ADO .NET (1)

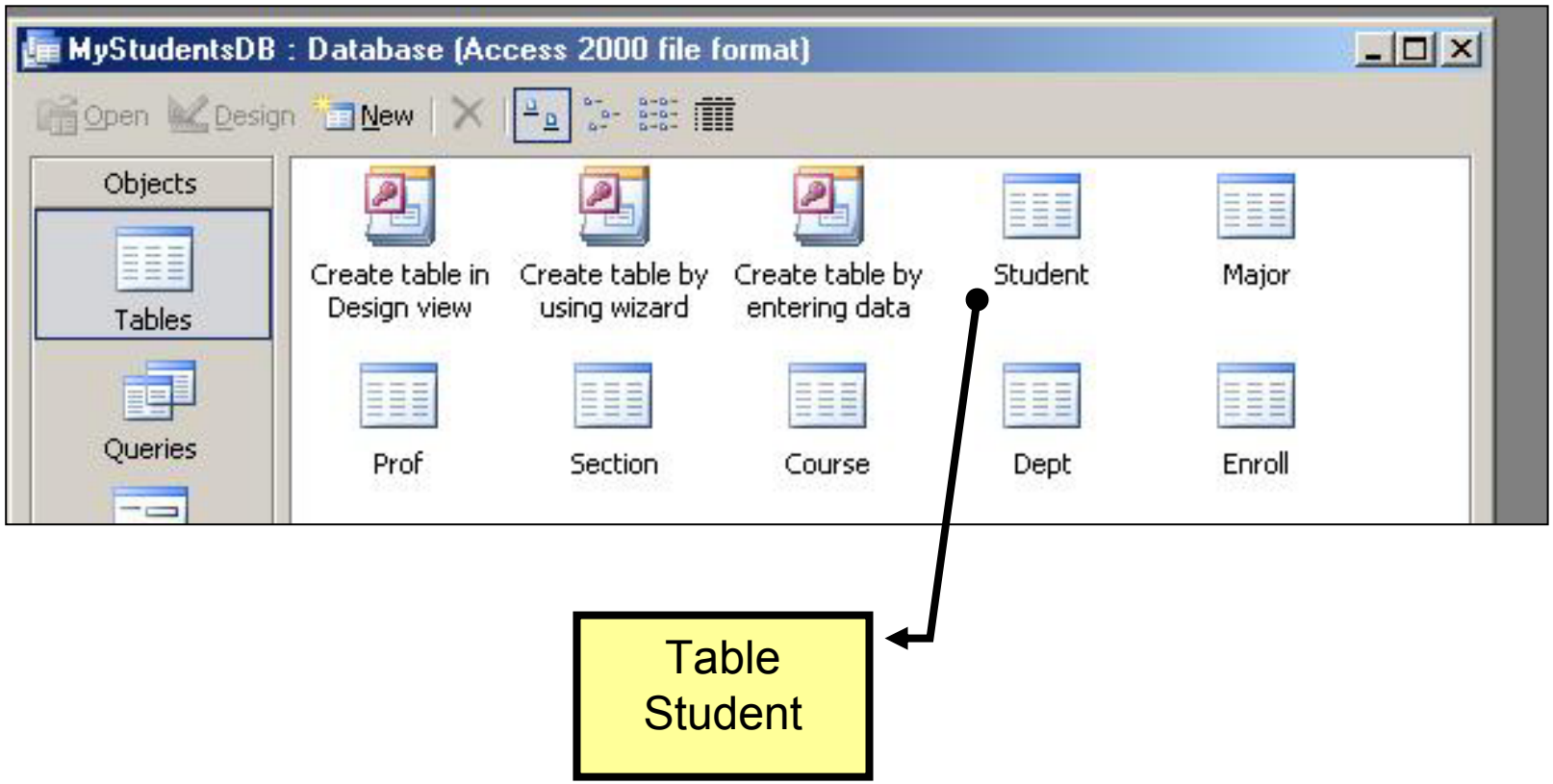
ADO .NET (ActiveX Data Objects)

- 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.



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, Leotha 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

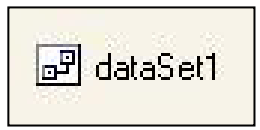
- We can access and modify data stored in a relational database using a query language.
- The primary query language used nowadays is SQL (Structured Query Language).
- SQL allows
  - Extracting data from a database.
  - Modifying data in the database.
  - And other things.

ADO .NET

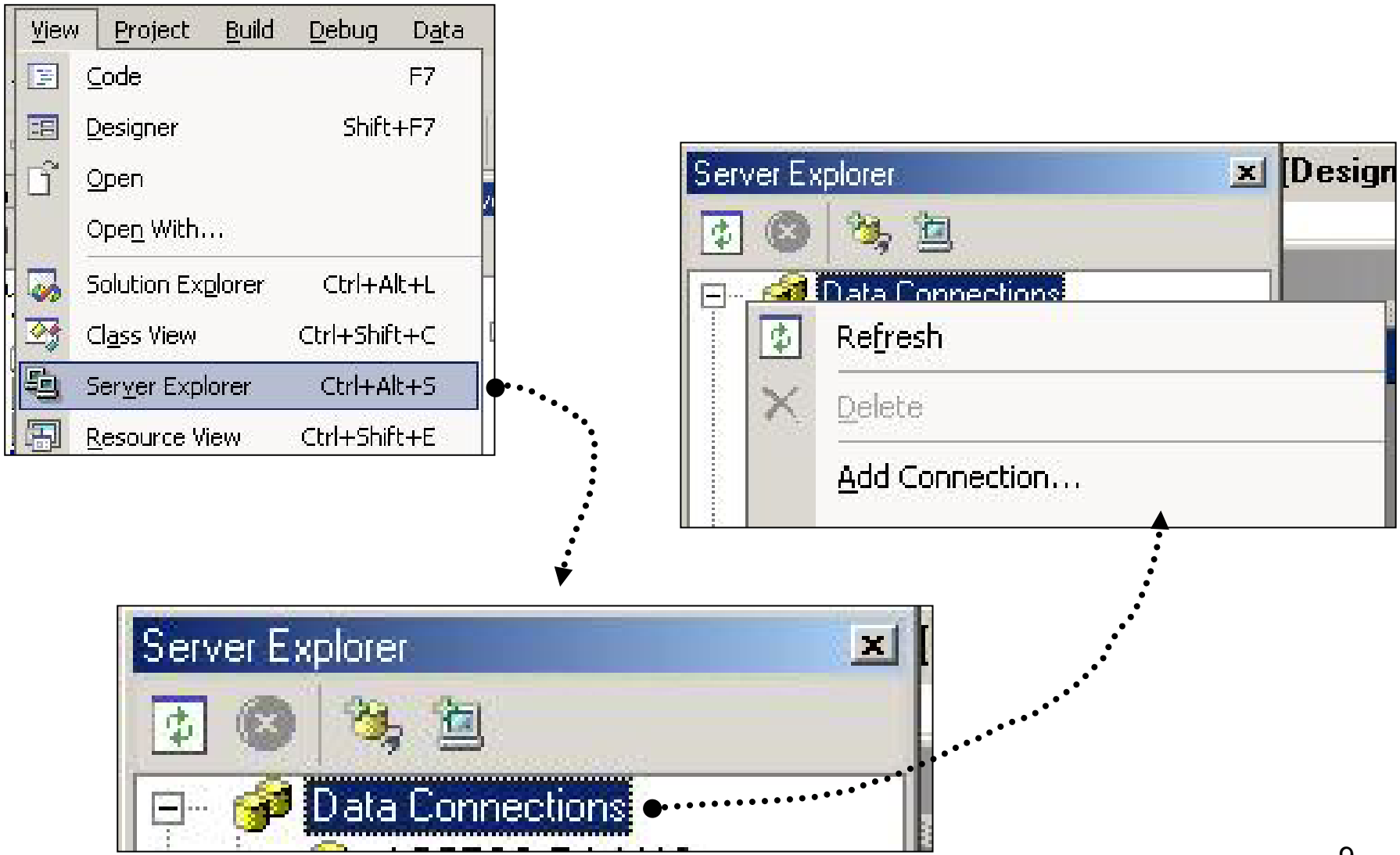
- ADO .NET provides an API for accessing database systems from within programs written in one of the .NET languages (such as C#).

ADO process and some related classes

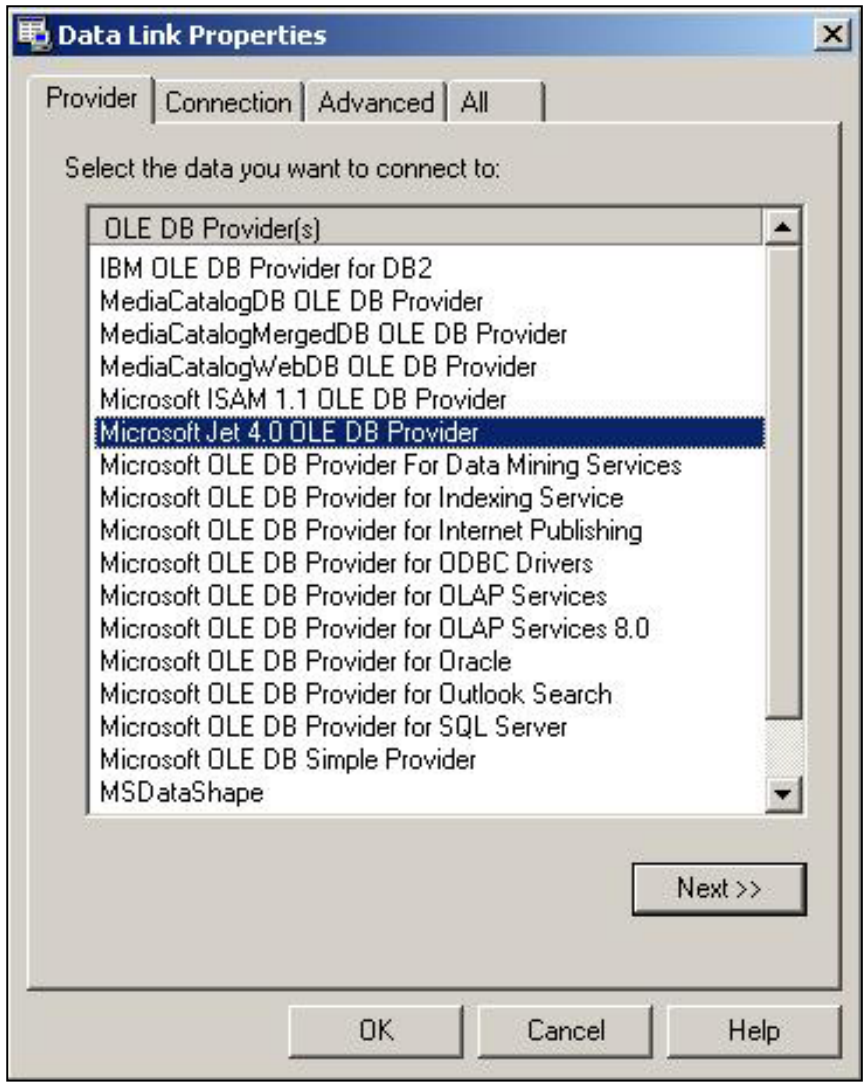
- Establish connection to a desired DB
  - `OleDbConnection`
- Create a SQL query
  - **`OleDbCommand`**
- Send query to DB and retrieve data
  - `OleDbAdapter`
- Store retrieved data (in memory)
  - `DataSet`
- Display data on GUI
  - `DataGrid`.
- Work with individual values from retrieved data
  - `DataTable`, `DataRow`, `DataColumn`.



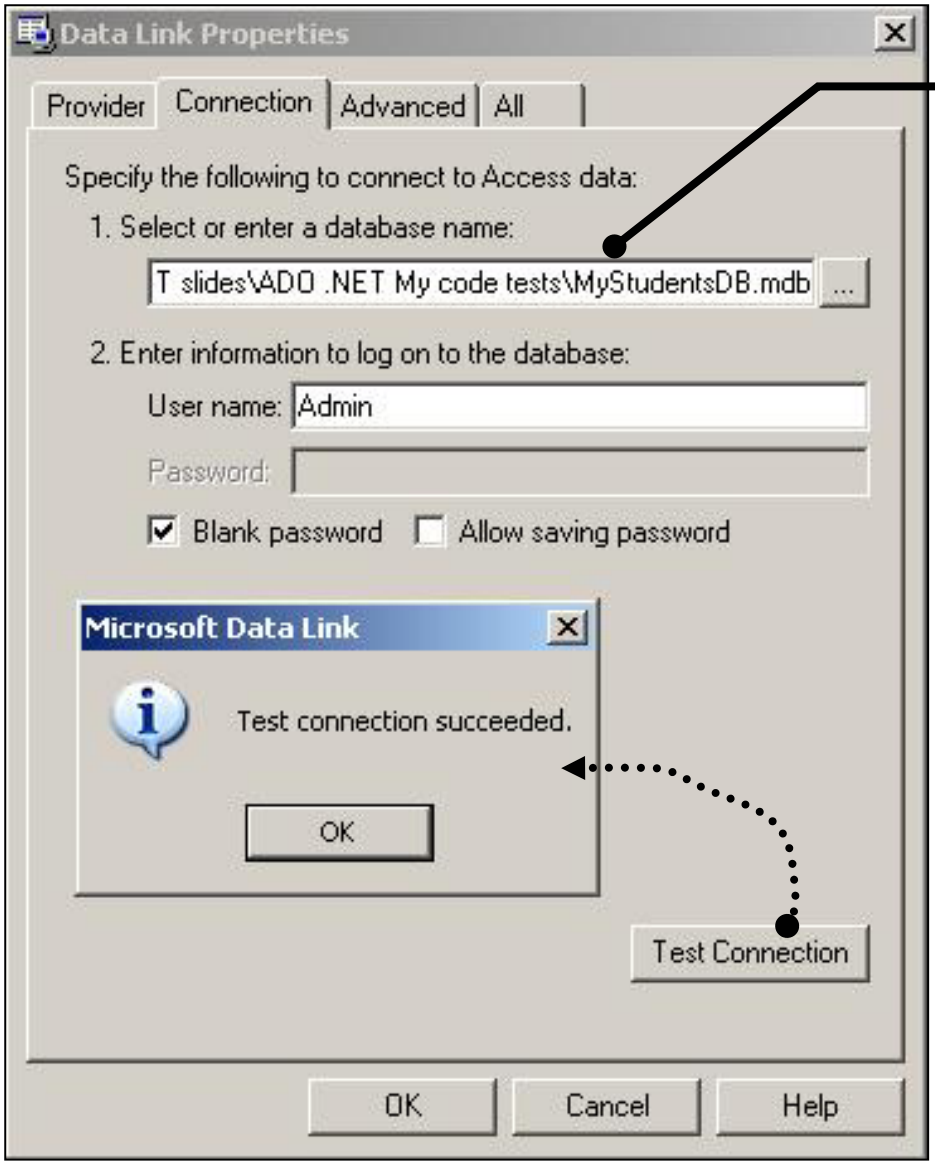
How to connect to a database



How to connect to a database …

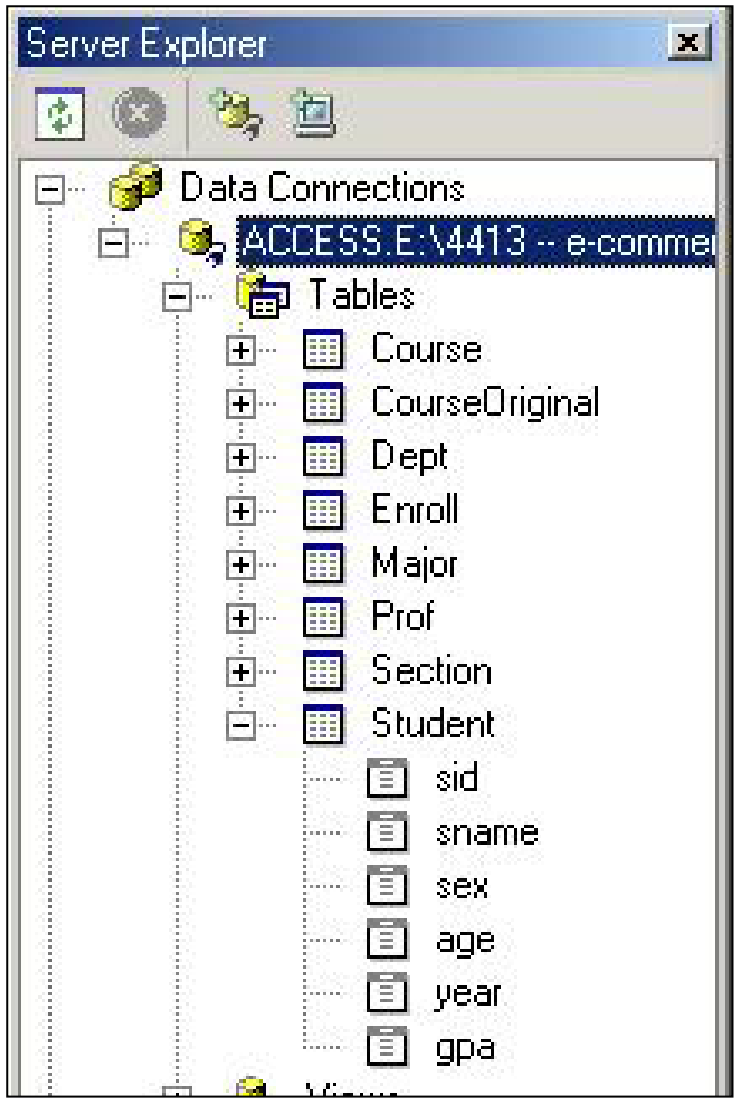


How to connect to a database …

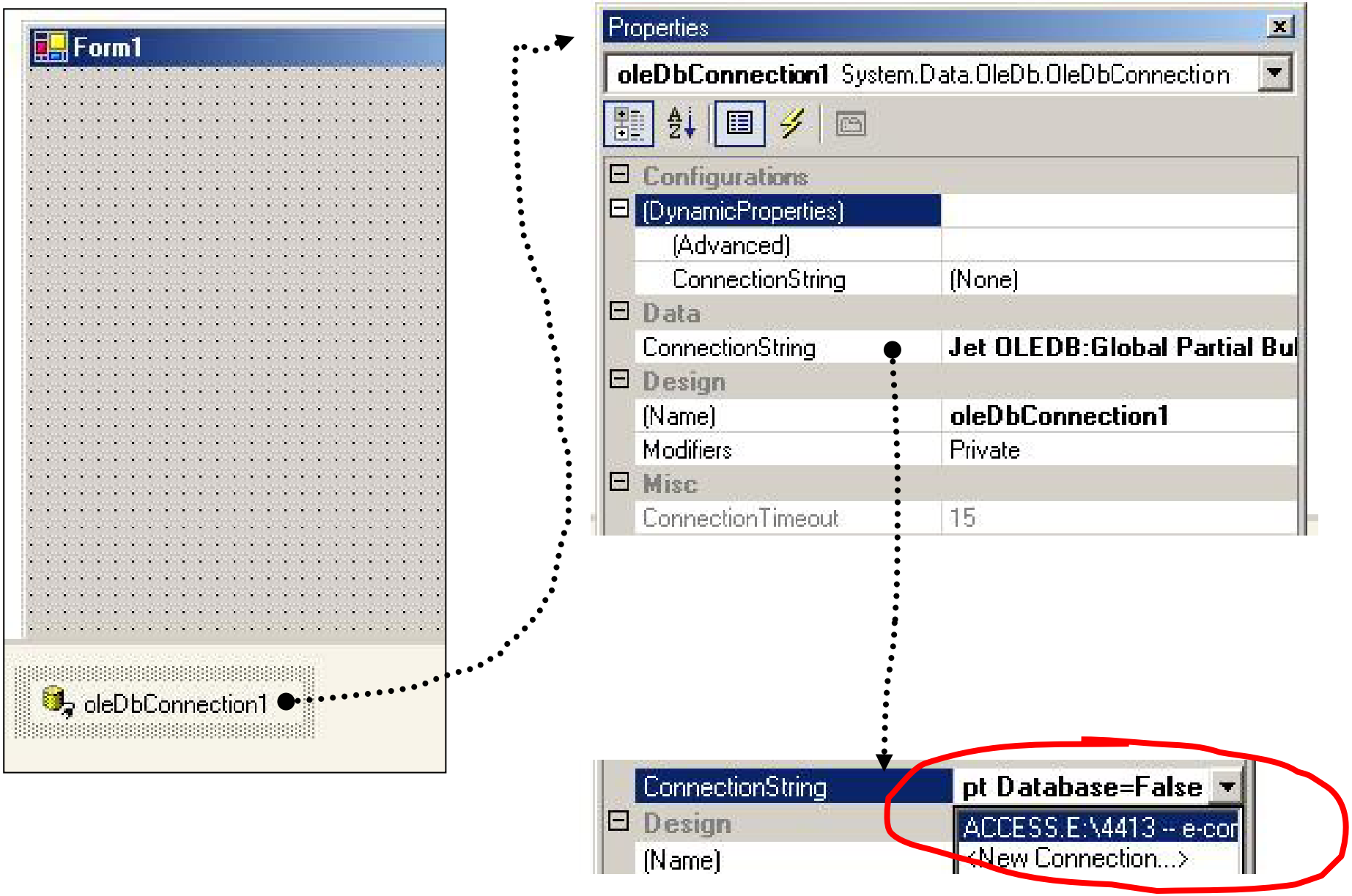


Navigate and find the desired DB

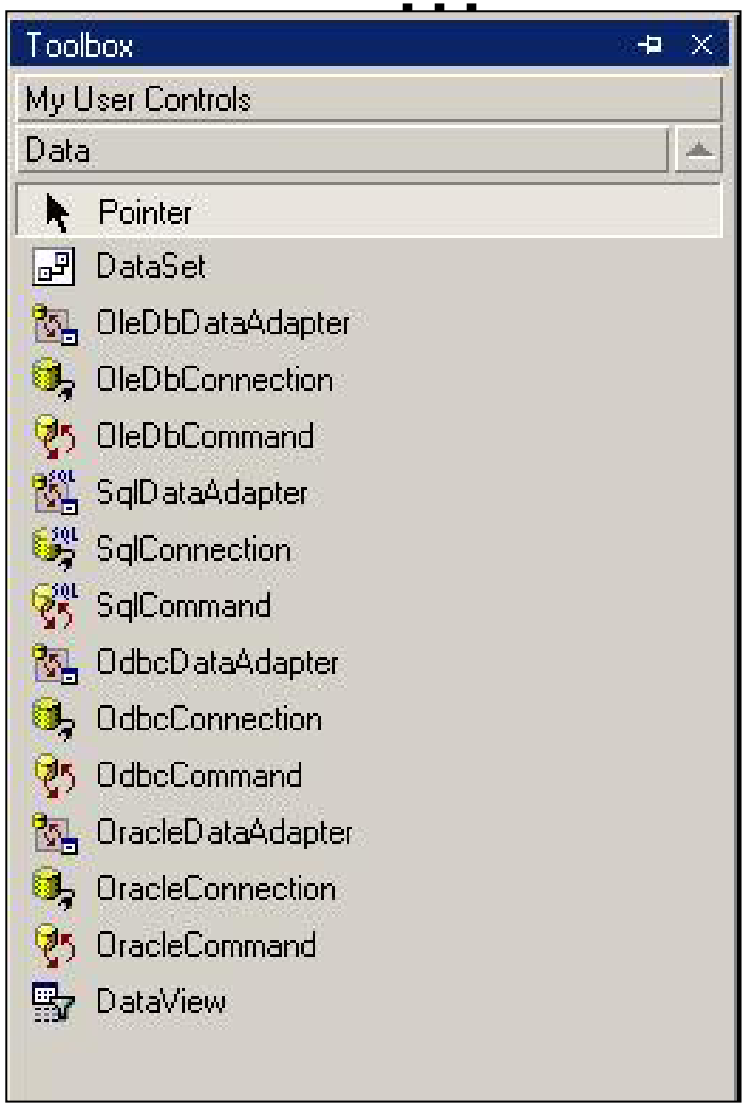
How to connect to a database …/



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.


Form1
oleDbConnection1
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...>

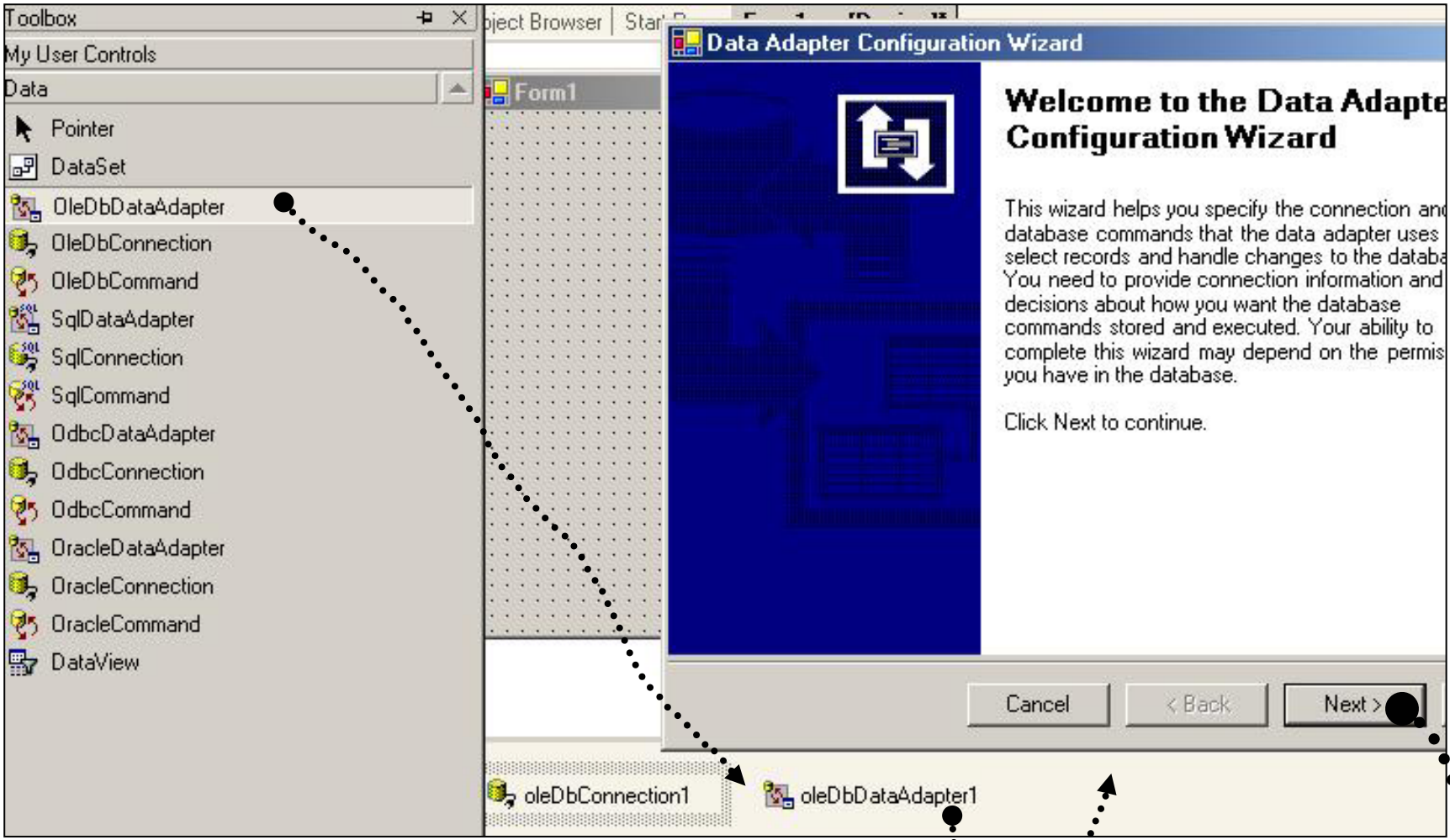
Data from ToolBox has related buttons



Next … need to add an OleDbDataAdapter.

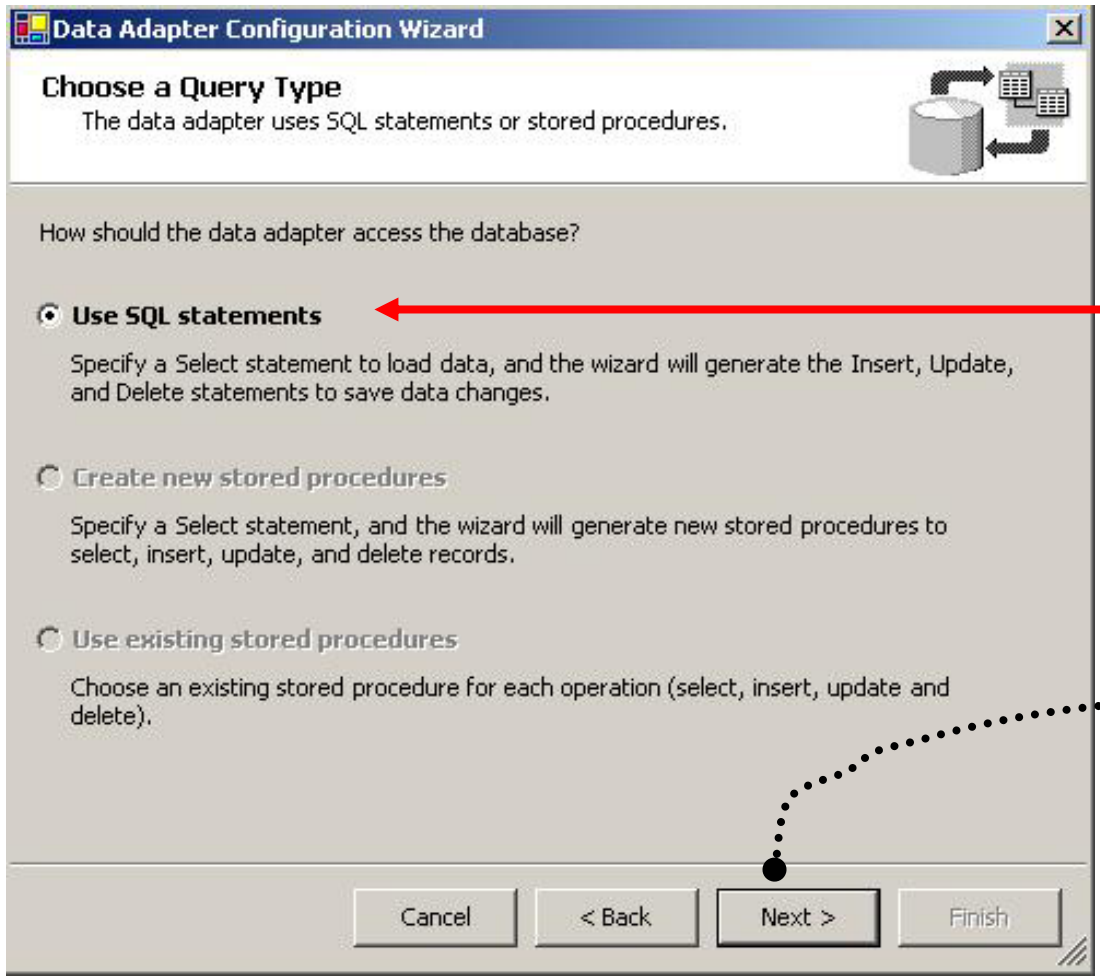
- The OleDbDataAdapter allows to create a query (and submit it to the DB).

Adding an OleDbDataAdapter

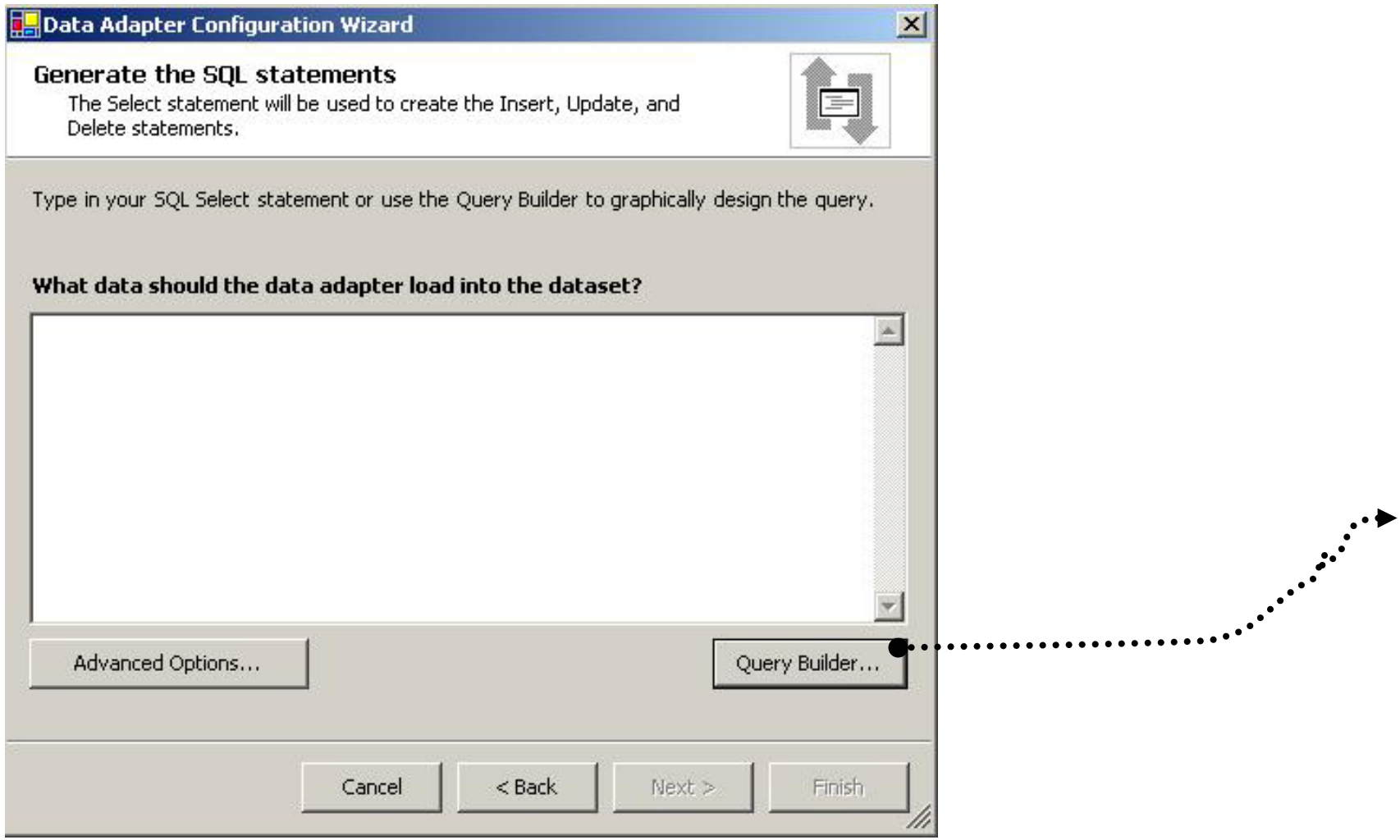


As soon as the data adapter is dropped, the Configuration Wizard opens.

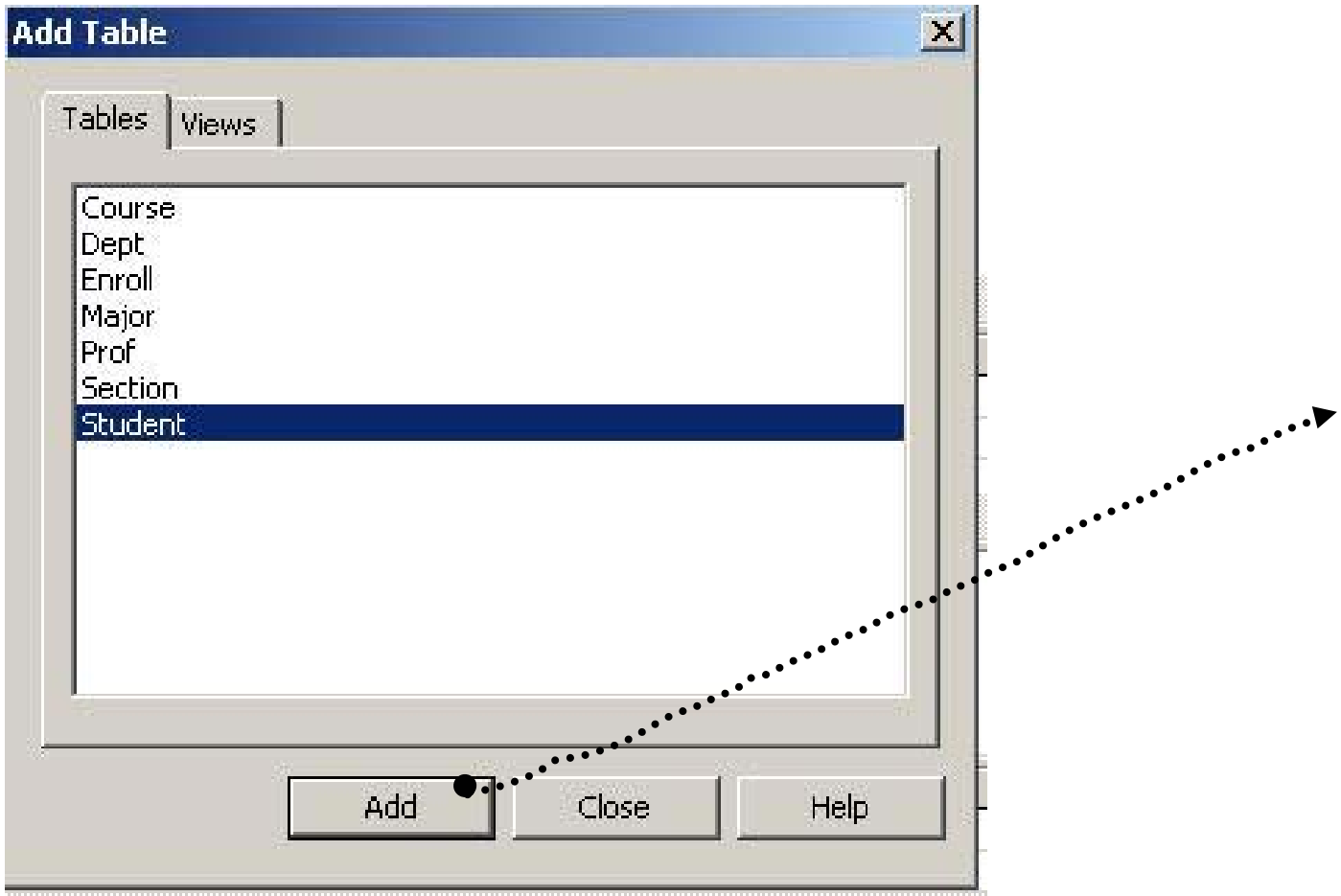
Setting up a query



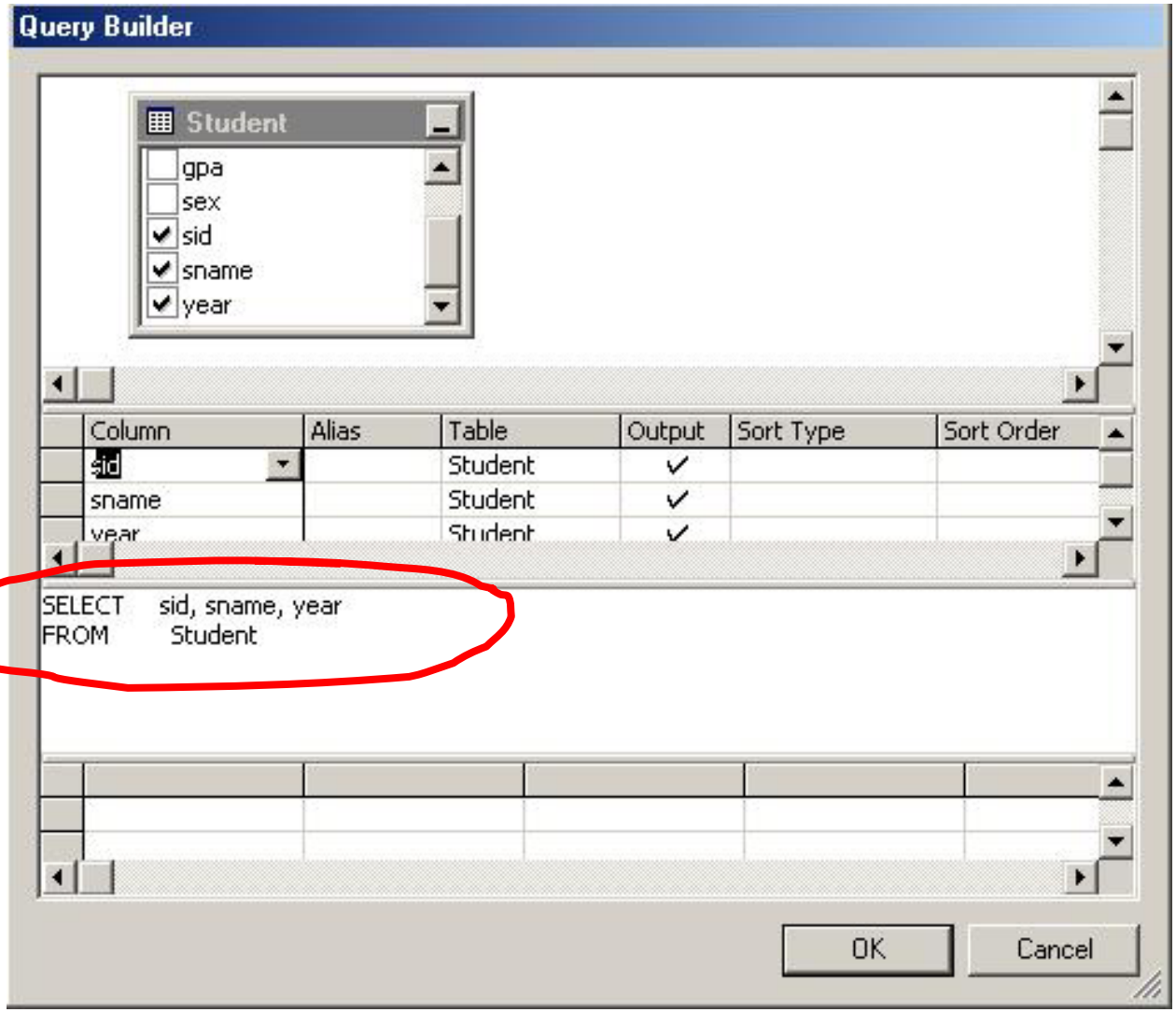
Setting up a query …



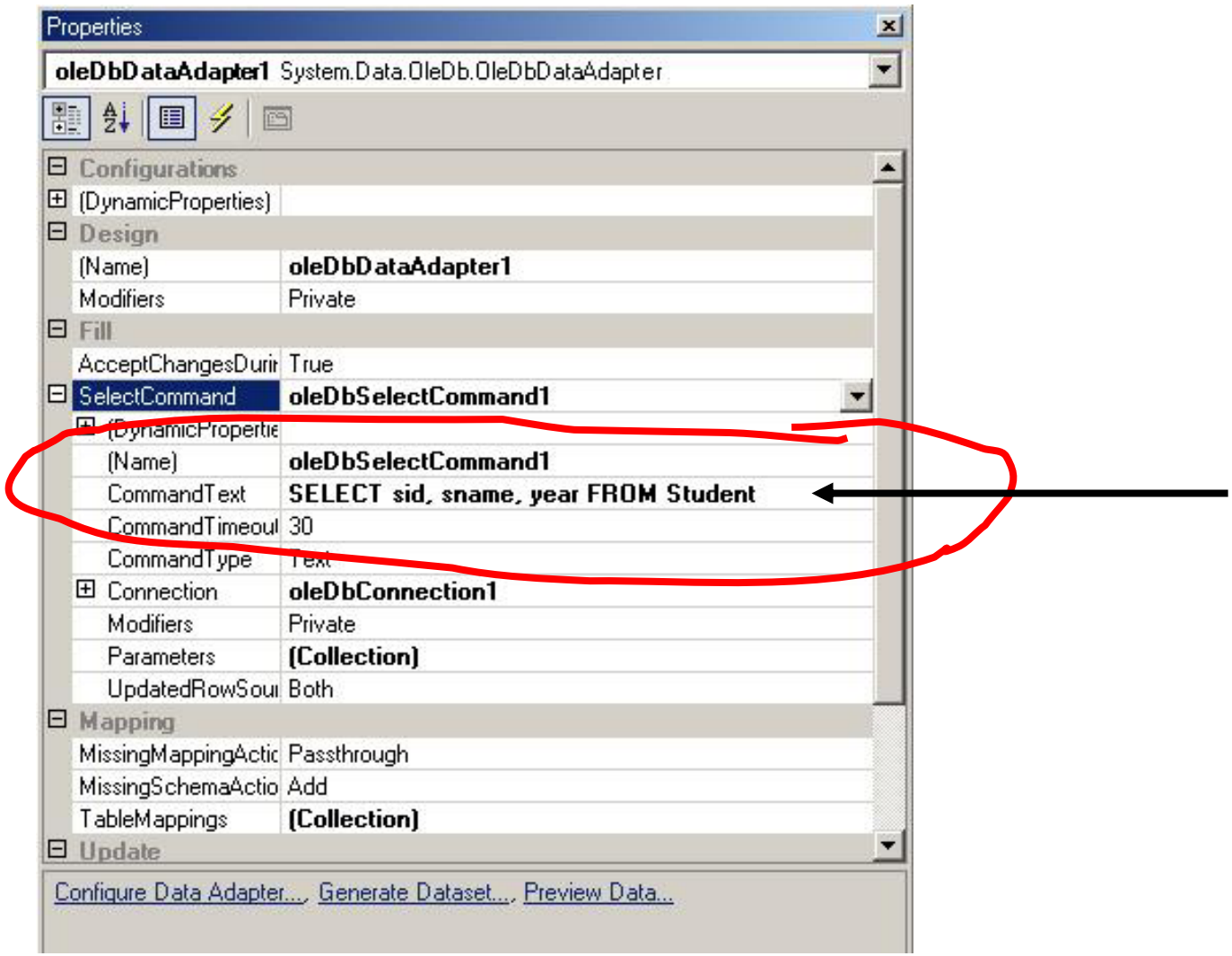
Setting up a query … select tables involved.



Setting up a query …write your query

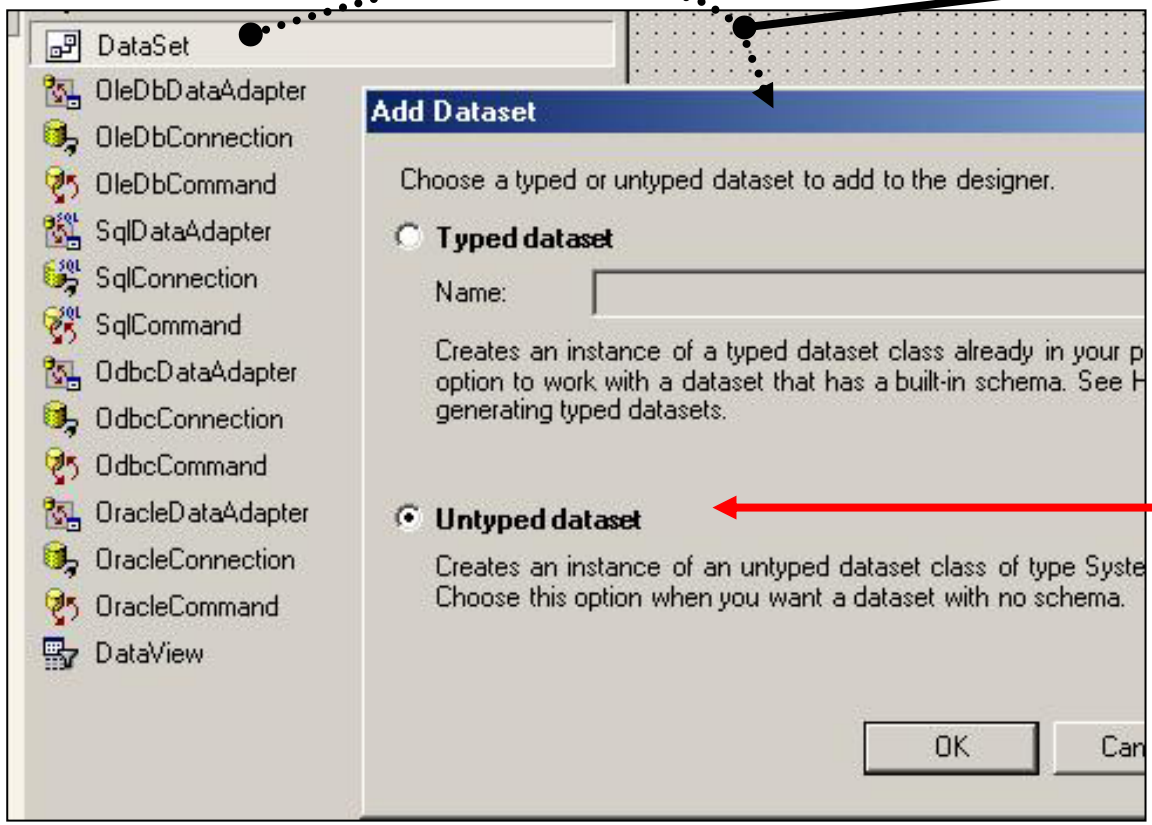


Once the data adapter wizard is finished, its properties reflect the set query.



Next … need to add a DataSet.

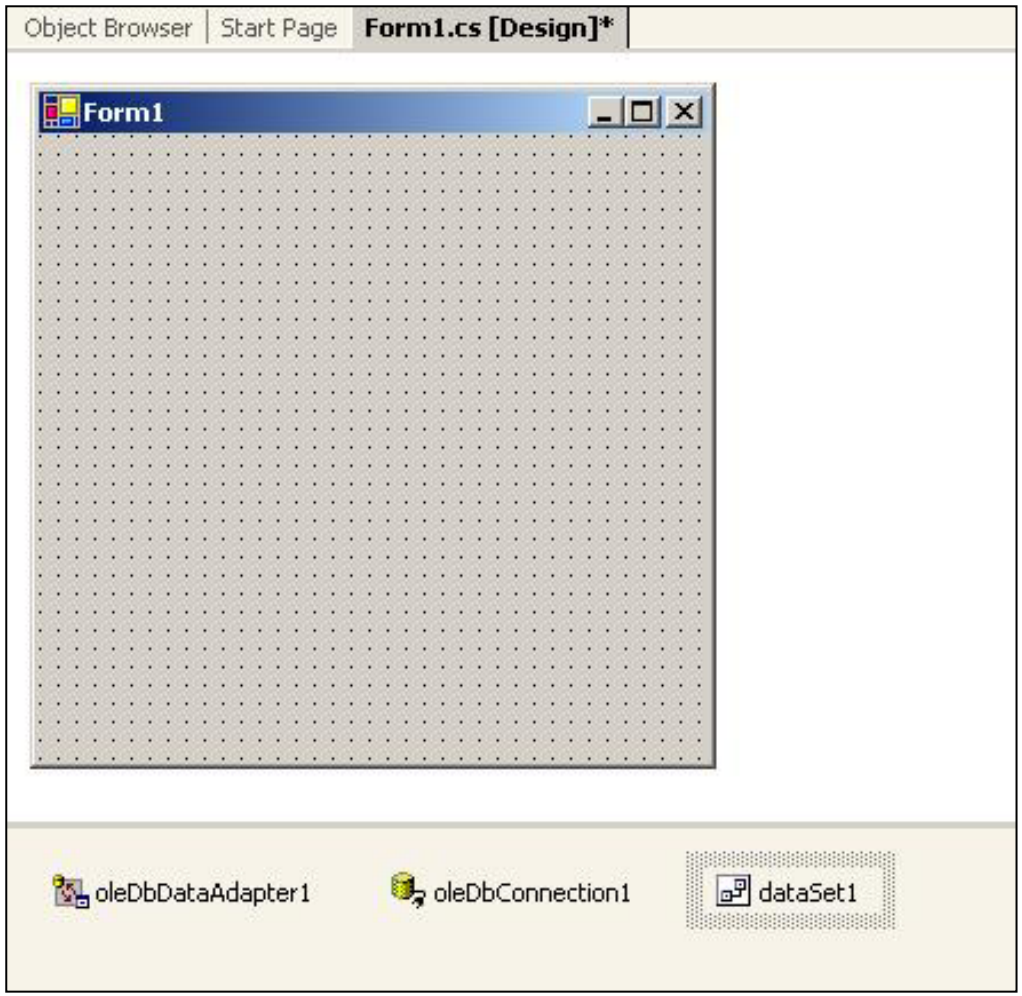
- The data adapter retrieves the data and the dataSet captures the retrieved data and holds it in memory. (after that we can display this data on a DataGrid).



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

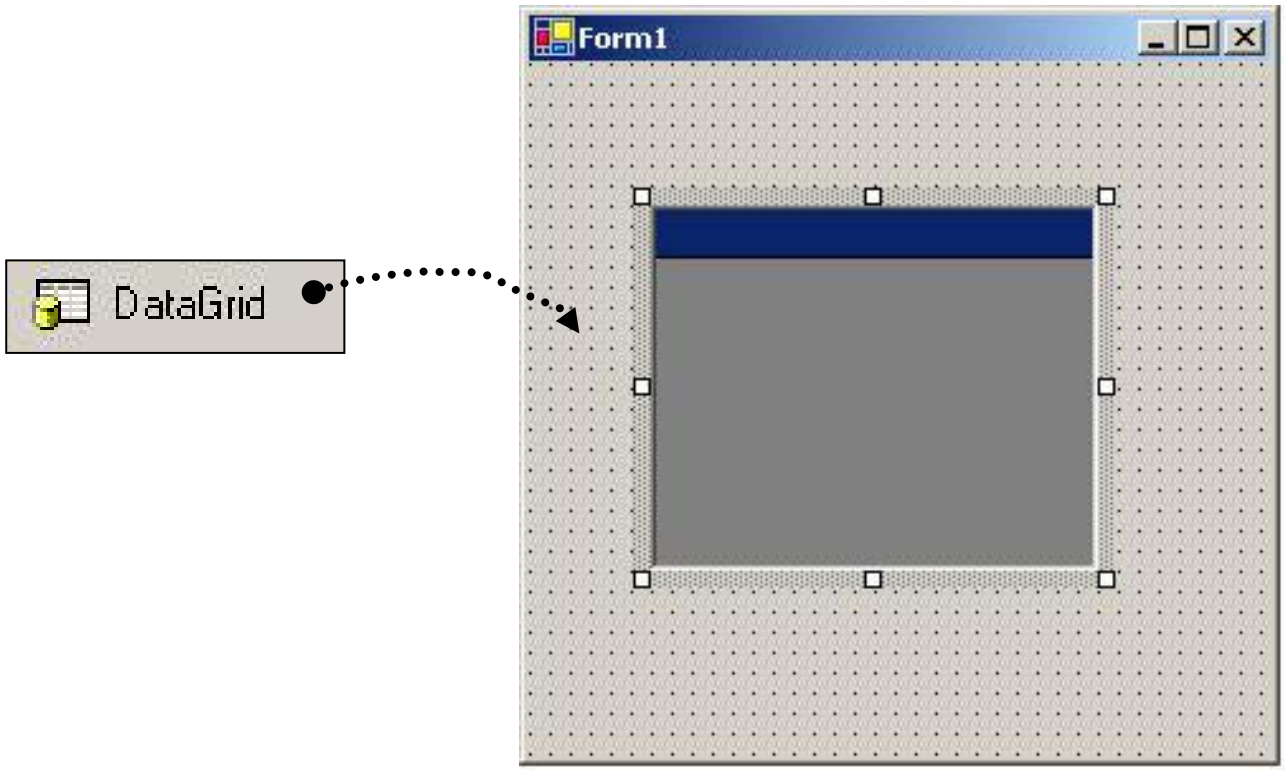
Select "`Untyped`" dataset".

DataSet added.

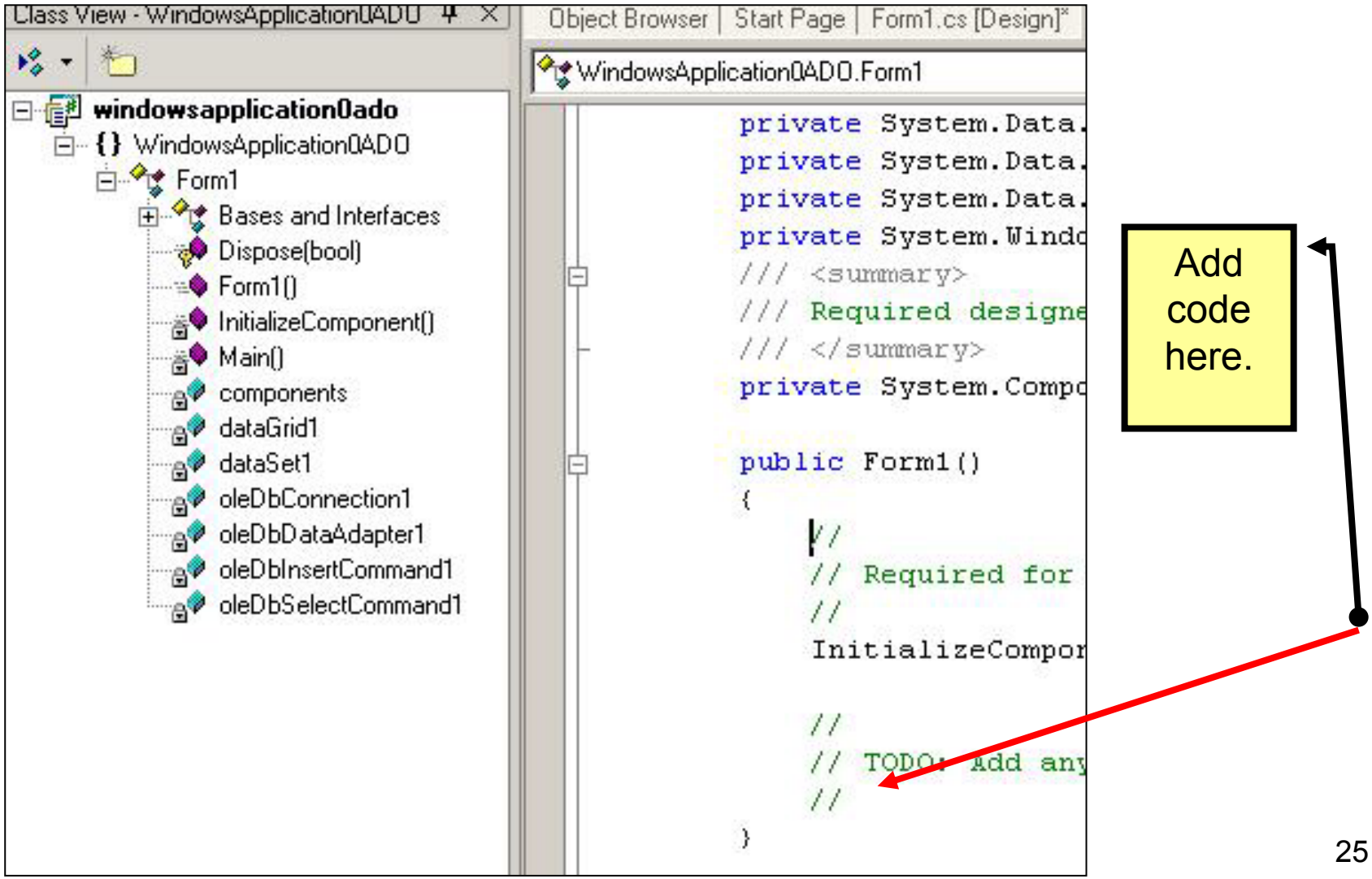


Next … we need to add a DataGrid.

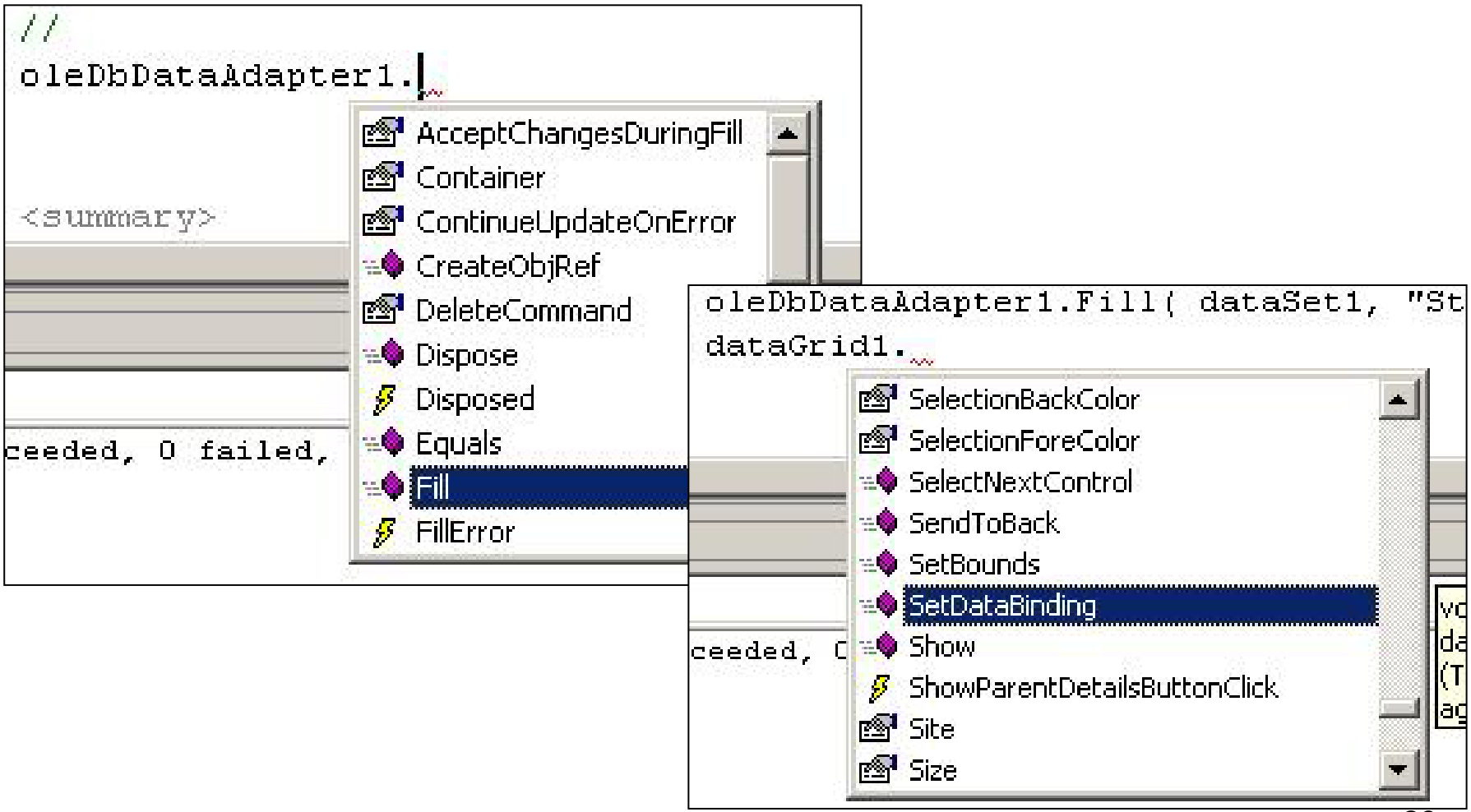
- A DataGrid is used to display in the GUI, the data that is held in a DataSet.



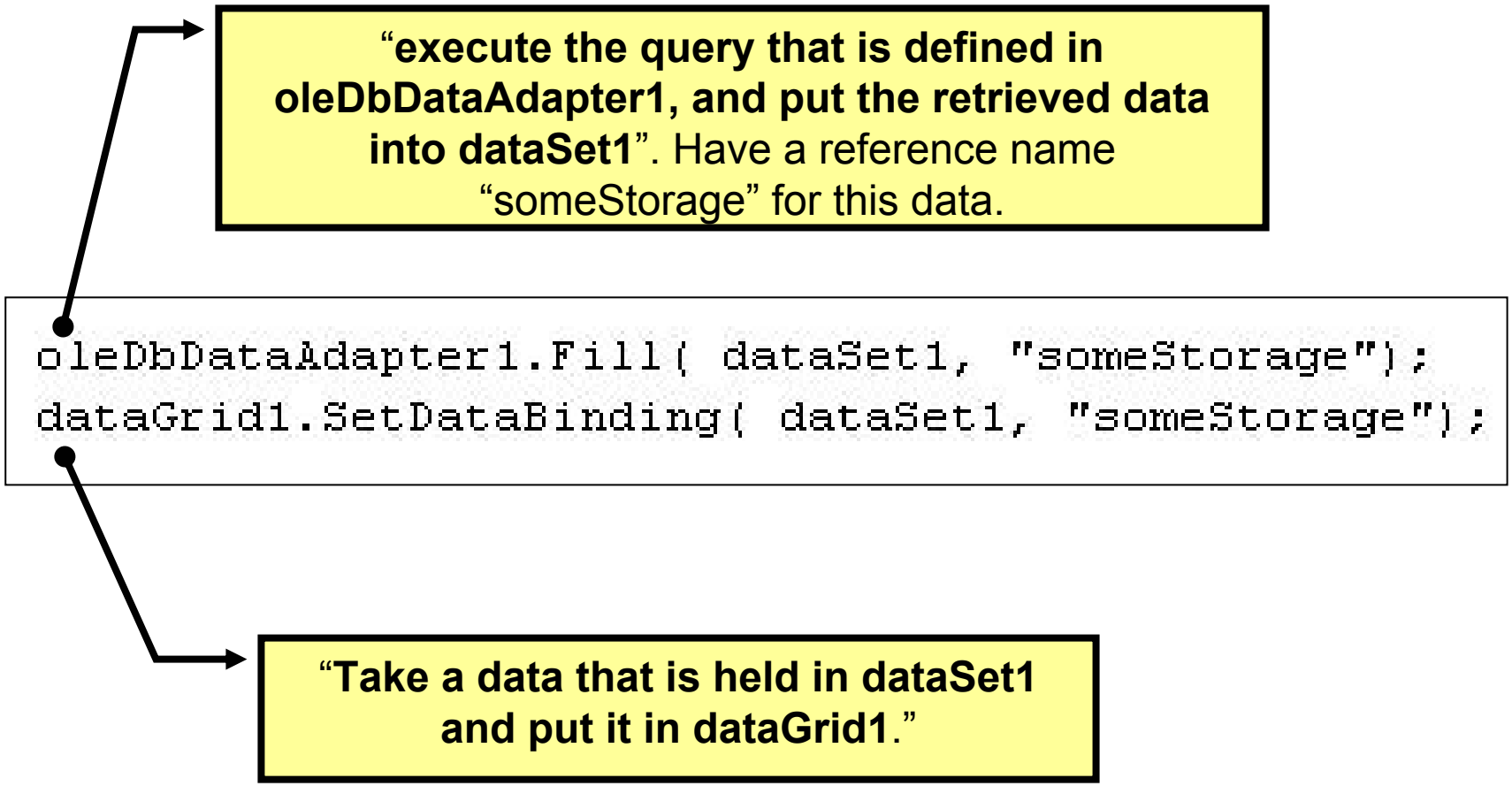
Finally … we need to write the code to “connect” the DataAdapter to the DataSet and the DataSet to the dataGrid.



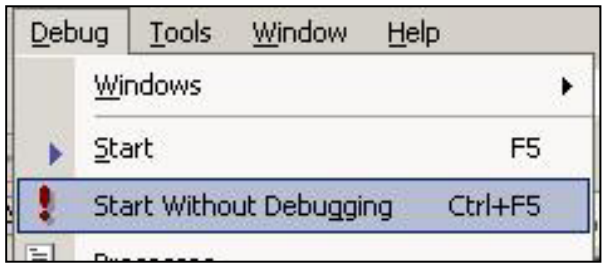
Writing the code ..

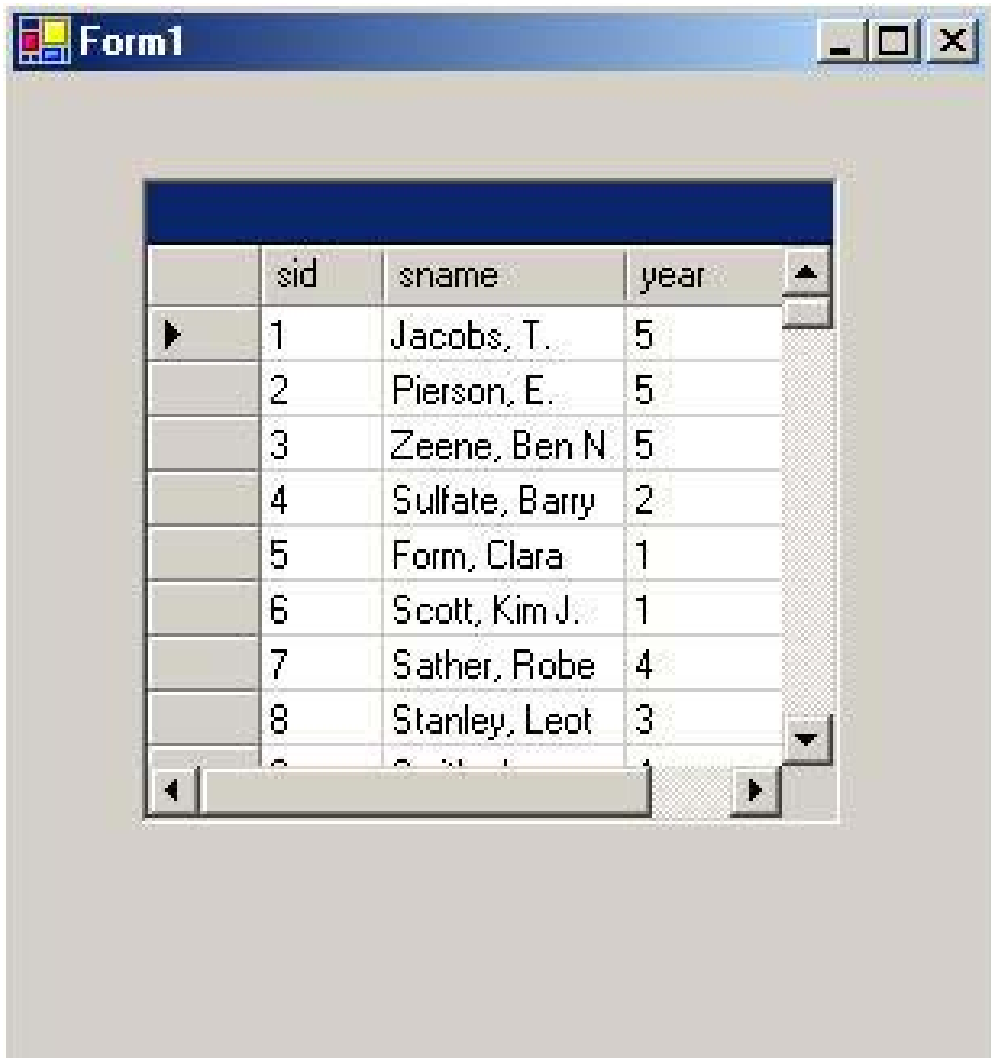


Writing the code …/

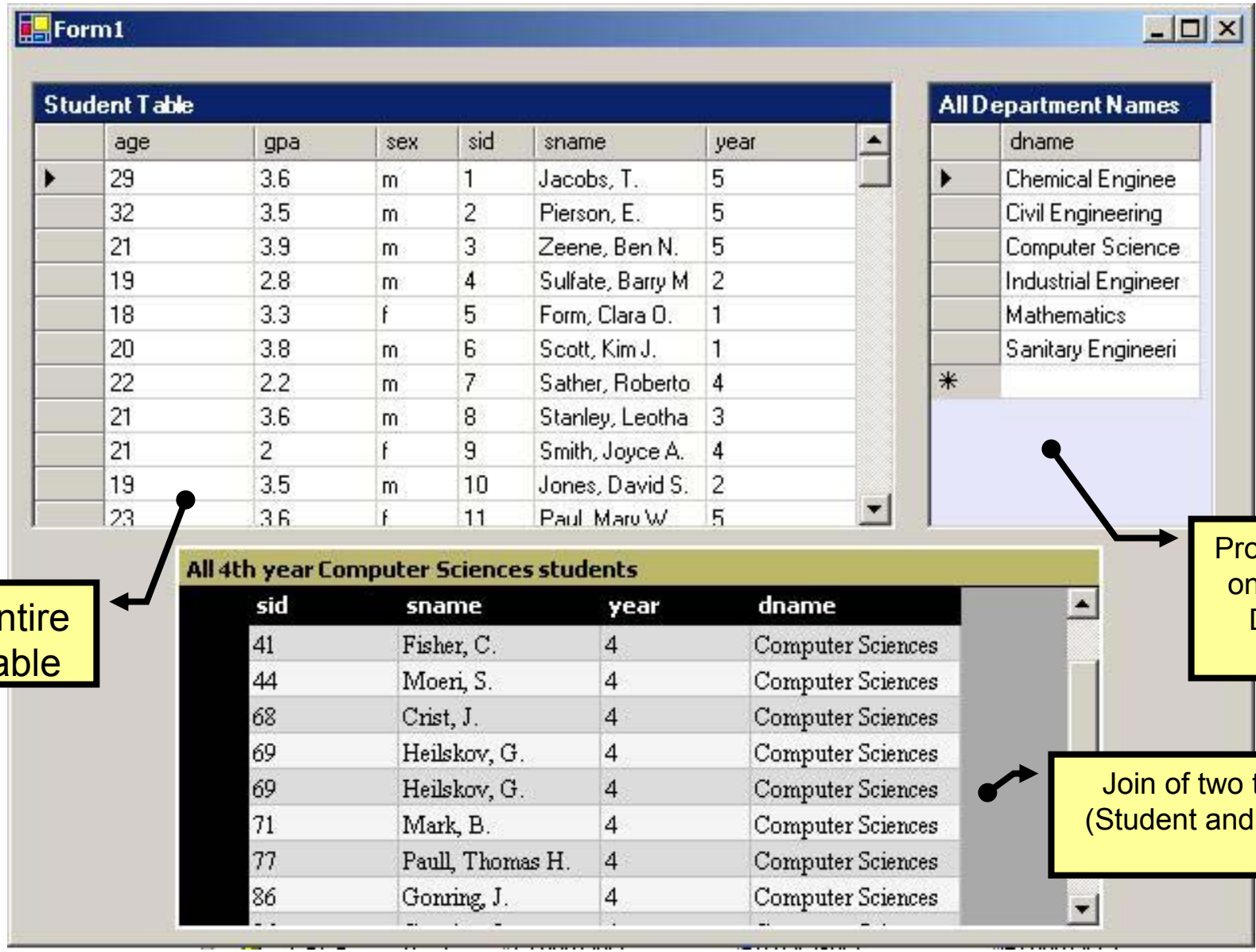


Running ..

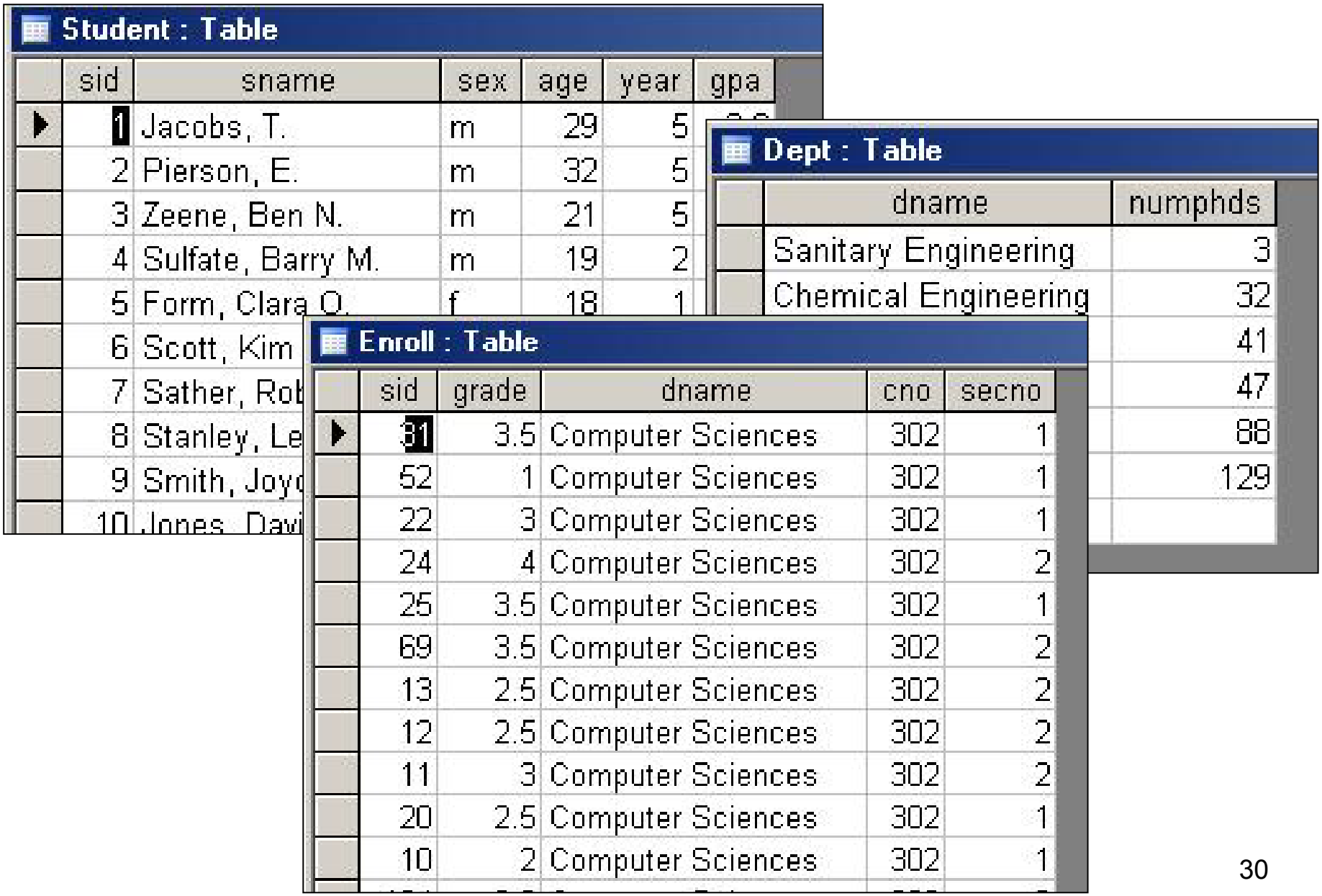

Debug
Tools
Window
Help
Windows
Start
F5
Start Without Debugging
Ctrl+F5


Form1
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 …



Tables Student, Dept, Enroll



Student : Table

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

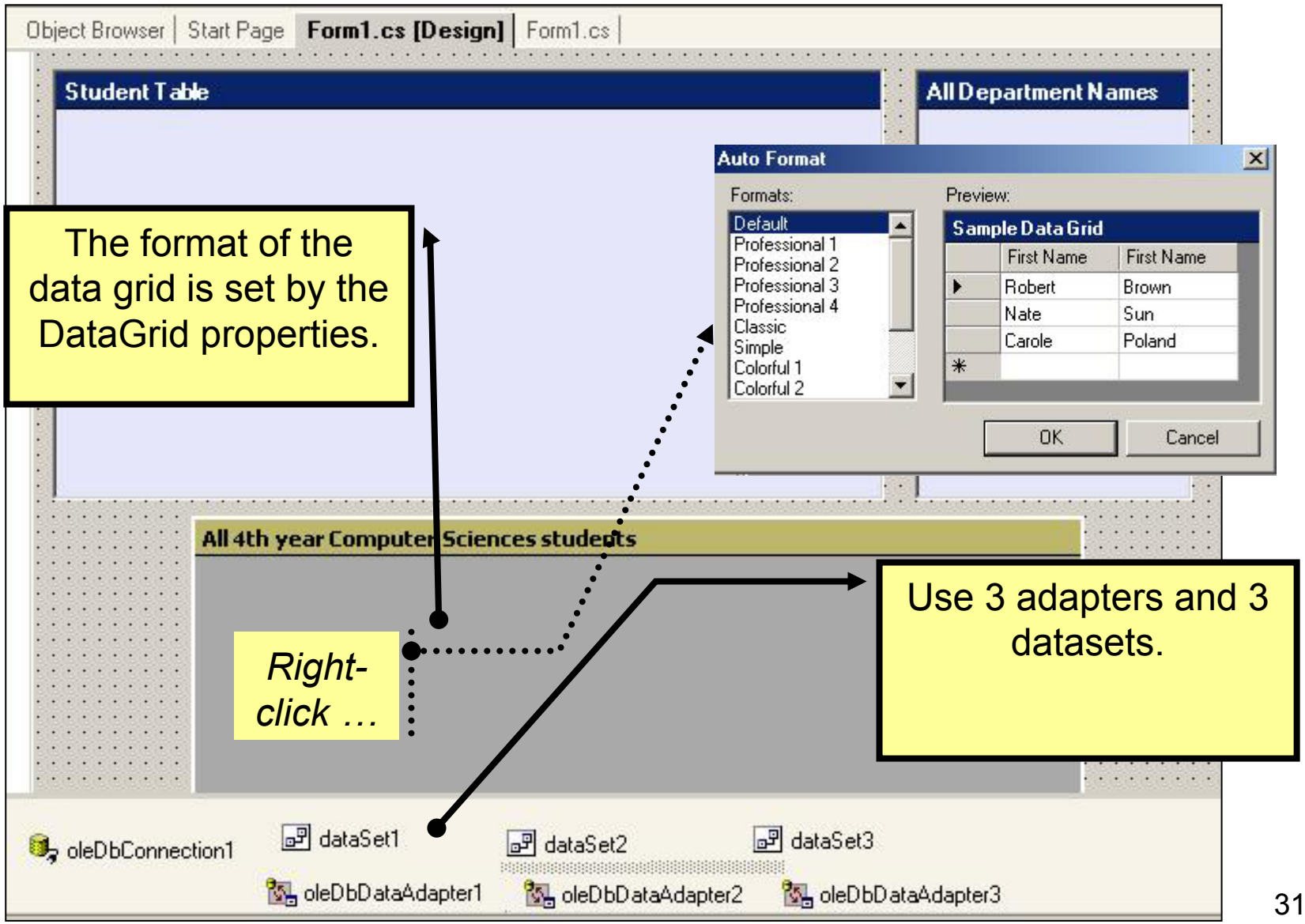
Dept : Table

dname	numphds
Sanitary Engineering	3
Chemical Engineering	32
	41
	47
	88
	129

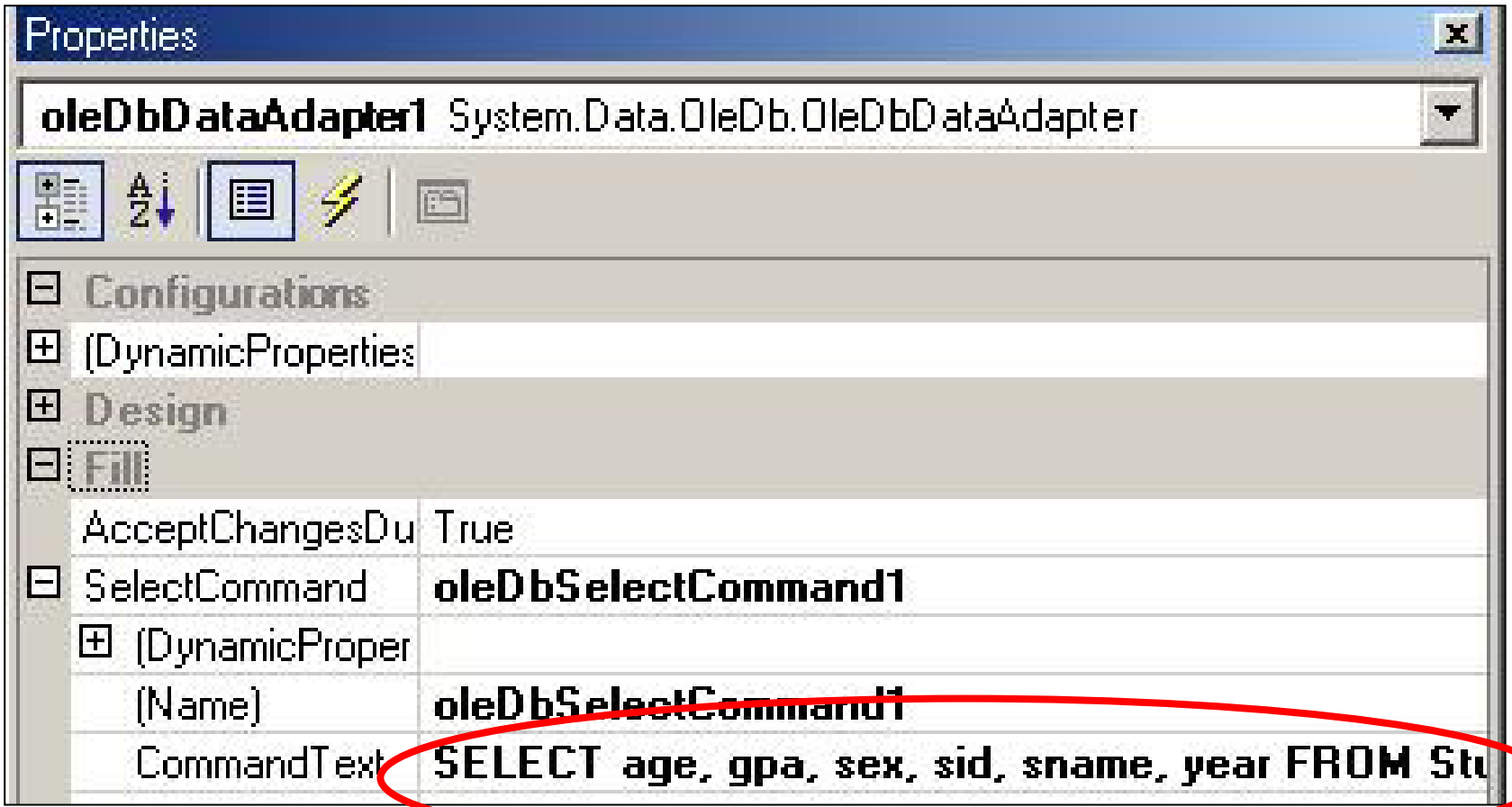
Enroll : Table

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

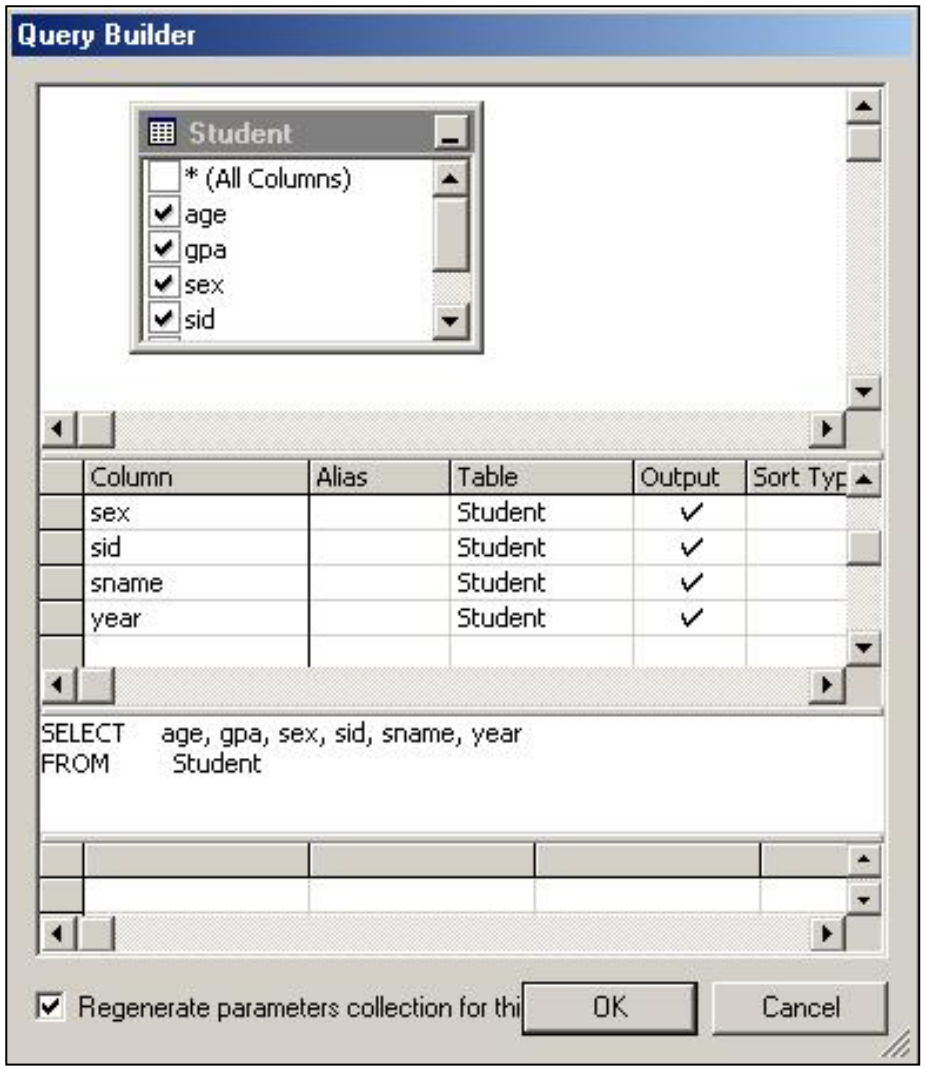
Designer view



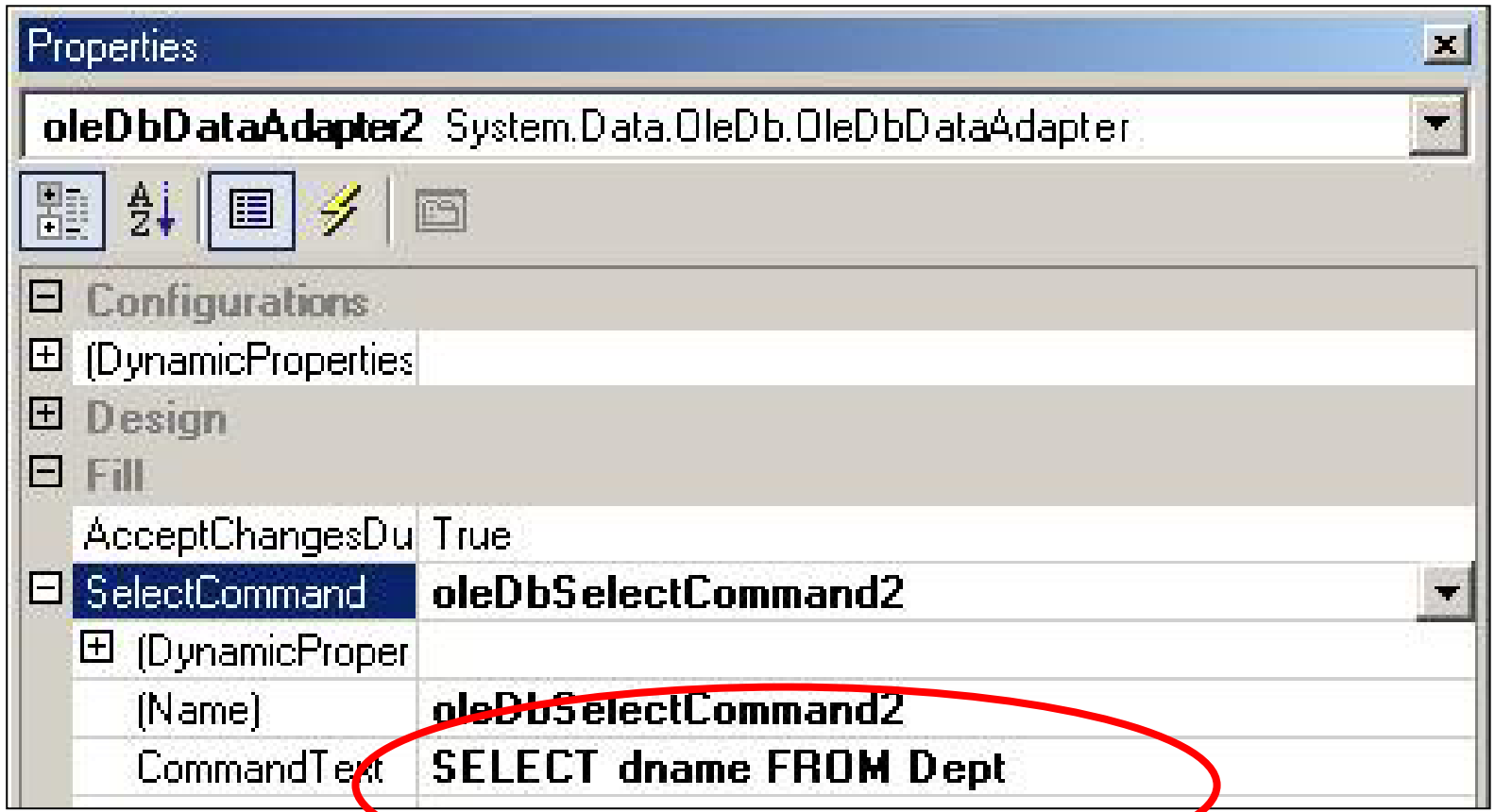
Adapter 1 properties



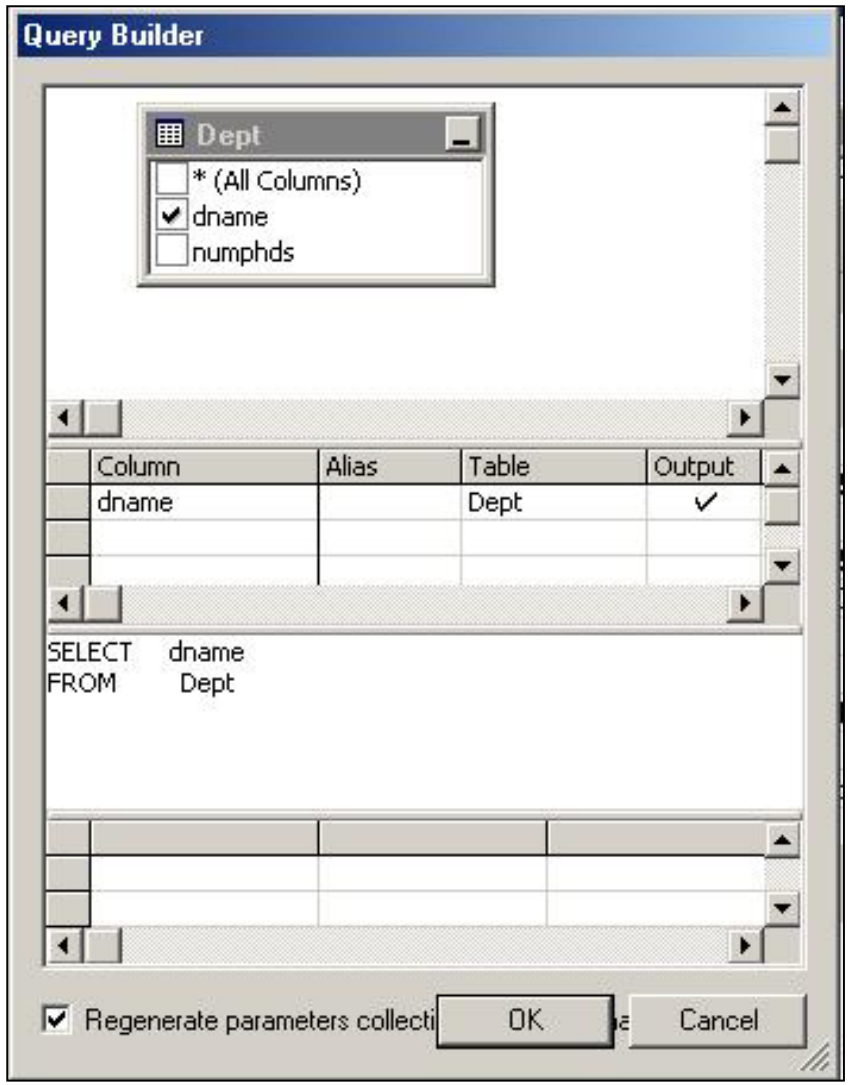
Adapter 1 query builder



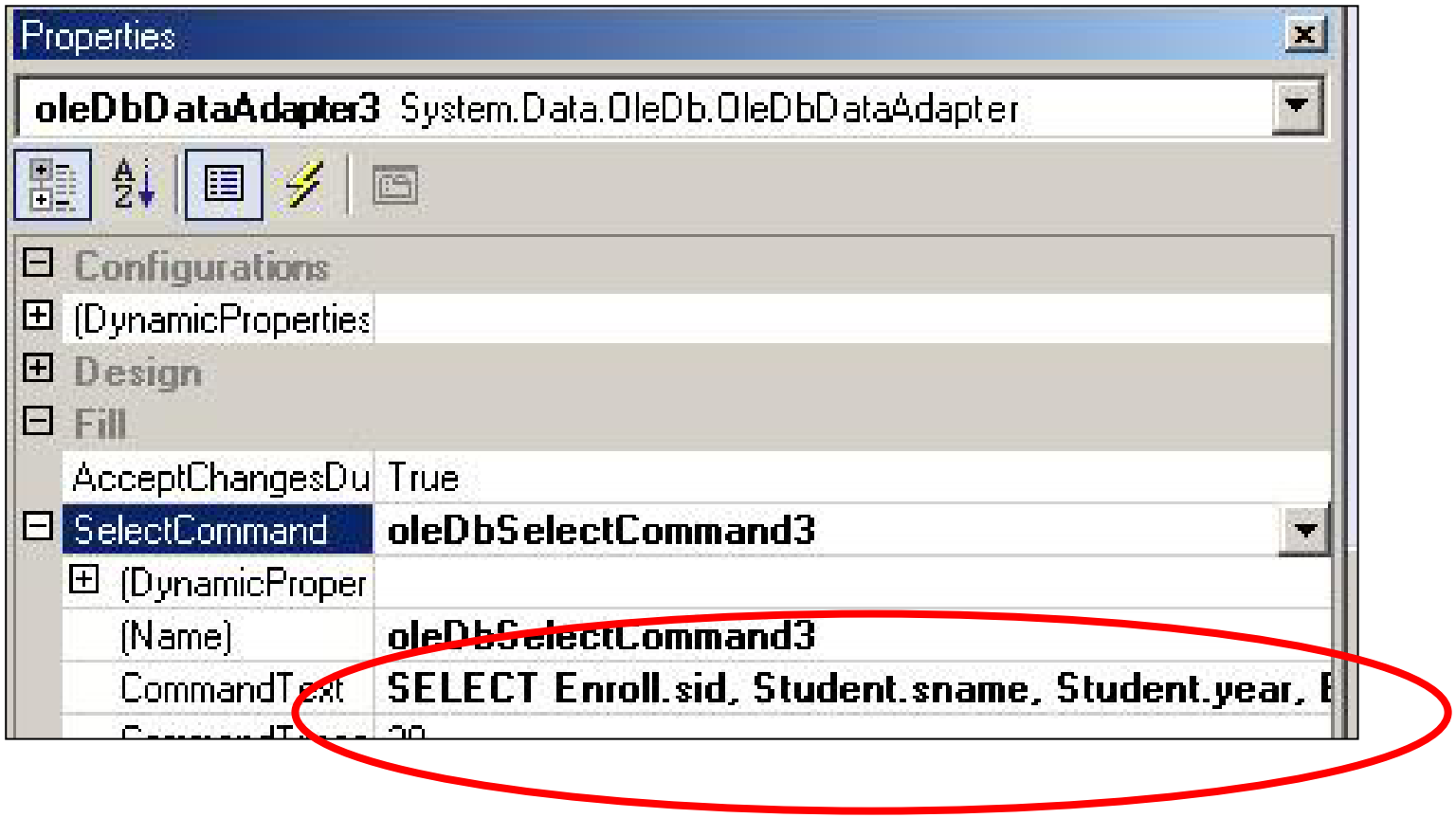
Adapter 2 properties



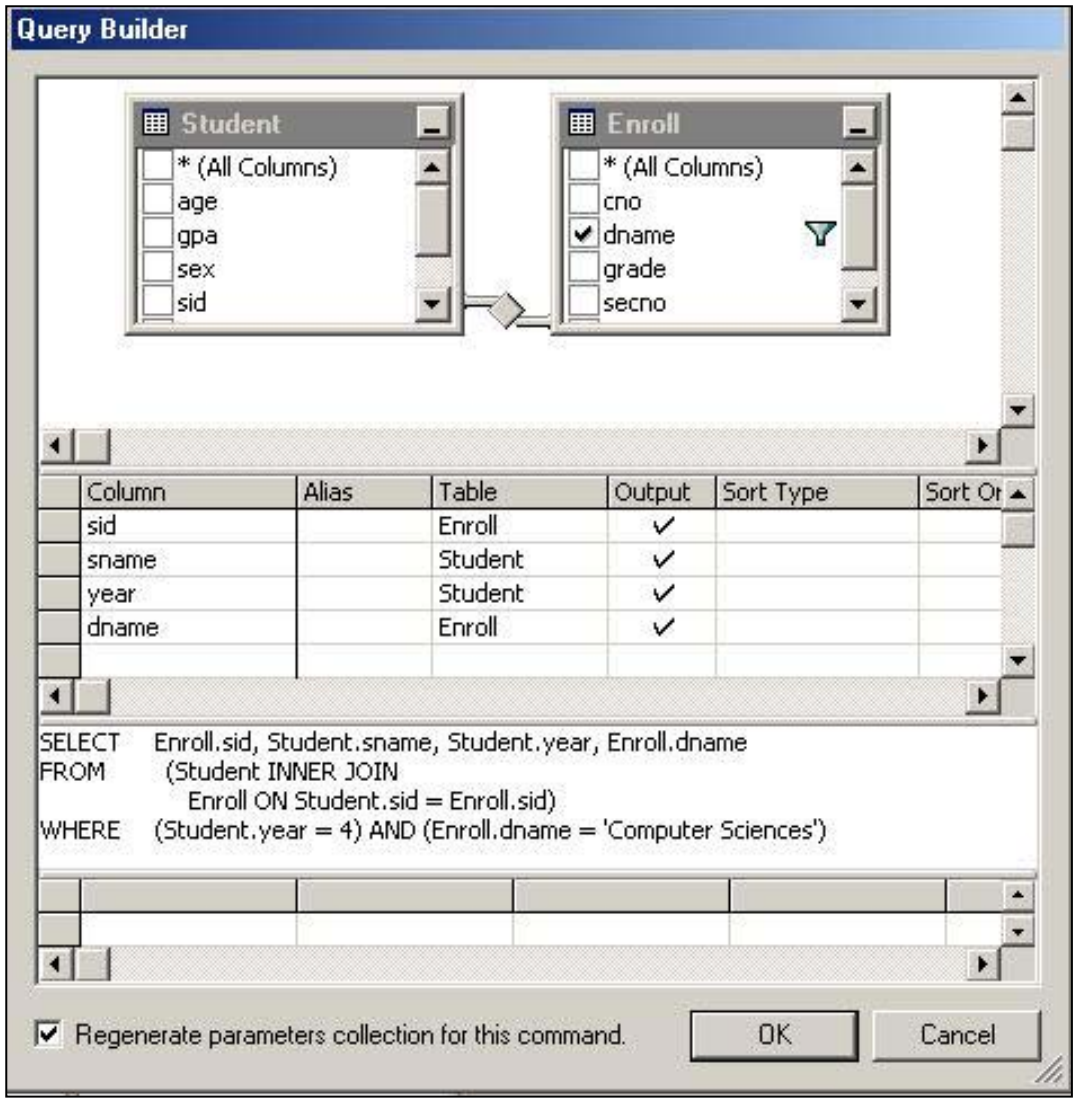
Adapter 2 query builder

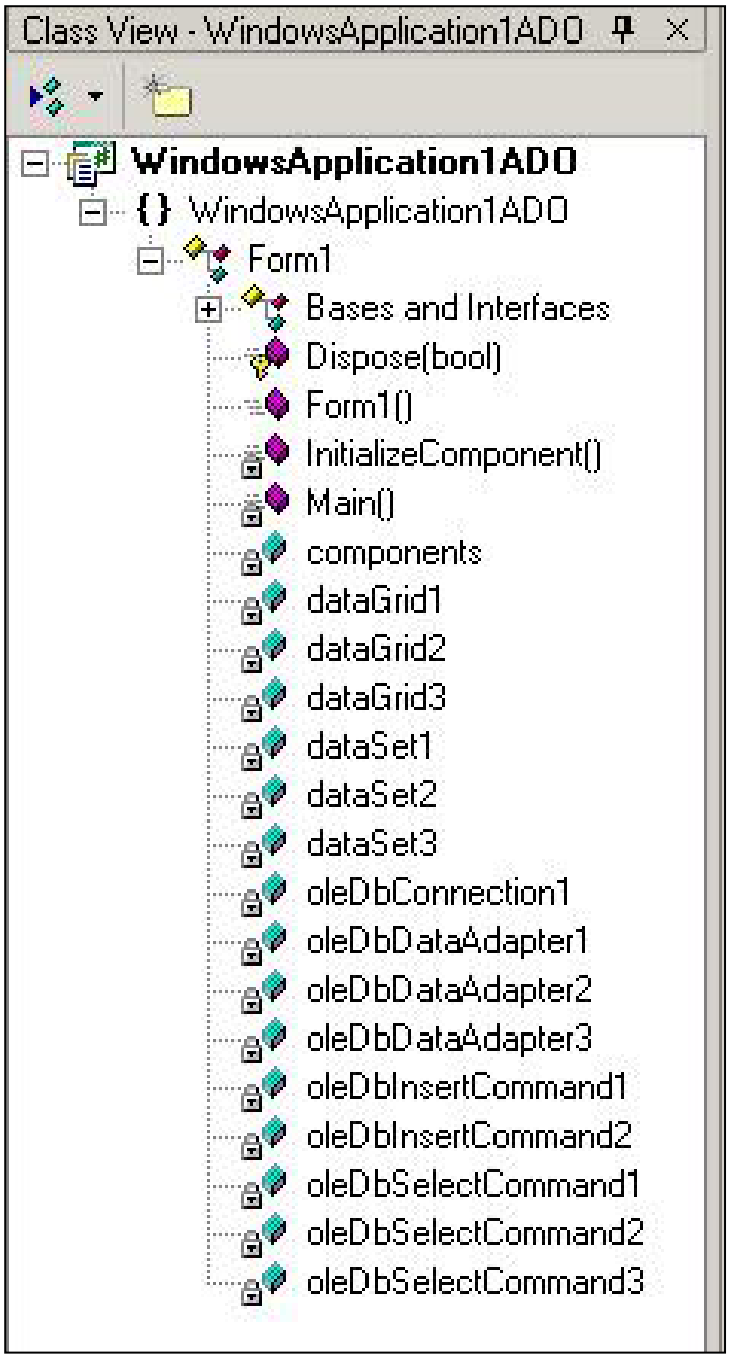


Adapter 3 properties



Adapter 3 query builder




Class View - WindowsApplication1ADO
WindowsApplication1ADO
{ } WindowsApplication1ADO
Form1
Bases and Interfaces
Dispose(bool)
Form1()
InitializeComponent()
Main()
components
dataGrid1
dataGrid2
dataGrid3
dataSet1
dataSet2
dataSet3
oleDbConnection1
oleDbDataAdapter1
oleDbDataAdapter2
oleDbDataAdapter3
oleDbInsertCommand1
oleDbInsertCommand2
oleDbSelectCommand1
oleDbSelectCommand2
oleDbSelectCommand3

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