()
{
    InitializeComponent();

    oleDbDataAdapter1.Fill( dataSet1, "Student");
    dataGrid1.SetDataBinding( dataSet1, "Student");

    oleDbDataAdapter2.Fill( dataSet2, "Dept");
    dataGrid2.SetDataBinding( dataSet2, "Dept");

    oleDbDataAdapter3.Fill( dataSet3, "res");
    dataGrid3.SetDataBinding( dataSet3, "res");
}
```

- The end