Databases: Starting to build a database

iT Centre Learning

iT services

UNIVERSITY OF OXFORD

The small print

Prerequisites

Time in the workshop is precious – it is an opportunity for you to interact with the workshop leader and other participants through questions and discussions and to share your experiences and concerns. To make the most of this time we sometimes ask you to carry out learning activities ahead of the workshop so that everyone comes into the class with the same basic knowledge. We keep this prior learning to a minimum and often make use of online videos. Online videos provided through LinkedIn Learning can be accessed free of charge by University members anytime, anywhere, through a browser or app.

Your course booking will tell you if any prior learning activity is required. If you don't have an environment where you can do this learning, you can come along to one of our LinkedIn Learning sessions. These are a quiet space where you can work through videos or other workshop resources.

If you arrive for a workshop without having done the prior learning, the workshop leader may suggest that you come back on another session.

Copyright

About the workshop designer

Pamela Stanworth has over a decade's experience working on databases with researchers and departments across the University. She brings a pragmatic approach to building projects that are effective, reliable and sustainable.

Pamela's roots are in engineering, working with blue-chip industrial companies, technical consultancy and small businesses. Her commitment in teaching and consulting is to enable people to use appropriate technology in their work, efficiently and to a high standard.

Revision history

Version	Date	Author	Comments
1.0	April 2021	Pamela Stanworth	Created based on DM005

About this workshop

This workshop will help you if you are thinking about building a database from scratch. Alternatively, you may be inheriting an existing database, and you need to understand how it works and decide about adapting it for future work. This will give you a taster of the questions you need to ask yourself and the decisions you need to make.

If you are supervising specialists who will do the actual work of building the database, we will give you an insight into the process of building a database so that you can manage the project effectively.

What you will learn

A sound structure is vital to the success of a database project, enabling you to organise your data efficiently and analyse it flexibly. So we will start by examining a multi-table structure, and understanding how the relationships work between tables. We will look at how field properties can make a database more usable and efficient.

We will also consider how you can import or link to data that is found outside your database, perhaps provided by other users.

We will look briefly at forms, reports and views, and their importance in making a user interface that is a safe, reliable and efficient way for people to interact with data. We will work with some simple queries, as a way of interrogating the dataset once it is assembled.

We will include pointers to further resources that will help you go on later to create a user--friendly interface and apply a range of interesting and useful analyses.

What you need to know

The ideas and techniques covered in this workshop will apply to a range of tools. We will demonstrate using *Access*, whose graphical interface is a good medium for learning. However, the concepts will be the same or similar, whatever relational database software you decide to use.

I will assume that you are reasonably confident in using the tool you have chosen to use to manage your data. With your chosen tool, you will need to be able to:

- Insert, correct and format data values
- Create and save records
- Navigate the commands and menus, using Help as necessary

If you need to review these activities, LinkedIn Learning is a great place to get guidance. There is an activity with relevant videos in the IT Learning Portfolio: visit skills.it.ox.ac.uk/it-learning-portfolio and search for “starting databases activity”.

The resources you need

Sample data and databases that you can use to experiment with will be available, but you may like to bring along your own.

The resources for most workshops, including any pre-course activity, are in the IT Learning Portfolio: visit skills.it.ox.ac.uk/it-learning-portfolio and search for “starting databases”.

If you have downloaded the sample files in a zip folder, make sure you **Extract** the files and save them in a convenient location such as your desktop. *Access* will not be able to open a database that is zipped but has not been extracted.

Please note that *Access* only trusts files if they have been saved in a “Trusted Location”. The Home Drive H:, used for most IT Learning Centre courses in our teaching rooms, has been designated an Access Trusted Location. If you make copies of the files for these exercises, and save them on your own computer in a location that is not trusted, you may not be able to carry out all the activities described.

Unless you have been told otherwise, in classroom workshops there will be a computer available for you to use with *Access for Windows* installed.

You can use your own computer with your preferred app installed if you want to – just bear in mind that I am not an expert in every app (although I am sure that between us we will be able to sort out most problems!).

About the database apps you can use

There are many applications that you can use to create a relational database, each having different strengths and applications. For example, the selection will depend on how many people are expected to use it (a handful of people, several dozen, thousands?) and how they will get access to it (saved locally or data viewed and contributed on-line? free software or paid-for?). You should also think about the devices that you and other users will be using (Windows, Mac, web browsers on a variety of devices?) and what features will be needed (design your own custom forms, produce charts?). Also what support will you need (courses from IT Learning Centre, videos online, existing expertise in your own team?).

Learning Objectives

This workshop has the following learning objectives:

Learning Objective One - Review the structure of an existing database

Learning Objective Two - Review the properties of existing fields

Learning Objective Three - Import more data

Learning Objective Four - Make relationships between tables

Learning Objective Five - Planning your own project

Learning Objective Six - Working with data using forms

Learning Objective Seven - Creating new forms

Learning Objective Eight - Altering forms

Learning Objective Nine - Using queries

Learning Objective Ten - Working with queries

Learning Objective One - Review the structure of an existing database

You are going to examine an existing database, to assess its suitability for the next phase of work.

Open **college IT help appointments.accdb** (provided in our teaching rooms in the Home Drive H:/). In this database, the team of IT support staff in a college are organising the appointments when students come to them for help.

Examine the tables and their data. Open **tblStudents** in design view, and explore the fields already in place, noting their properties and changing some if necessary. It has been decided that there is no need to record a student's gender: delete the **Gender** field in **tblStudents**.

In a suitable table, add a field for the **Duration** of an appointment – what type of data should this be?

A table is the place for storing data – facts & figures.

Learning Objective Two - Review the properties of existing fields

In the database for IT help appointments, look at the tables, and change some properties of fields:

In **tblStudents**, **UniversityCardNumber** can have maximum 9 characters

In **tblAppointment**, **AppointmentDate** and **AppointmentTime** have the formats Long Date and Long Time respectively

In **tblPreviousSchools**, **SchoolName** needs to be a mandatory field

Learning Objective Three - Import more data

It has been decided to introduce a table which lists the members of the IT staff team. This will reduce the need to type in the names and details of the staff members, repeatedly.

The details have been provided as a spreadsheet, **IT Helpers.xlsx** in your bundle of files. Import the list of staff into the database, as a separate table called **tblITAdvisors**. Allow a new field to be created, which will act as the primary key in this new table.

Review the data in the table, and check that it has imported successfully.

Learning Objective Four - Make relationships between tables

In the database for IT help appointments, review the relationships diagram.
It may be helpful to rearrange the field lists, move and stretch them to a layout that is easy to understand. Note which field has been set up as the primary key of each table.

Look carefully at each of the joins between tables. Does each join tell a plausible story?

On talking to the IT staff, you discover that they want to record more information about the locations where these appointments are held. You decide to replace the single Location field with a separate table (provided in our example database). So add the table of Locations to the relationships diagram.

Create any necessary new field/s and join/s. Enforce Referential Integrity for all joins, and check that any new join/s are suitably marked with “one” and “many”.

Learning Objective Five - Planning your own project

The relationships diagram is the heart of any relational database – it specifies how the various tables are joined. Deciding on which tables are to be linked, and how, takes a lot of thought so you should allow time to work on this and design a diagram which properly models the evidence or data you are collecting.

Spend a few minutes thinking about your own project. What tables should it contain? What fields, tables, properties and joins would be needed? Sketch out below an ideal structure for your data.

The concepts discussed in this course will apply, whichever software you decide to use for your project: the choice of software depends on a range of factors. The IT Teachers in the IT Learning Centre would be happy to discuss with you your own database project.

Learning Objective Six - Working with data using forms

In the IT appointments database, try out any forms and reports that are already in place. Forms present data that is stored in the tables. Some existing forms and reports may continue to be useful, but others may now be out of date and can safely be deleted, without affecting the data.

Use **frmStudents** to correct Peter Green's address to 23 Waterson Street, Iffley, Oxford.
Page through the records, one by one, to see the other student details through the form. Add one more student – invent some plausible data for them.

Learning Objective Seven - Creating new forms

Use the Form Wizard to create a new form, for editing and adding data about the appointments.
Name the new form **frmAppointments**.
Include all the fields from **tblAppointments**, and choose an appearance that you like.

Test the form, that it works for editing existing appointment data and for adding a new appointment for an existing student. Notice the features of a form which make it easier for a human user to work safely and accurately on the data (instead of trying to work in a table).

Student Brian Aldridge wants to book an appointment for next Tuesday morning: what happens when you try to do that, and what do you need to do?

Learning Objective Eight - Altering forms

Try out the form **frmStudentsNeedsWork** in Form View. Open it in Design View and improve its appearance and usability. For example try some of these:

Make the **FamilyName** text box wider and taller, for emphasis and to accommodate longer names

Format the label “Student details” in the header to be white text and bold

Remove the unnecessary labels “Address2” and “Address3”, then move the three **Address** boxes closer together

Line up the **Title**, **GivenName** and **FamilyName** boxes

Change the fill colour of the footer to match the header

Learning Objective Nine - Using queries

Some queries are already available in this database, so try them out. If they are useful for future work, you might retain them, but otherwise you could delete them and create new, more appropriate ones.

Run **qryStudentDetails**, then examine it in Design View. In the structure of the query, notice the table with its list of available fields. In the design grid, notice which fields are specified in the columns – these fields will appear when the query is run.

Notice the criteria and sort order that are set for this query. Try changing these, and observe the effect on the query results.

Learning Objective Ten - Working with queries

Create a new query showing the appointments that have been recorded, with their time and date information, sorted in date order. Run the query to test it. Save it as **qryAppointmentDetails**.

Now add the table of student details to the query, and arrange to display the students' names instead of StudentID numbers.

Experiment with criteria such as:

- Show only appointments where the student did not turn up to keep the appointment
- Show only appointments before 10am (Note: format the time using a colon like this 10:00)
- Show appointments with students who live in OX4 postcode area
- Try out AND and OR criteria – adding more criteria on the same row or on different rows

Remember to delete all previous criteria each time, before setting up new ones.

You might set up a number of these queries, saving each with a different name so that you can run them repeatedly as your project progresses.

Further information

Getting extra help

Course Clinics

The IT Learning Centre offers bookable clinics where you can get pre- or post-course advice. Contact us using courses@it.ox.ac.uk.

Study Videos from LinkedIn Learning

On our website, you will find our collection of self-service courses and resources. This includes providing LinkedIn Learning video-based courses free to all members of the University. Visit skills.it.ox.ac.uk/linkedin-learning and sign in with your Single Sign-On (SSO) credentials.

Some courses recommend pre- and/or post-course activities to support your learning. You can watch the online videos anywhere, anytime, and even download them onto a tablet or smartphone for off-line viewing.

About the IT Learning Portfolio online

Many of the resources used in the IT Learning Centre courses and workshops are made available as Open Educational Resources (OER) via our Portfolio website at skills.it.ox.ac.uk/it-learning-portfolio.

Find the pre-course activity for this course in the IT Learning Portfolio: visit skills.it.ox.ac.uk/it-learning-portfolio and search for “starting databases”.

About the IT Learning Centre

The IT Learning Centre delivers over 100 IT-related teacher-led courses, which are provided in our teaching rooms and online, and we give you access to thousands of on-line self-service courses through LinkedIn Learning.

Our team of teachers have backgrounds in academia, research, business and education and are supported by other experts from around the University and beyond.

Our courses are open to all members of the University at a small charge. Where resources allow, we can deliver closed courses to departments and colleges, which can be more cost-effective than signing up individually. We can also customize courses to suit your needs.

Our fully equipped suite of seven teaching and training rooms are usually available for hire for your own events and courses.

For more information, contact us at courses@it.ox.ac.uk.

About IT Customer Services

The IT Learning Centre is part of the Customer Services Group. The group provides the main user support services for the department, assisting all staff and students within the University as well as retired staff and other users of University IT services. It supports all the services offered by IT Services plus general IT support queries from any user, working in collaboration with local IT support units.

The Customer Services Group also offers a data back-up service; an online shop; and a PC maintenance scheme. Customer Services is further responsible for desktop computing services – for staff and in public/shared areas – throughout UAS and the Bodleian Libraries.

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Databases:
Starting to build a database

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Resources for your learning

Activities for you to practice today
- In the coursebook
- Work at your own pace!
- Be selective

Videos with today's topics in LinkedIn Learning

Follow-up work
- Continue with exercises after the session
- Bookable Course Clinics later

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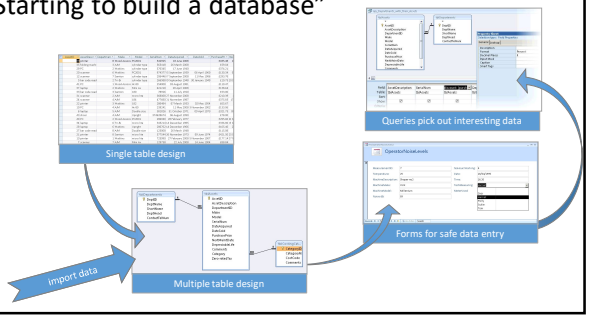
Road map for "Starting to build a database"



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Organising data

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A new database

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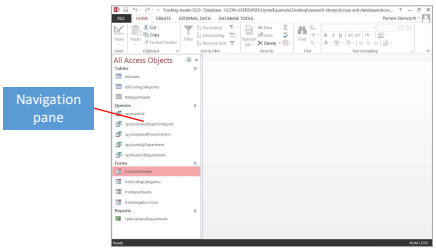
Opening a database file



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** Backup the database **

Save a backup copy of the database

All tables, queries, forms, reports etc are saved in one database file

MyDatabase.accdb

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Tables

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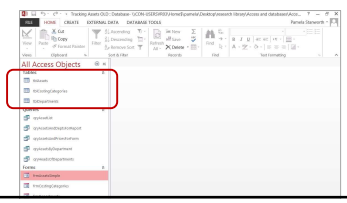
Review the tables

Examine each table

Create new tables

Remove any?



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Datasheet View shows the raw data

not good for editing data ☹

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Design View of a table

Field name (no spaces)
Data type
Description

tblTowns

Field Name	Data Type
identifier	AutoNumber
TownName	Text
PostCodeCentre	Text
Population	Number
contractDoc	Attachment

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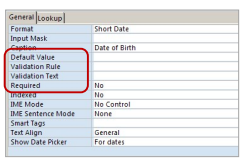
Check properties for individual fields

Set properties to make each field more usable
- Field size, caption, format for dates and numbers

Access cannot test whether the values are *correct*, only whether they are *plausible*

Help the user to give accurate data



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Starting to build a database

Look at Learning Objectives One and Two

Resume at 10:30 please

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Find the resources for this workshop in our IT Learning Portfolio

Download the files
(and more) from the
IT Learning Portfolio at

skills.it.ox.ac.uk/it-learning-portfolio

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Using external data

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Getting data from an external source

Access, *Excel*, text file and others

Import or Link?

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Designing with Multiple Tables

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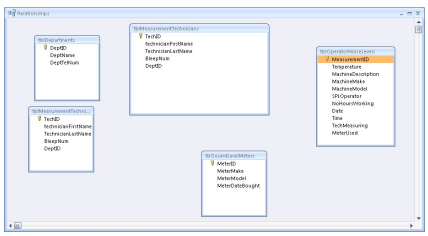
A multi-table database



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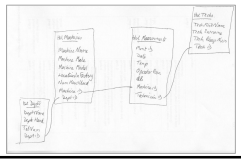
Designing a relational database

Plan it on paper first

Choose the tables, then the fields

Mark how the tables are related



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Choose one field to be the primary key

A field where every record has a *different* value so it can identify the record uniquely

Usually create a dedicated field

e.g. PersonID

Use AutoNumber data type

Use 

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Setting up Relationships

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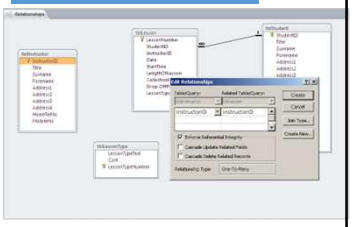
Making relationships between tables

Relationships diagram

Show tables

Move and resize table boxes



Make each join by dragging a field name

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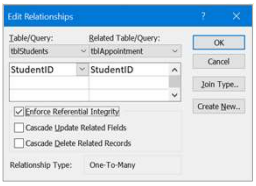
… Referential integrity …

Prevent orphan records

"Every foreign key value must find a matching primary key value"

Database can enforce referential integrity on a join



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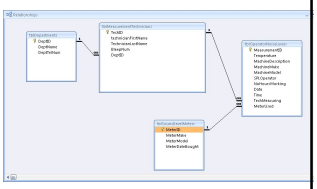
The Relationships Diagram

Join lines appear in the Relationships diagram

- Will be used in future queries

Print the diagram using Relationship Report



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Starting to build a database

Look at Learning Objectives Three, Four and Five

Resume at 11:30 please

And take a break

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Forms for working on data

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Easiest for *people* to work on data using *forms*

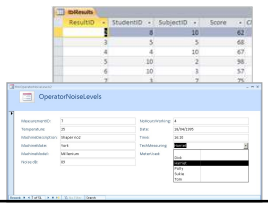
Too risky to work on data in *tables*

A *form* is safe and efficient for humans

Usually one record at a time

Easy to use

Related data appears via drop-downs



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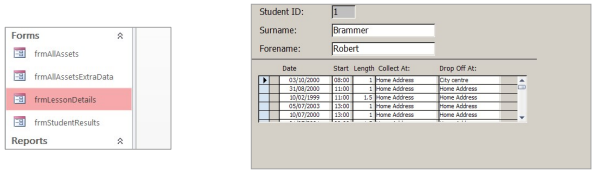
Forms are for entering and editing data



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3 views of a form

Form View	Editing the data Using the form
Layout View	Sample data is visible but not editable Rearranging the form
Design View	No data values Detailed design changes

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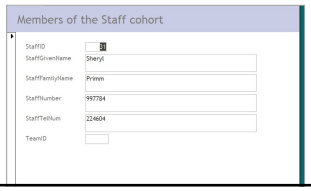
Wizard for creating a form

An easy way to create a simple form
Based on one table (or query)
Some popular options

Plan a family of forms



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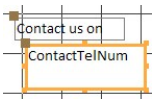
Manipulating a text box

Each text box has a label
- Selecting
- Moving
- Re-sizing



Edit text inside a label

Add another control

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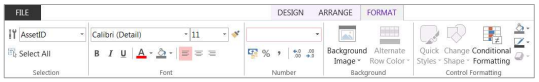
Buttons for popular formatting options

Font formatting
Colours, lines and fills
Number, date formatting



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Starting to build a database

Look at Learning Objectives Six, Seven and Eight

Resume at 12

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Queries for analysing data

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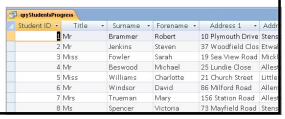
Queries for analysing data

Creating a query using the wizard

Only selected fields and selected records are shown
- Beware: editing the data here is changing the source data in the tables

When query is run, presents the latest values from the tables



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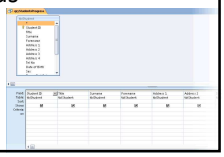
Query Design View

Switch between Design and Datasheet Views

Diagram shows tables, fields and joins

Design grid lists the selected fields



Close and save the query

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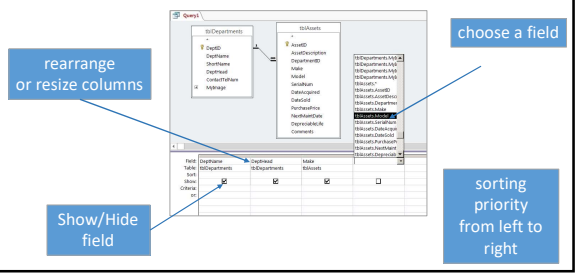
Changing a query design



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A query based on two tables – or more

In Query Design View

Show Table

Add all the tables needed for this enquiry

Joins show any existing relationships

Any record which appears in both tables appears in the results dataset

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Query criteria

Query Design

Limit the records included in the results

Enter a value under one field

All records which exactly match will be included

AND, OR, NOT

Comparisons using > < >= <= Between

Wildcard symbols * ?

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Where next?

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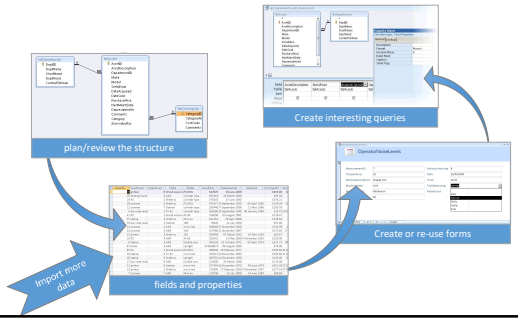
Where next?



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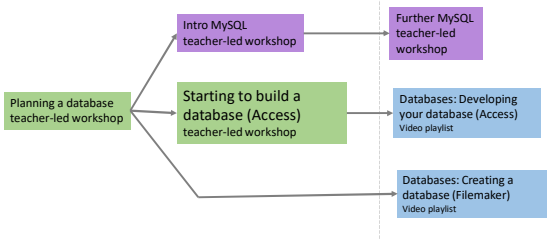
Databases – Routes to Learning



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Starting to build a database

Look at Learning Objectives Nine and Ten

Finish at 12:30

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