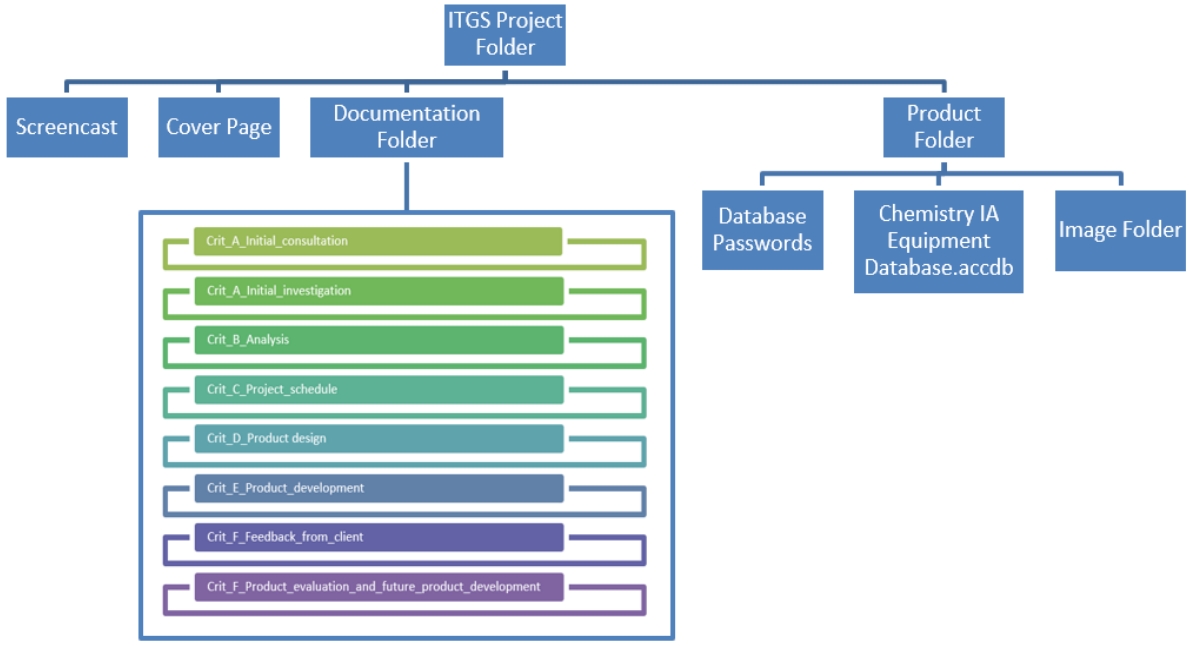
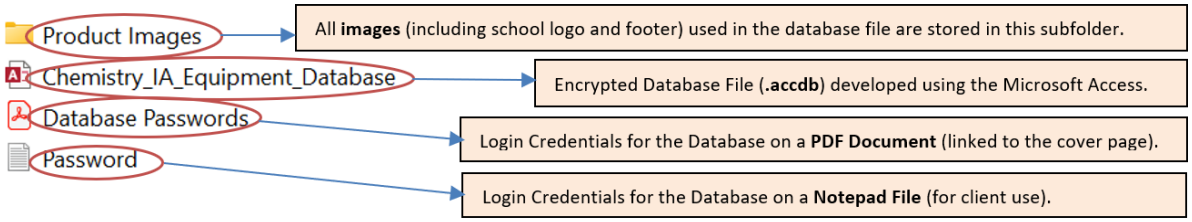
Criterion E: Product development

Project Folder Structure



Documentation Folder: Contains word and pdf documents of all criterion files.

Structure of Project Files: Consists of one database file and two passwords file.



Overall Structure of the Database

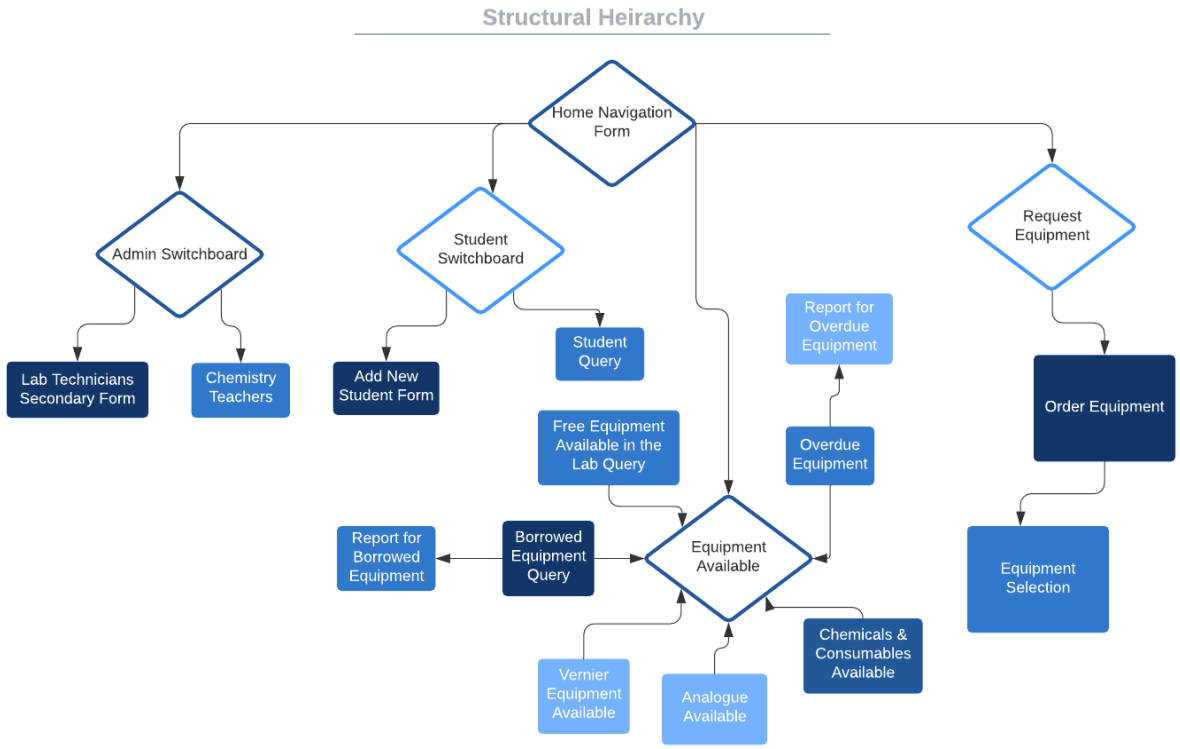


Figure 0.1 Structural Hierarchy of the MS Access Database (Candidate, 2021)

Basic Techniques

- Logo Designing/Creation with Adobe Photoshop
- Creating a Blank Database and creating tables
- Designing Forms and adding navigation buttons on forms
- Database Encryption
- Relationships

Non-Basic (Advanced) Techniques

- Hard-code embedded password on forms
- Access Switchboard
- Parameter Queries
- Macros and Do-commands
- Creating Reports

Technique 1 – Logo Designing/Creation with Adobe Photoshop[1]

The logo for the database was created using adobe photoshop CS5 (64 bits)[1]. First a new transparent page was opened: **File>Open>Size 210 x 210>International Paper>Transparent.** The school logo and chemistry orbital diagram picture given by the client was imported and dragged onto the transparent page. Using the magnetic lasso tool[2] the outside of the school logo was cropped and a Ctrl+C shortcut was used to copy and paste into the centre of the orbital diagram. The text was added in bold font and the saturation and opacity of the logo were changed to blend with the chemistry orbital diagram. This was done to ensure that the logo is connected to the theme of chemistry and scientific exploration. Then in order to make the logo more professional the background was removed using the brush tool and the file was saved in PNG format, by clicking: **File>Save As>Name: D**

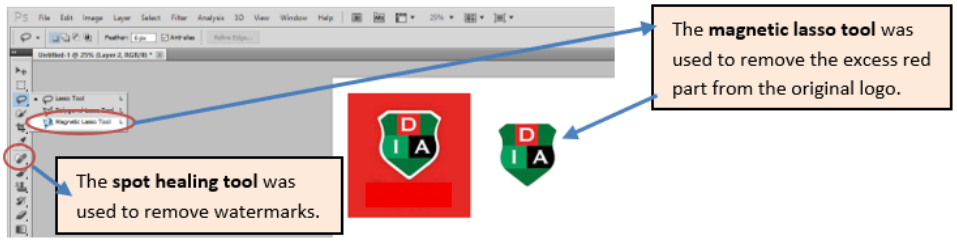


Figure 1.1 - Cropping the original logo given by the client

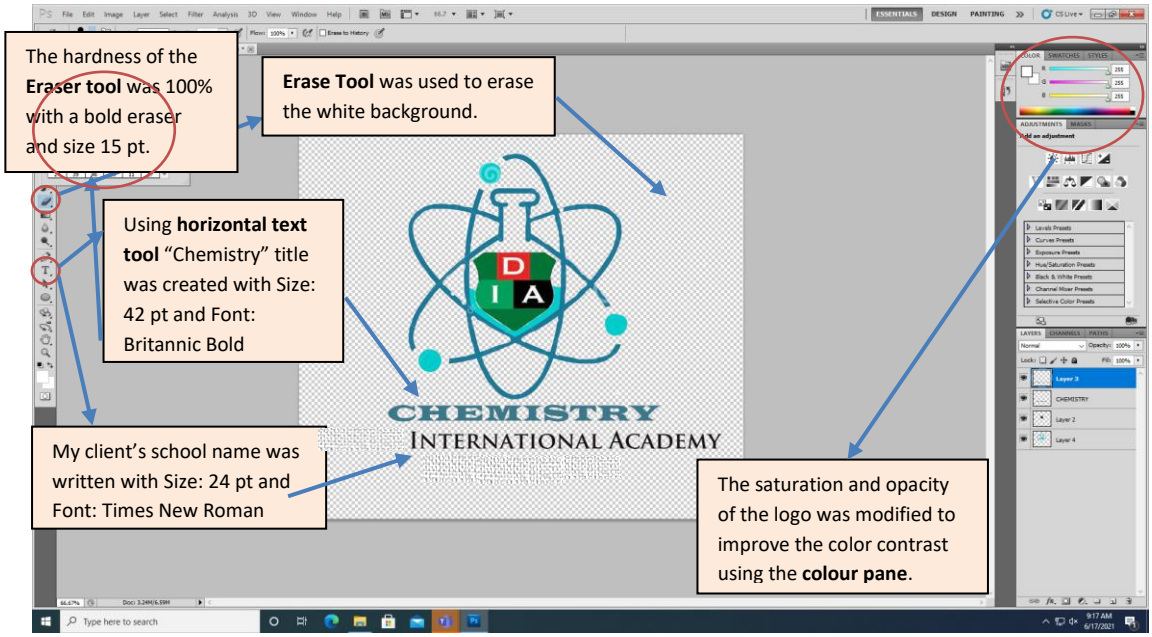


Figure 1.2 - Final Stage of designing the logo

Figure 1.3 - Final Logo that will be displayed on the top left hand side of the database

[1] McCathran, Kelly, et al. "Adobe Photoshop CS5." 12.0.4.

[2] "Adobe Help Center." Adobe Photoshop Tutorials, http://helpx.adobe.com/ae_en/photoshop/how-to/photo-editor.html. Accessed 12 Sept. 2021.

Technique 2 – Creating a blank database with MS Access[3] and adding tables

First, a blank database was opened on MS Access[3] by clicking **File>New>Blank Database** and it was saved as an Access Database in the file format: Chemistry_IA_Equipment_Database.accdb.

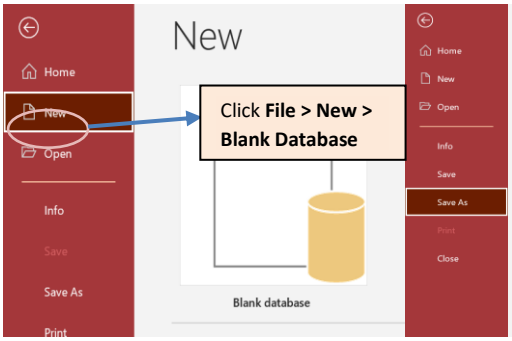


Figure 2.1 - Opening a blank database

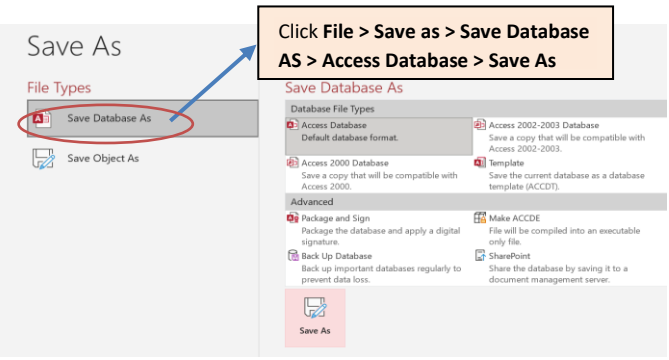


Figure 2.2 - Save the Database As an Access Database

Creating Tables

Tables for the teachers, the students, the apparatus, equipment selection and order equipment were created by clicking **Create>Table**. This was done to collect data in a tabular format to create relationships. Relevant validation rules were added and tested to ensure that the data entered is in the correct format and an appropriate data type is given.

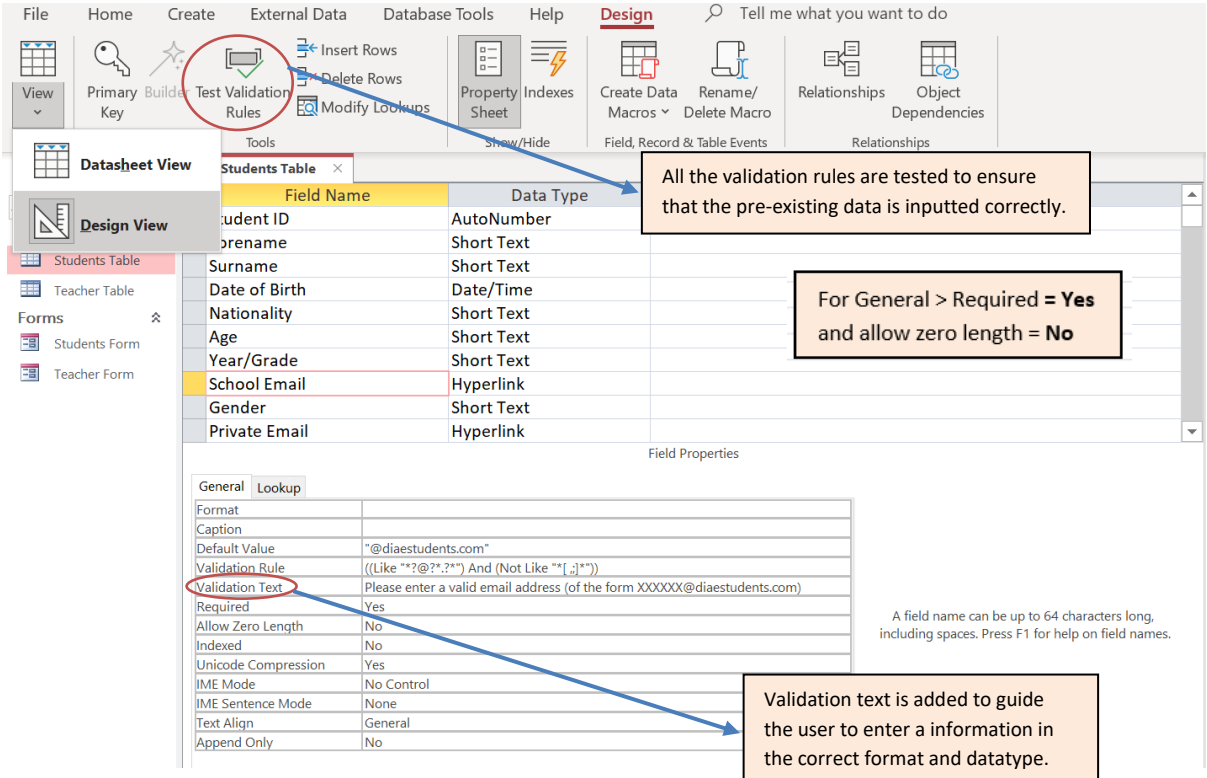


Figure 2.3 - Creating the student's table in Design View

[3] MS Access 2021

Examples of Validation Rules used within the database:

- Presence Checks:
  - **Rule:** Presence = Yes
- Length Checks for personal phone numbers:
  - **Validation Rule:** Field Size = 12
  - Validation Text: Please enter a valid phone number with an international code
- Student ID Format
  - **Format:** "DIA"000000
- Non-zero length = Yes
- Format for Email Address for Teachers and Students:
  - Rule: ((Like "*?@?*.?*") And (Not Like "*[,;]*"))
  - **Validation Text:** Please enter a valid email address (of the form XXXXXX@diaestudents.com)
- Lookup Wizard for a Predefined Value List
  - Value List = "Broken", "Used" & "New"

For all other tables: The same process is used to create all other tables with their respective validation rules and data types.

Importing Data: All the data given by the client (on the excel spreadsheet) is imported to the MS Access Database[3].

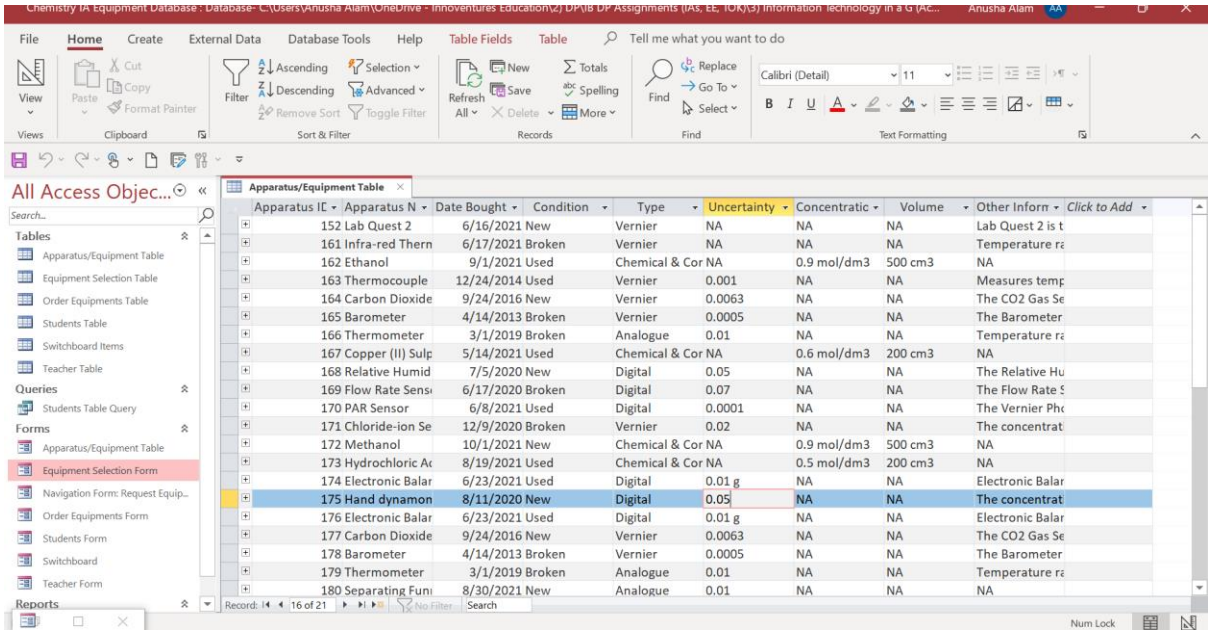


Figure 2.4 Datasheet view of the Apparatus/Equipment Table with Data provided by the client

Technique 3 – Designing forms and inserting navigation buttons on MS Access

Designing the Sub forms[4]

In order to create a form for the tables, **Create>Form Wizard** was clicked and the teacher's table was selected. All the fields were selected from the list of available fields and the columnar layout was chosen. Sub-forms were added to make the interface look more user-friendly and interactive for my client and her students.

For all other forms: The same process is repeated to create forms for other tables and each of these forms is linked to the switchboards and the home navigation form.

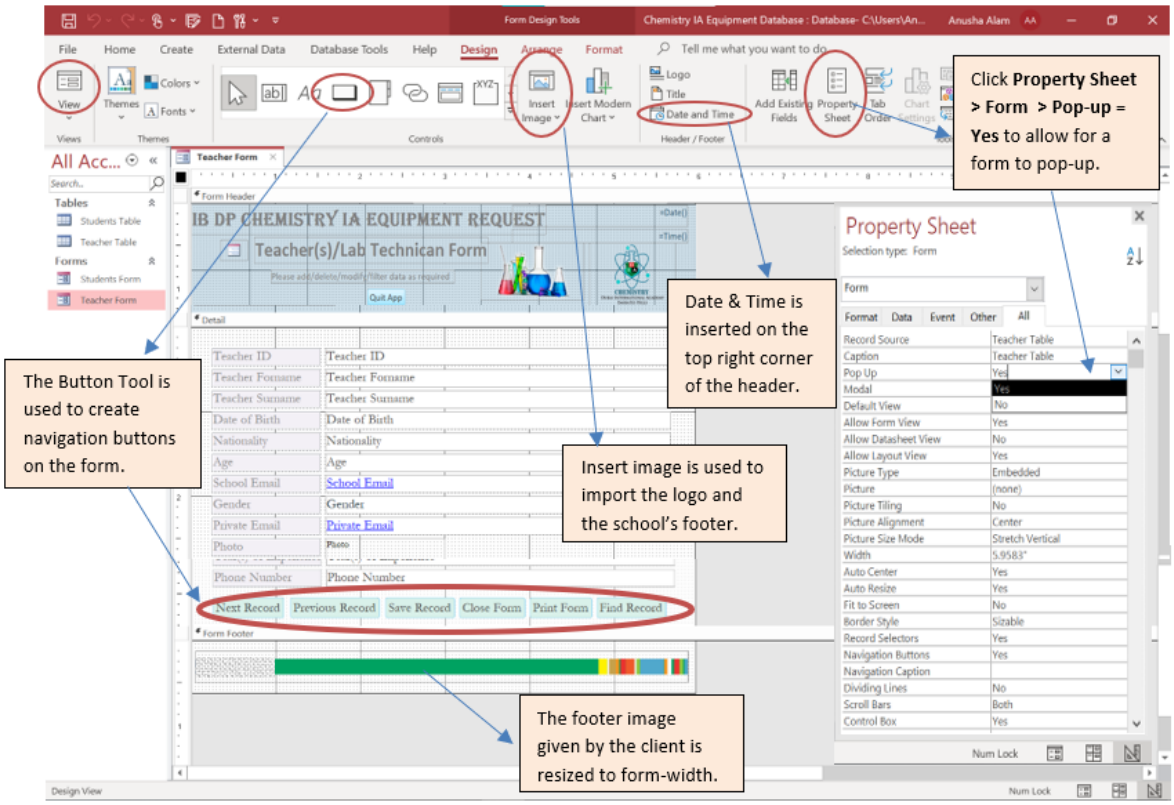


Figure 3.2 – Designing the teacher form using the form wizard on MS access.

[4] "Access: Creating Forms." GCFGlobal.Org, http://edu.gcfglobal.org/en/access/creating-forms/1. Accessed 14 Sept. 2021.

Designing the Home Navigation Form[5]

To make navigation easier for the students to request orders, a home navigation form was created to view the apparatus, equipment-selection and order form in one location without having to open individual forms. Horizontal tabs for the navigation form are chosen because a horizontal menu bar is more distinctly visible for my client without having to scroll down. It is also more aesthetically pleasing and consistent with other forms.

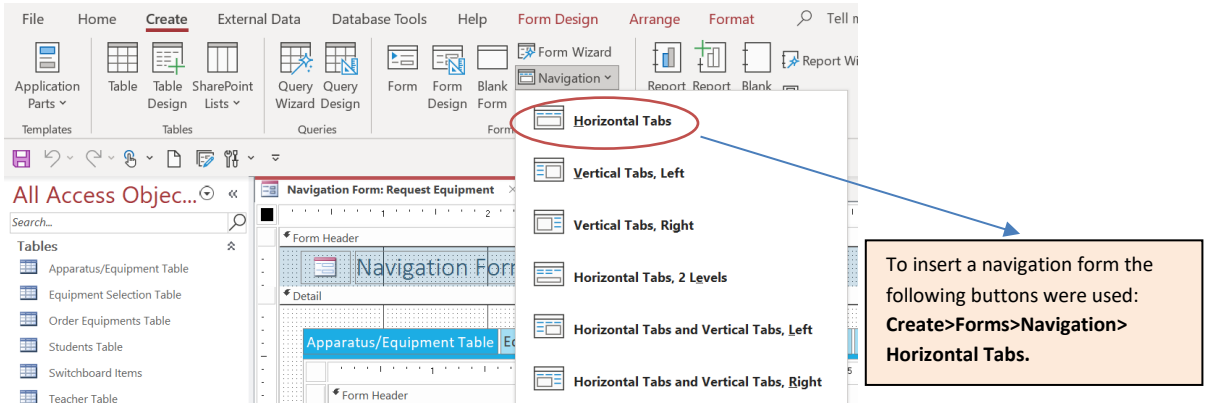


Figure 3.3 Inserting a horizontally-tabbed home-navigation form

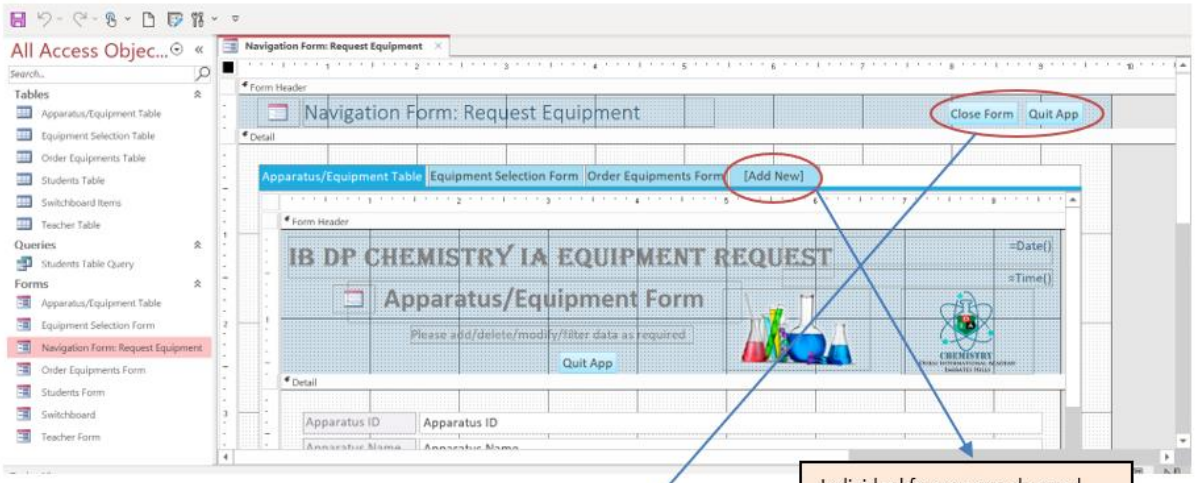


Figure 3.4 Merging Sub-forms into the Home Navigation Form

[5] Video: Create Navigation Forms. http://support.microsoft.com/en-us/office/video-create-navigation-forms-67773fba-1ddb-4624-a07f-fc84e8c82de8. Accessed 18 Sept. 2021.

Technique 4 – Database Encryption on MS Access[6]

The MS Access[6] database was encrypted with a password to ensure that all the data of my client's school remains confidential. First, the database was opened in exclusive mode by clicking **File>Open>Browse> File: "Chemistry IA Equipment Database">Open Exclusive[7].** Then re-click **File>Info>Encrypt with Password>Set Database Password: Chemistry4U** (decided by the client) and click verify.

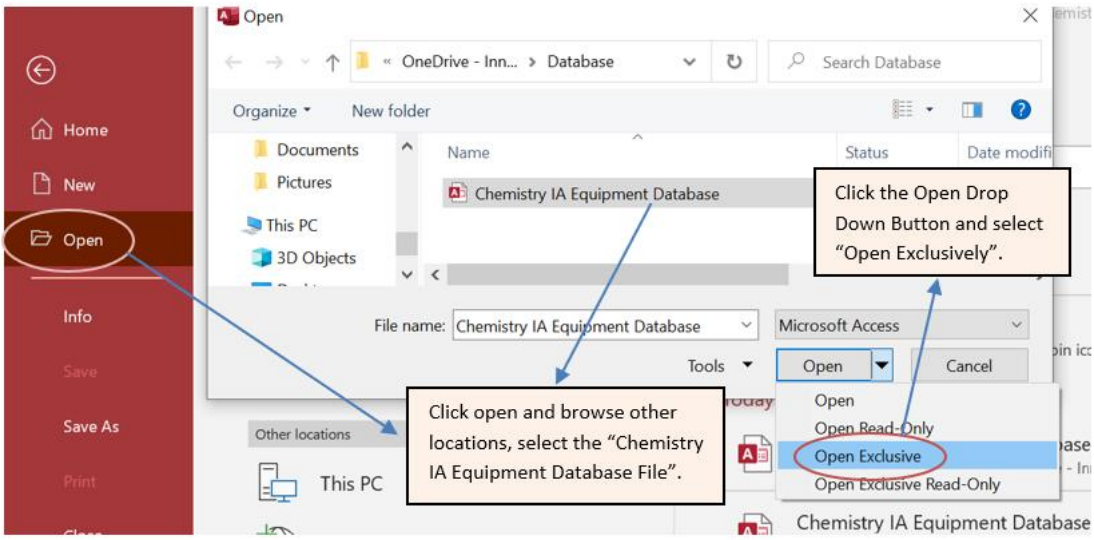


Figure 4.1 - Opening the MS Access Database file exclusively

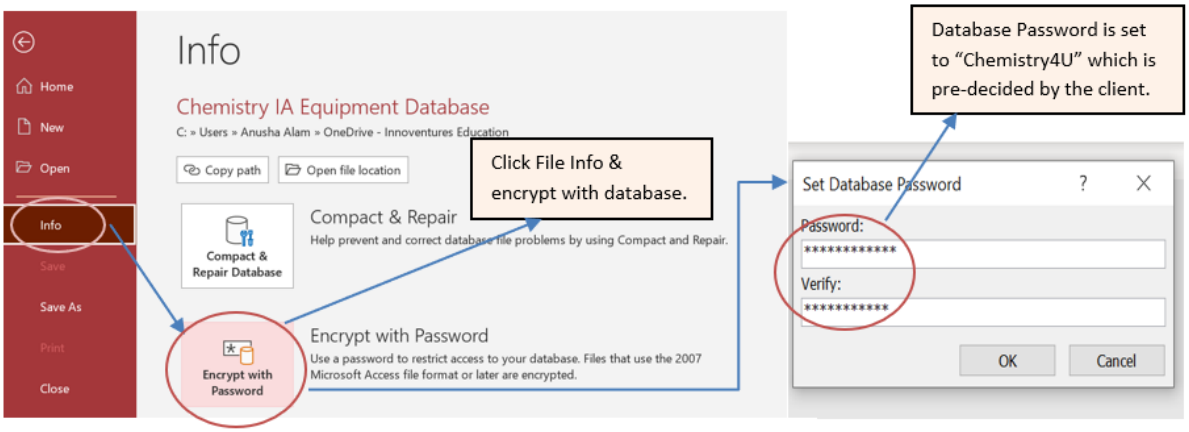


Figure 4.2 – Encrypting the Database with a password

Figure 4.2 - Setting a Database Password

The password is saved on to a Notepad File and a word document for the client's future use.

[6] MS Access 2021

[7] Encrypt a Database by Using a Database Password. http://support.microsoft.com/en-us/office/encrypt-a-database-by-using-a-database-password-12aa0e5c-34c6-4957-af3b-b5f5cfa9a766. Accessed 17 Sept. 2021.

Technique 5 – Relationships on MS Access[8]

Relationships were created to prevent any redundancy of data and maintain structured data. First, all 5 tables were imported to the relationships page by clicking **Add Tables>Add Selected Tables**. Then a one-to-many relationship was created between all primary and foreign keys. Then enforce referential integrity was deselected.

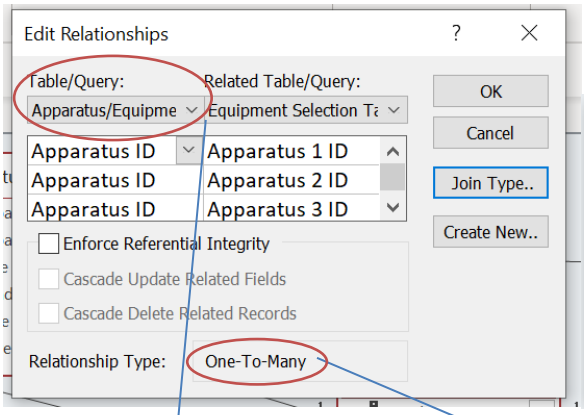


Figure 5.1 Editing relationships between fields

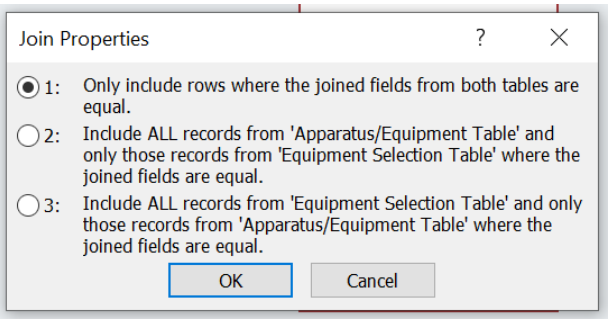


Figure 5.2 Modifying join-type properties to Option 1

The primary key of the "Apparatus Table" was linked with the secondary keys in the equipment selection table.

One-to-many relationships are selected to allow multiple secondary fields to be connected to a single primary key.

The same process of inserting one-to-many relationships was used to create other relationships between the order equipment table and teacher ID and student ID.

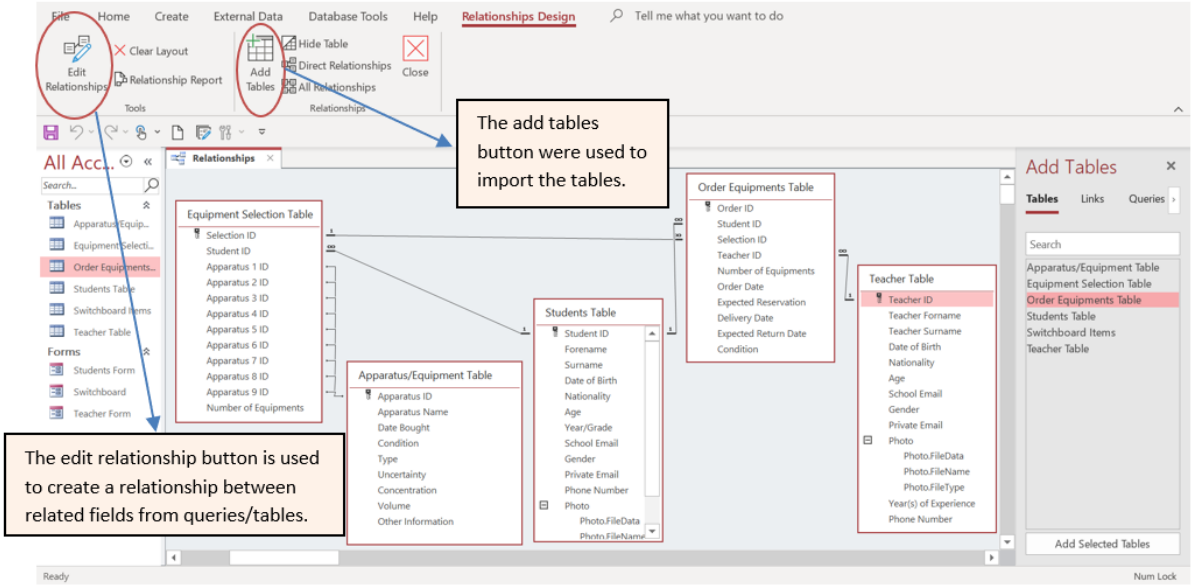


Figure 5.3 Relationship design for the entire database (across the 5 tables)

The relationships will allow each user to select values from a predetermined set of data using the primary keys which will appear as a drop-down list within form view.

[8] MS Access 2021

Technique 6 – Hard-code embedded password[9] on forms

There was a hardcoded embedded password[5] inserted on the teacher form to prevent any unauthorized user from accessing or manipulating any personal information of the teachers (i.e. as specified by my client). The password is set to: **Chemistrystaff**. First, the teacher form is opened in design view; then the following is clicked **Property sheet>Event>On open** and then more options was clicked to open a Microsoft visual basic for applications. The error message was entered into the message box to guide the user.

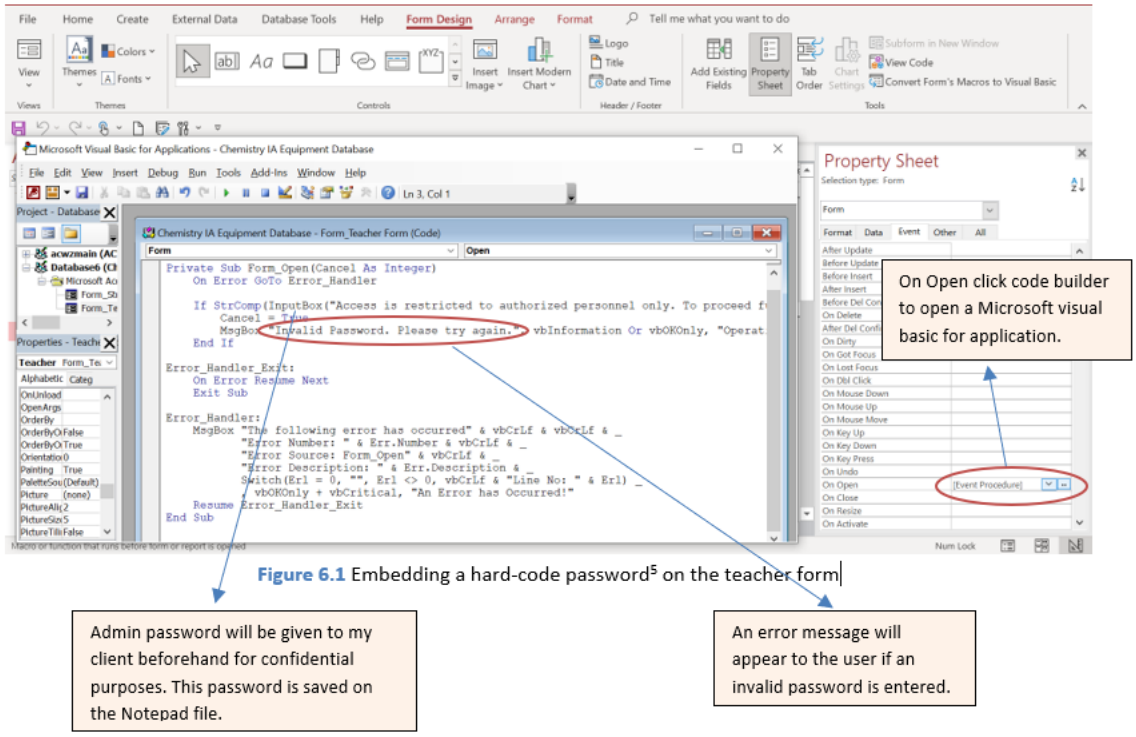


Figure 6.1 Embedding a hard-code password[5] on the teacher form

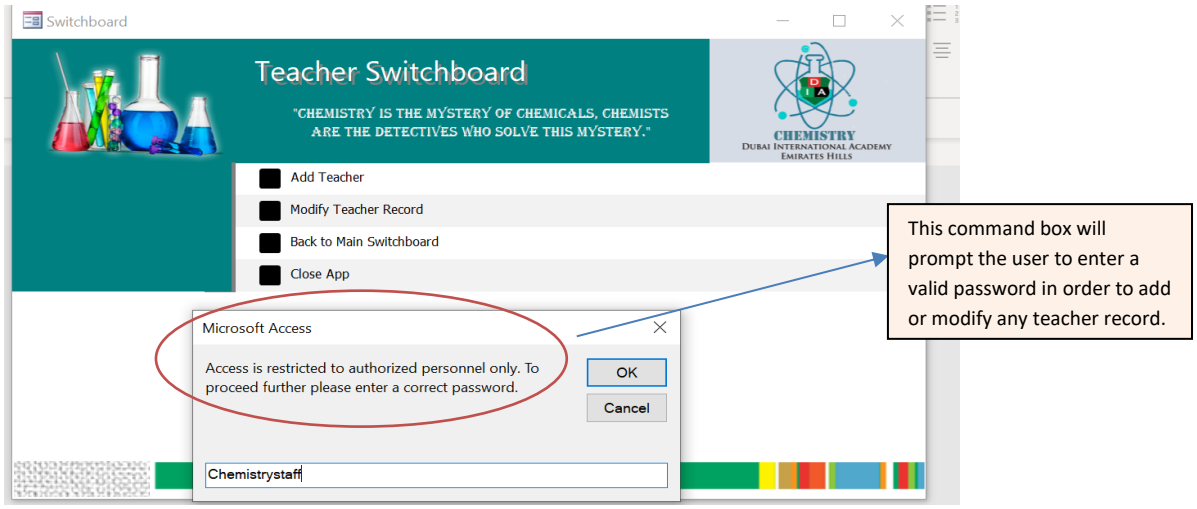


Figure 6.2 Password login form for authorized users

[9] Pineault, Daniel, et al. "Access - Password Protect a Form or a Report." *DEVelopers Hut*, 16 Sept. 2018, www.devhut.net/2018/09/16/access-password-protect-a-form-or-a-report/. Accessed 15 Sept. 2021.

Technique 7 – Switchboard[10]

To make the navigation through the database more convenient, a custom switchboard manager was inserted which allowed the user to run reports, maintain data and close the application from one location. The switchboard manager was added by clicking the customize quick access toolbar and clicking: **Choose commands from>All Commands>Switchboard Manager>Add>Ok.** After a switchboard manager was opened and the main switchboard was titled **Chemistry IA Equipment Database**. This switchboard was set to default for navigation purposes.

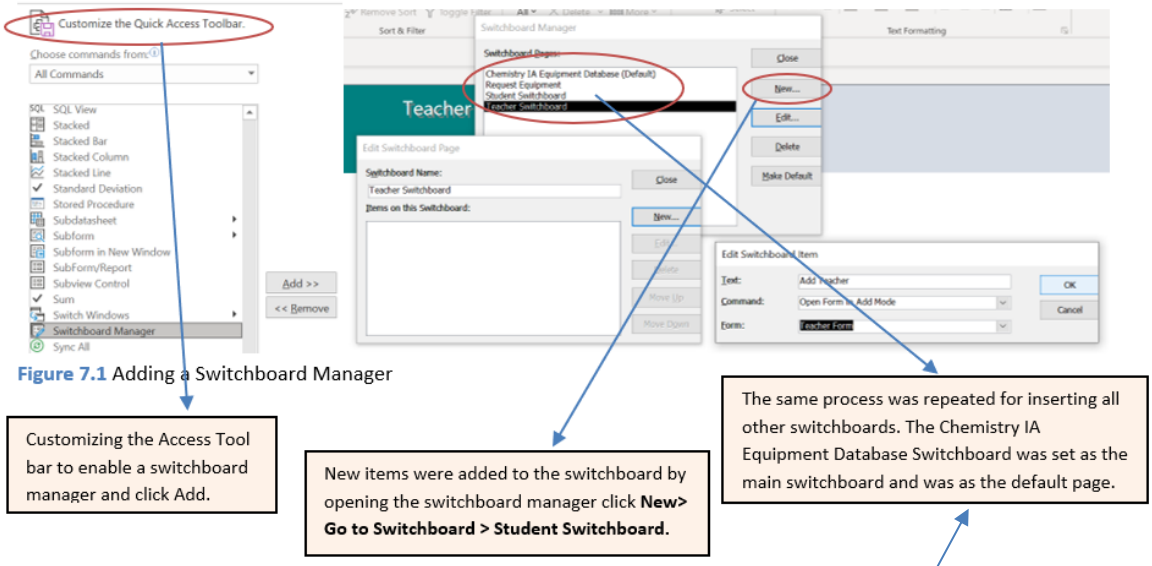
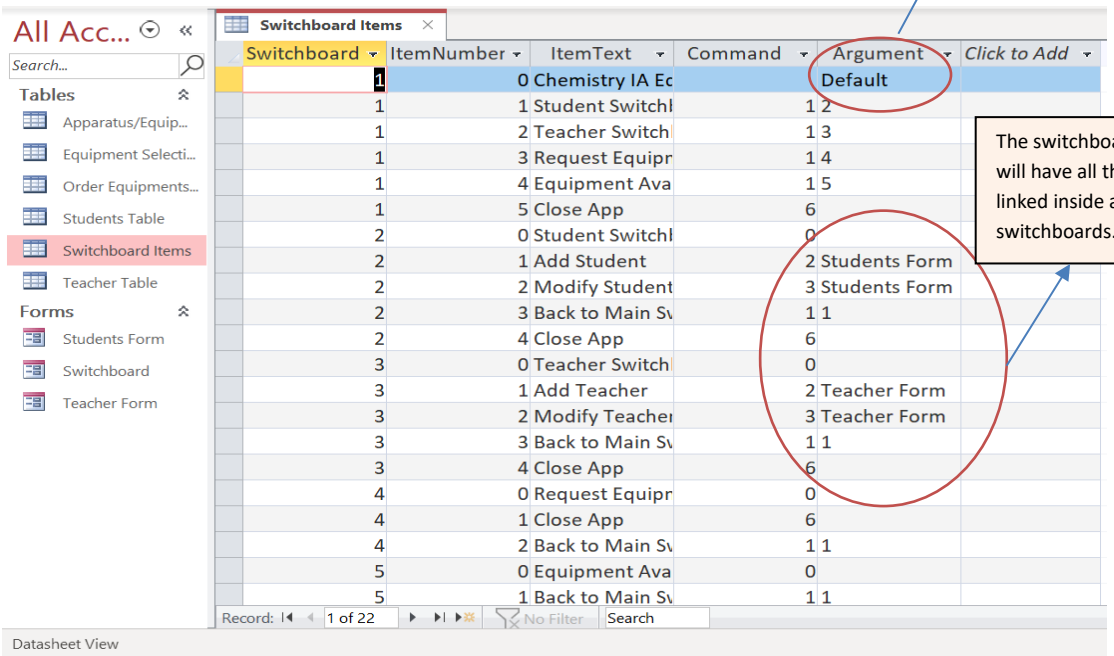


Figure 7.1 Adding a Switchboard Manager

Customizing the Access Tool bar to enable a switchboard manager and click Add.

New items were added to the switchboard by opening the switchboard manager click **New> Go to Switchboard > Student Switchboard.**

The same process was repeated for inserting all other switchboards. The Chemistry IA Equipment Database Switchboard was set as the main switchboard and was as the default page.



The switchboard manager will have all the sub forms linked inside and all other switchboards.

Figure 7.1 Table of Switchboard Items

[10] Create and Use a Switchboard. https://support.microsoft.com/en-us/office/create-and-use-a-switchboard-f8b3d607-8f1f-4ecf-9979-79b1565f5471. Accessed 20 Sept. 2021.

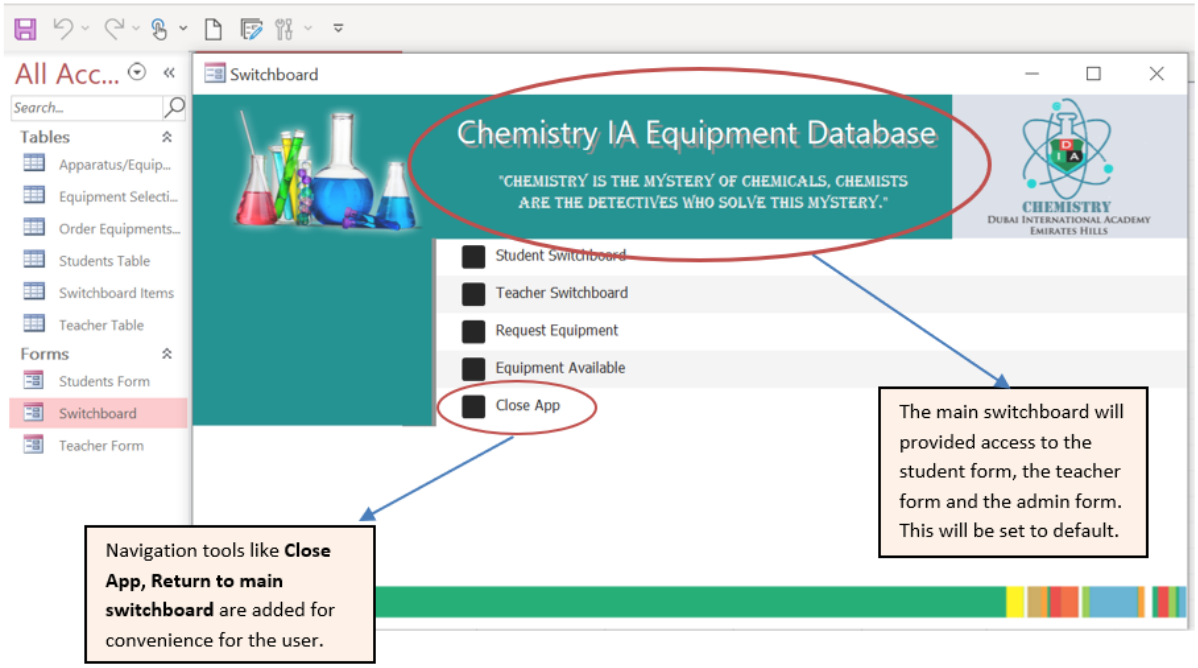


Figure 7.3– Main Switchboard on MS Access

The switchboard manager[11] is set to open by default.

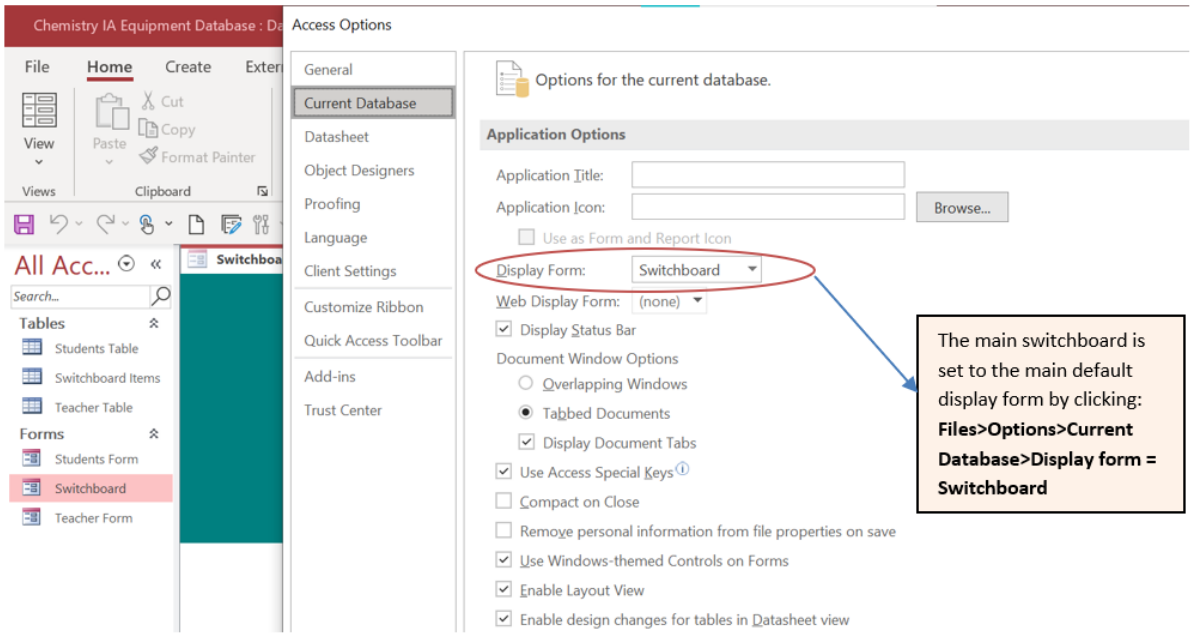


Figure 7.4– Setting the main switchboard as the default page

[11] Create and Use a Switchboard. https://support.microsoft.com/en-us/office/create-and-use-a-switchboard-f8b3d607-8f1f-4ecf-9979-79b1565f5471. Accessed 20 Sept. 2021.

Technique 8 – Parameter Queries

A parameter query[12] was created to organize the teacher and student table by alphabetical order of the forename. This allowed the client to search for specific apparatus and students (in a particular grade) conveniently based on a certain search parameter. First, the table was opened and then **Create>Query Wizard>Simple Query Wizard**.

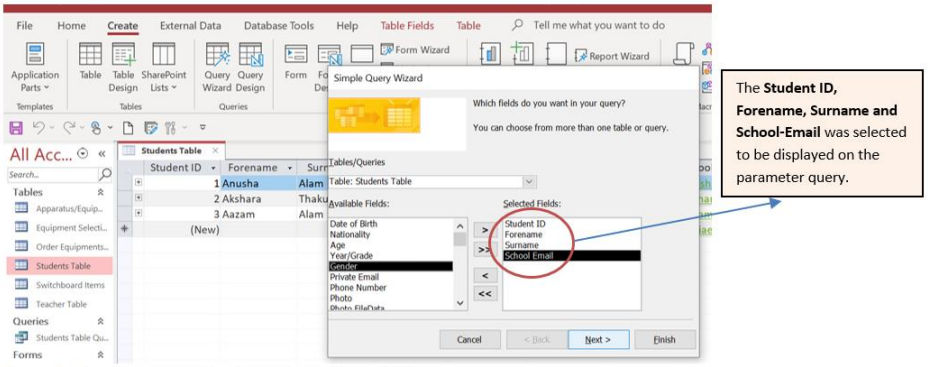


Figure 8.1 Creating a query for the student table on MS Access

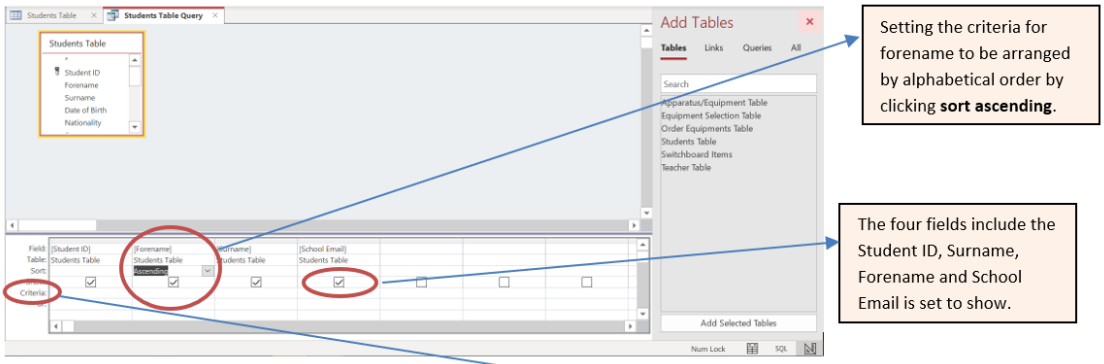


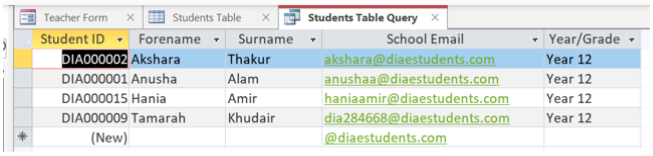
Figure 8.2 Adding filters to the selected fields on the Parameter Query

For example, to search students by a particular grade the following criteria is set:

Criteria = Like "*" & [Enter Grade] & "*"

To search specific condition of apparatus (e.g. broken/used/new) the following criteria is set:

Criteria = Like "*" & [Enter Condition] & "*"



Students Table Query

Student ID	Forename	Surname	School Email	Year/Grade
DIA000002	Akshara	Thakur	akshara@diaestudents.com	Year 12
DIA000001	Anusha	Alam	anushaa@diaestudents.com	Year 12
DIA000015	Hania	Amir	haniaamir@diaestudents.com	Year 12
DIA000009	Tamarah	Khudair	dia284668@diaestudents.com	Year 12
(New)			@diaestudents.com	

Figure 8.3 Student Table Query Output (Organized Alphabetically by Forename) and in Grade 12 (Defined Parameter)

For all Other Queries: The same process was used to create other queries for borrowed, broken and returned equipment so that my client and lab technicians can easily monitor the required data.

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[12] TeachUComp. "Access 2016 Tutorial Parameter Queries Microsoft Training." YouTube, 13 Sept. 2016, http://www.youtube.com/watch?v=Z6k-9QZ3QIY.

Technique 9 – Macroes[13] and Do-Commands

An embedded macro was inserted on Microsoft Access[14] to allow the client to generate specific reports of apparatus using the Apply Filter Macro. This is to allow the client to easily print reports containing specific information and data about the broken, available and unavailable equipment.

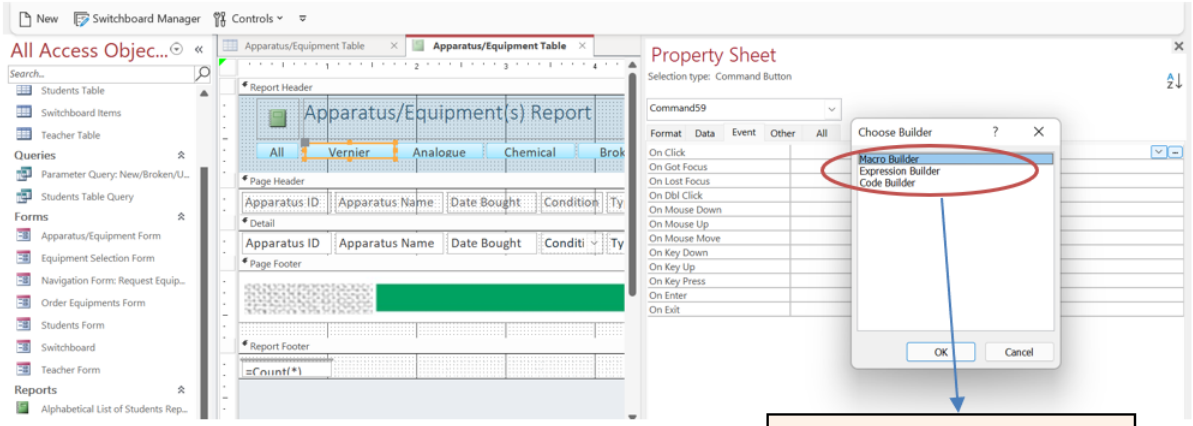

Figure 9.1 Opening the Macro Builder (On Click) for each button on report

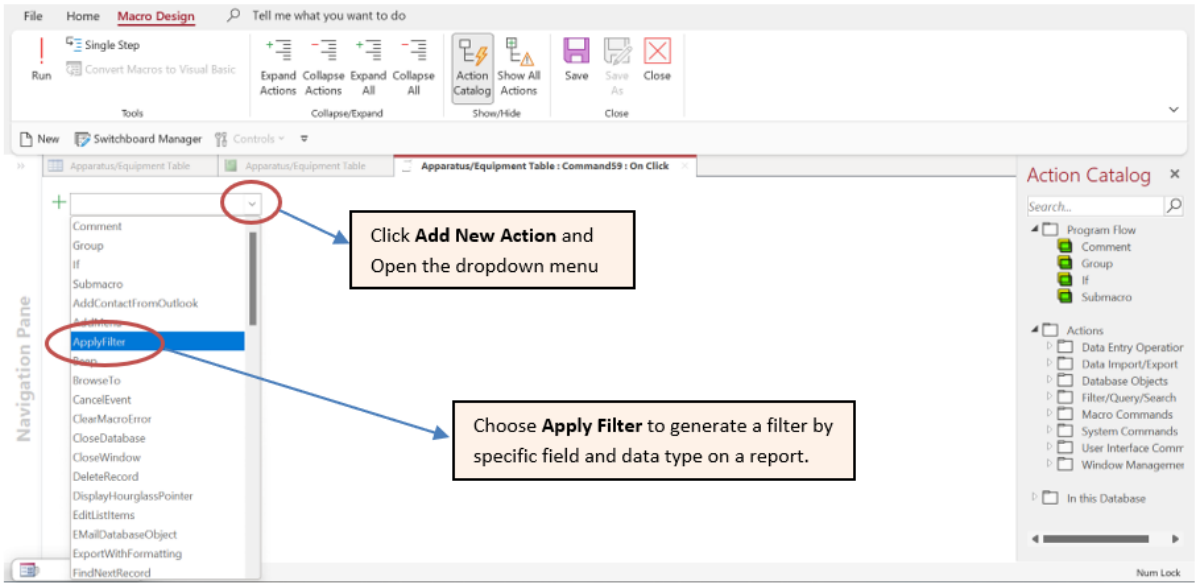

Figure 9.2 Selecting the ApplyFilter Macro to generate a filter of specific records

Expressions used inside the expression builder to set where conditions for the Macro

1. All Category: Where Condition = [Condition] =True
2. By Availability: Where Condition = [Available]=-1
3. By Equipment Type: Where Condition = [Type]="Specific Type"
4. By Equipment Condition: Where Condition = [Condition]="Specific Condition"

[13] Learning, LinkedIn. "Access Tutorial: Embedding Macros into Buttons." YouTube, 8 Feb. 2013, https://www.youtube.com/watch?v=qiNd0RqohGk.

[14] MS Access 2021

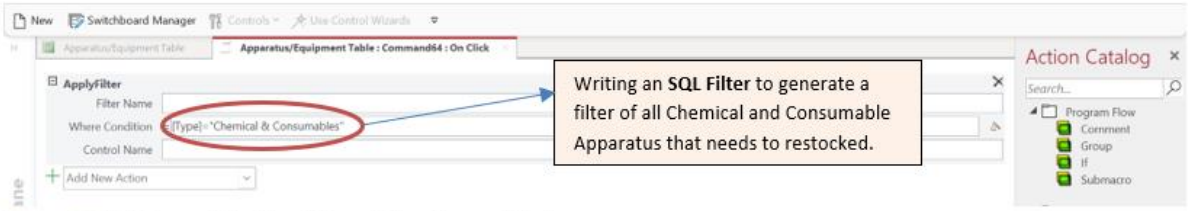

Figure 9.3 Writing an SQL Filter[15] for a Select Type of Equipment

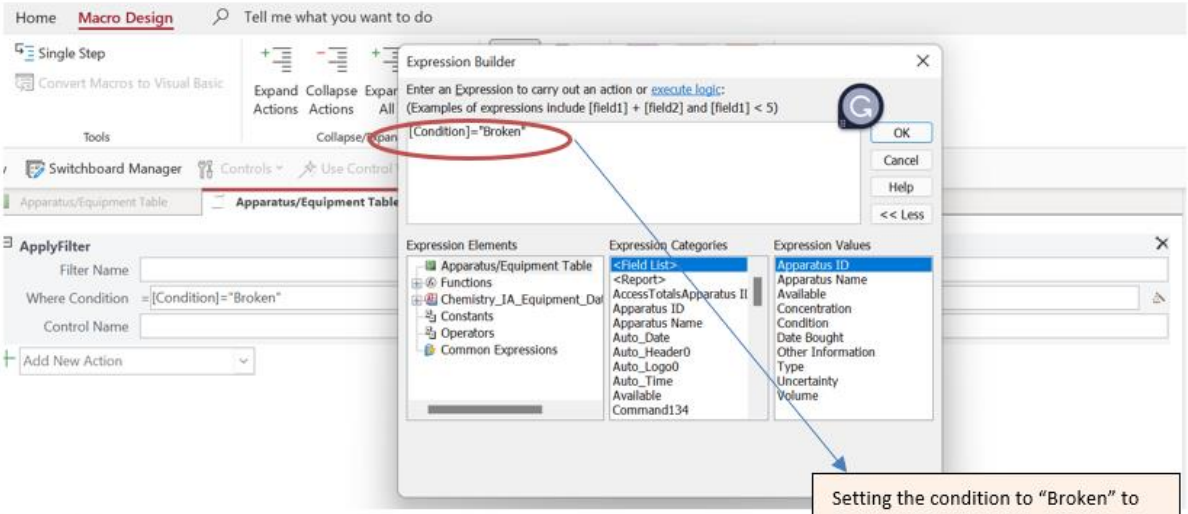

Figure 9.4 Writing the expression on the expression builder to filter apparatus

End Result[15]:

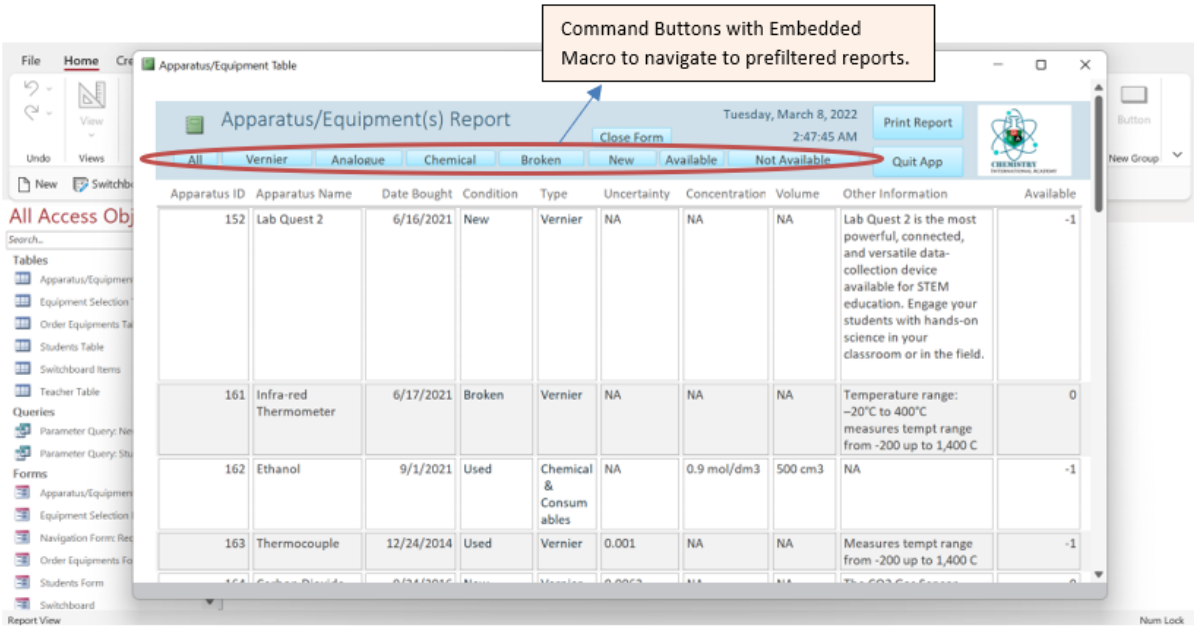

Figure 9.4 Output of Embedded Macro on a Report

The same process was repeated to run macros to Open Queries from the main switchboard.

[15] Learning, LinkedIn. "Access Tutorial: Embedding Macros into Buttons." YouTube, 8 Feb. 2013, https://www.youtube.com/watch?v=qiNd0RqohGk.

Technique 10 – Creating Reports[16]

All the reports are auto-sized to fit the page and alternating coloured fields are enabled. A report was created for each parameter query which allows the client to create reports of each search. The client can run reports directly from the main switchboard for quicker navigation. The same process is repeated for creating all other reports.

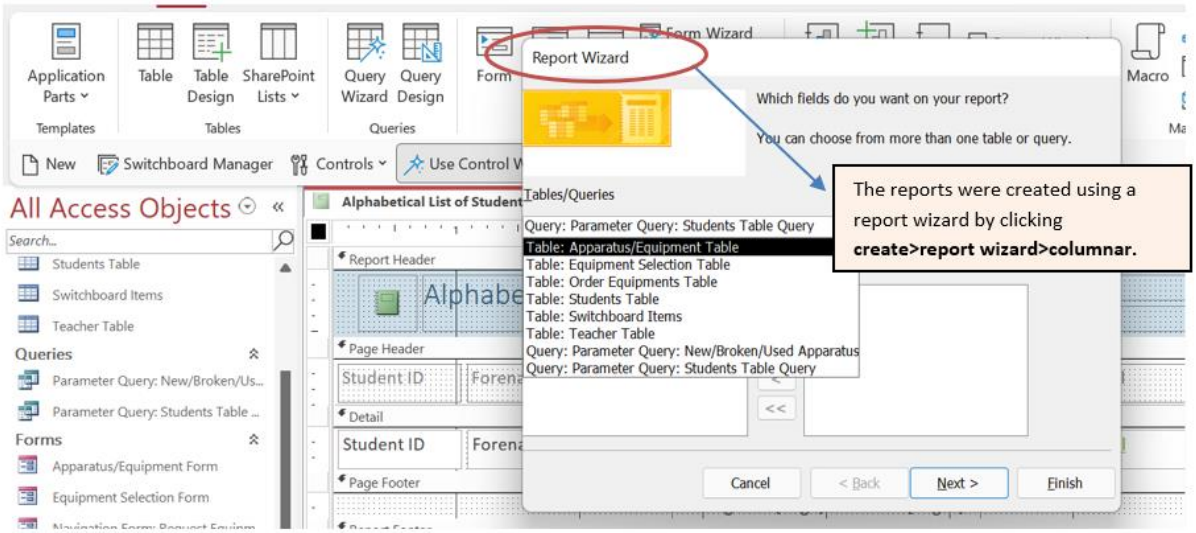

Figure 10.1 Opening the Report Wizard to Create a report

End Result

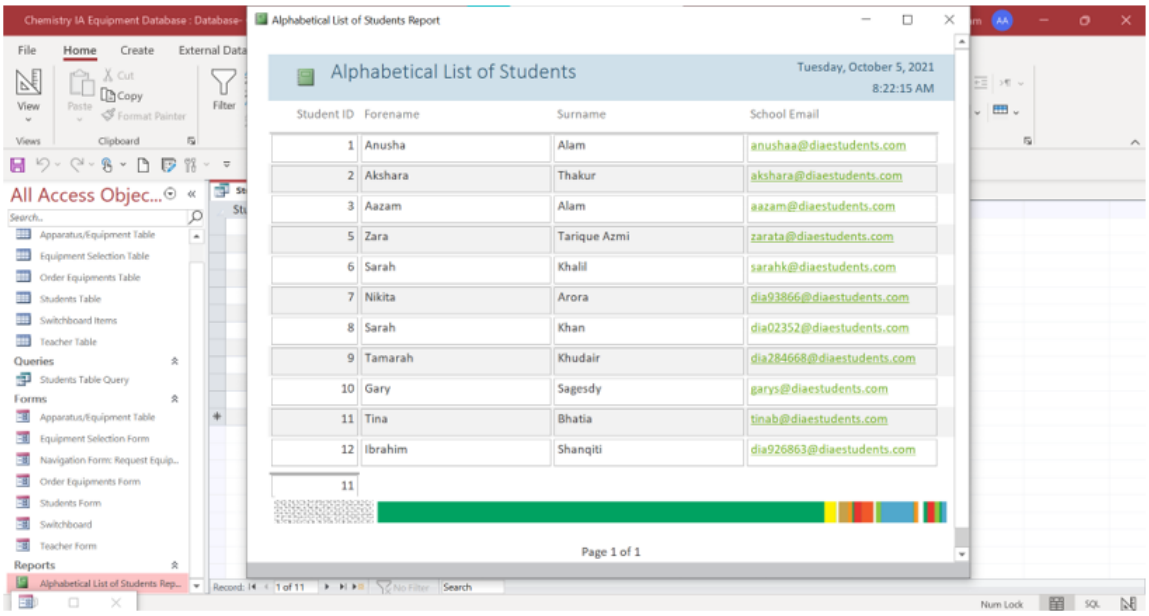

Figure 10.2 Output – Report View of the Students Table Organized Alphabetically

Word Count: 999

[16] Create a Simple Report. http://support.microsoft.com/en-us/office/create-a-simple-report-408e92a8-11a4-418d-a378-7f1d99c25304. Accessed 14 Sept. 2021.