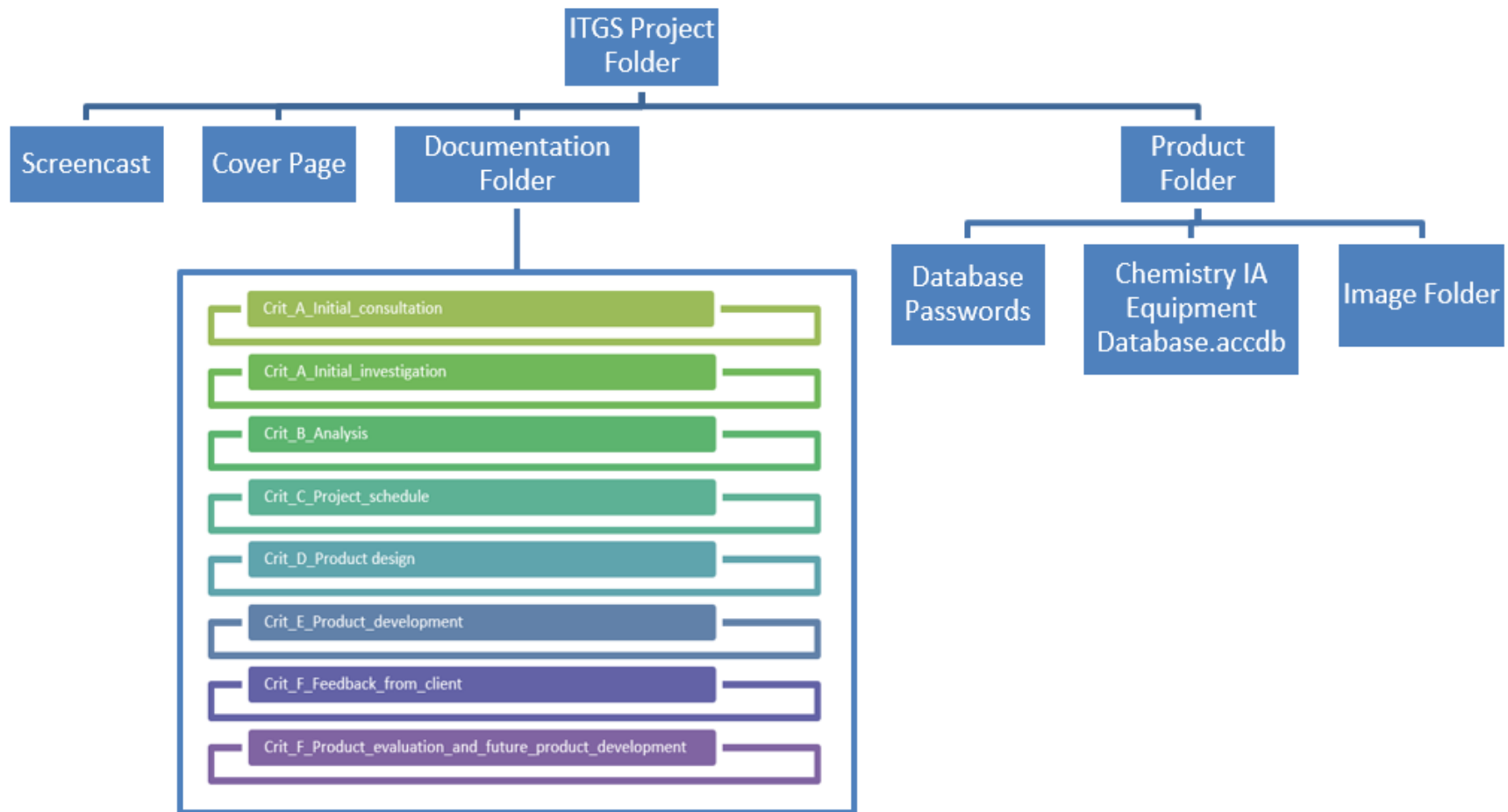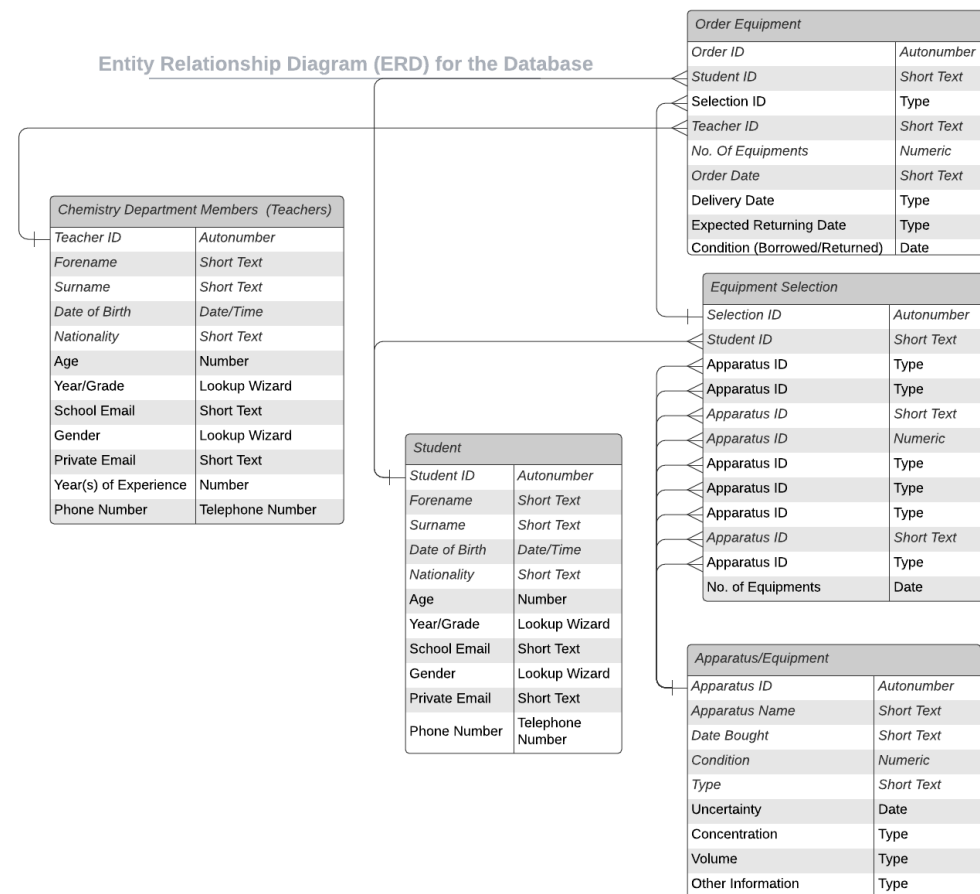# Criterion D: Product design—Overall structure

**Project Folder Structure:** Structure of ITGS Project Folder

## Overall Structure of the Microsoft Access Database: ERD Diagram

This entity-relationship diagram (ERD) shows the one-to-many relationship between the tables to reduce the redundancy of data indicated by the lines connecting the primary and secondary IDs across tables.  The arrows represent the primary keys (IDs) connecting with the secondary keys (IDs) representing a one-one relation between different fields of data. This will help reduce the redundancy and repetition of data.

**Entity Relationship Diagram (ERD) for the Database**

**Order Equipment**

| Order ID | Autonumber |
|---|---|
| Student ID | Short Text |
| Selection ID | Type |
| Teacher ID | Short Text |
| No. Of Equipments | Numeric |
| Order Date | Short Text |
| Delivery Date | Type |
| Expected Returning Date | Type |
| Condition (Borrowed/Returned) | Date |

**Chemistry Department Members  (Teachers)**

| Teacher ID | Autonumber |
|---|---|
| Forename | Short Text |
| Surname | Short Text |
| Date of Birth | Date/Time |
| Nationality | Short Text |
| Age | Number |
| Year/Grade | Lookup Wizard |
| School Email | Short Text |
| Gender | Lookup Wizard |
| Private Email | Short Text |
| Year(s) of Experience | Number |
| Phone Number | Telephone Number |

**Equipment Selection**

| Selection ID | Autonumber |
|---|---|
| Student ID | Short Text |
| Apparatus ID | Type |
| Apparatus ID | Type |
| Apparatus ID | Short Text |
| Apparatus ID | Numeric |
| Apparatus ID | Type |
| Apparatus ID | Type |
| Apparatus ID | Type |
| Apparatus ID | Short Text |
| Apparatus ID | Type |
| No. of Equipments | Date |

**Student**

| Student ID | Autonumber |
|---|---|
| Forename | Short Text |
| Surname | Short Text |
| Date of Birth | Date/Time |
| Nationality | Short Text |
| Age | Number |
| Year/Grade | Lookup Wizard |
| School Email | Short Text |
| Gender | Lookup Wizard |
| Private Email | Short Text |
| Phone Number | Telephone Number |

**Apparatus/Equipment**

| Apparatus ID | Autonumber |
|---|---|
| Apparatus Name | Short Text |
| Date Bought | Short Text |
| Condition | Numeric |
| Type | Short Text |
| Uncertainty | Date |
| Concentration | Type |
| Volume | Type |
| Other Information | Type |

# Overall structure of the Access Database

**Overall Structure of the Database: Structural Hierarchy**

The diagram below shows the structural hierarchy of the Microsoft access database which a user will be proceeded to after the correct database password is entered as per the client's requirement. By default the database will open from a home navigation form which will act as a navigation panel to direct the user to other forms, tables, reports and queries.



Structural Heirarchy
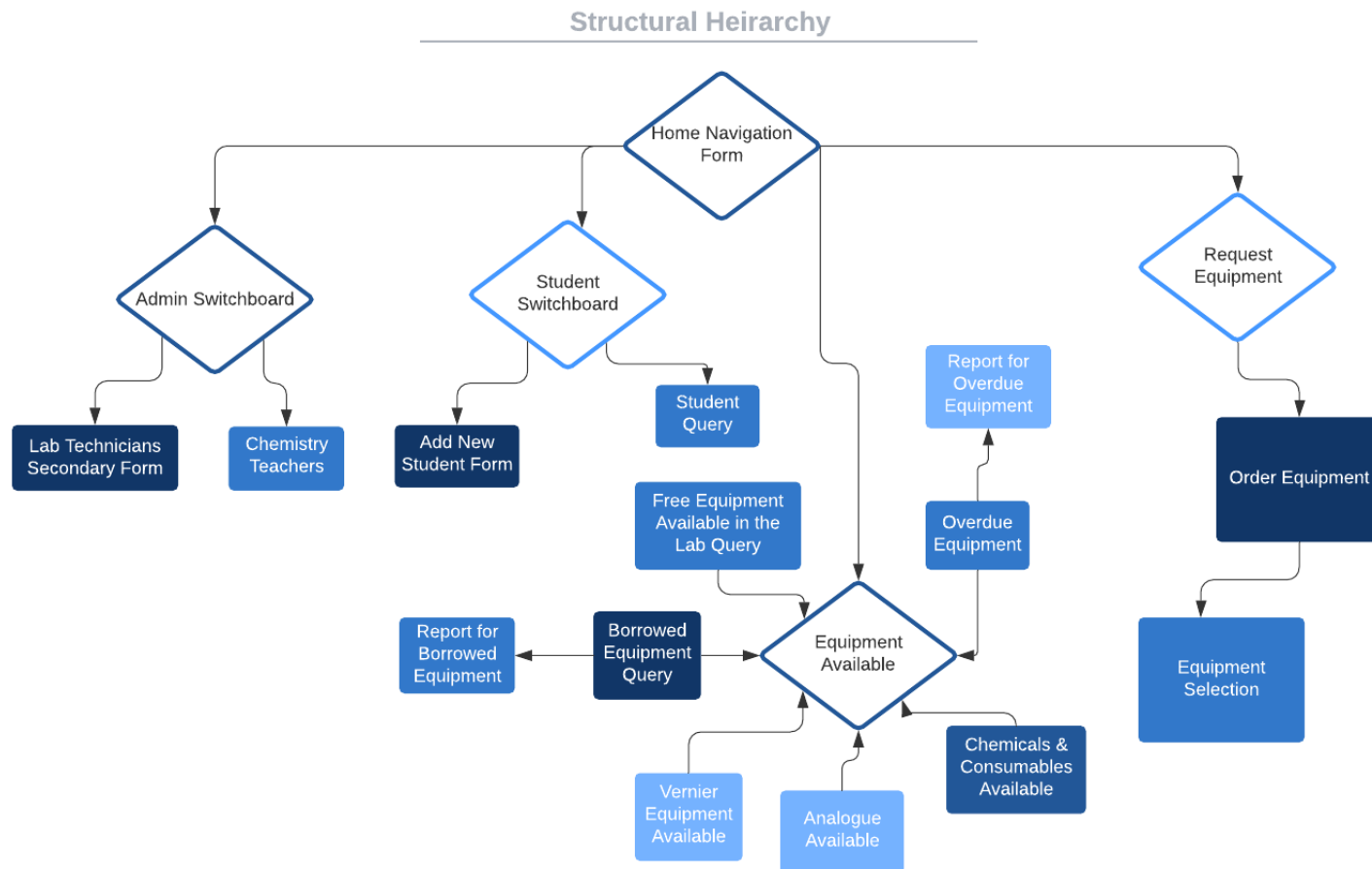
# Internal structure: Table Design

The following tables will be used to collect data and their respective field name, type and properties have been given to ensure the validity and correctness of data. The relationship diagram shown on the first page reduces data redundancy by linking primary and secondary IDs from the tables below.

**Chemistry Department Members (Teachers & Lab Technicians) Table**

*\*Field Type* – The field ensures that correct type of data is entered within this particular field.

*\*\*Field Properties* – Field properties are validation and verification rules as well as input masks that aim to ensure that the data entered is valid and in an appropriate format.

| Field Name | Field Type* | Field Properties (Validation & Verfication Rules/Input Masks)** |
|---|---|---|
| Teacher ID | Autonumber | Presence Check |
| Forename | Short Text | Presence Check |
| Surname | Short Text | Presence Check |
| Date of Birth | Date/Time | Presence Check |
| Nationality | Short Text | Presence Check |
| Age | Number | Presence Check, |
| School Email | Short Text | Presence Check |
| Gender | Lookup Wizard | Presence Check, Value List (Male/Female) |
| Private Email | Short Text | |
| Photo | Attachment | Presence Check, |
| Year(s) of Experience | Number | Presence Check, Range Check (must be between 0 to 15 years inclusive) |
| Phone Number | Number | Presence Check, Length Check, Character Check |

Since my client's school has been opened for 15 years only the maximum experience in this school can only reach 15).

Length Checks will ensure that value entered meets the length requirement of 7 digits and is numerical only.

This will ensure that teachers only choose from the drop-down box provided (with the acceptable values only).

**Students Tables –** The following table will keep a record of all current chemistry students in my client's school.

| Field Name | Field Type* | Field Properties (Rules/Input Masks)** |
|---|---|---|
| Student ID | Number | Presence Check, Must be formatted: "DIA XXXXXX" where x represents the autonumber |
| Forename | Short Text | Presence Check |
| Surname | Short Text | Presence Check |
| Date of Birth | Date/Time | Presence Check |
| Nationality | Short Text | Presence Check |
| Age | Number | Presence Check |
| Year/Grade | Lookup Wizard | Presence Check, Value List (Grade 7/8/9/10/11/12/13) |
| School Email | Short Text | Presence Check<br><br>**Validation Rule:** ((Like "*?@?*.?*") And (Not Like "*[ ,;]*"))<br><br>**Validation Text:** Please enter a valid email address (of the form XXXXXX@diaestudents.com) |
| Gender | Lookup Wizard | Presence Check, Value List (Male/Female/Other) |
| Private Email | Short Text | |
| Phone Number | Number | Presence Check, Length Check, Character Check |

All students enrolled my client's school have been designated an ID by the school starting with "DIA…."; Therefore the same format will be followed for clarity.

Presence check validation rule will ensure that when new data is entered, all requested field are completed by users.

The student ID will be used (as a secondary ID) to create relationships with equipment selection and order forms.

A predetermined value list for grade is provided to students for consistency amongst all students.

**Apparatus/Equipment Table –**

| Field Name | Field Type* | Field Properties (Rules/Input Masks)** |
|---|---|---|
| Apparatus ID | Autonumber | Presence Check |
| Apparatus Name | Short Text | Presence Check |
| Date Bought | Date/Time | Presence Check, Length Check |
| Condition | Lookup Wizard | Presence Check, Value List (Used, broken, new) |
| Type | Lookup Wizard | Presence Check, Value List (Vernier/Analogue/Digital/Chemicals & Consumables) |
| Uncertainty | Number | Presence Check, Character Check |
| Concentration | Number | Presence Check, |
| Volume | Number | Presence Check, |
| Other Information | Short Text | (Optional) |

This is a specific criteria requirement by the client to identify broken, used and new equipment, using parameter queries which will allow for effective tracking of apparatus.

This will classify whether an equipment is vernier, digital, analogue or chemical, which would help my client to track if any expensive equipment (such as vernier and digital apparatus) go missing/unreturned using overdue equipment query.

**Equipment Selection Table –** Students can request for 9 equipment at max. to conduct their experiment. Therefore 9 apparatus IDs have been used.

| Field Name | Field Type* | Field Properties (Rules/Input Masks)** |
|---|---|---|
| Selection ID | Autonumber | Presence Check |
| Student ID | Short Text | Presence Check |
| Apparatus ID | Short Text | Presence Check |
| Apparatus ID | Short Text | Presence Check |
| Apparatus ID | Short Text | Presence Check |
| Apparatus ID | Short Text | Presence Check |
| Apparatus ID | Short Text | Presence Check |
| Apparatus ID | Short Text | Presence Check |
| Apparatus ID | Short Text | Presence Check |
| Apparatus ID | Short Text | Presence Check |
| Apparatus ID | Short Text | Presence Check |
| No. of Equipments | Number | Presence Check, Character Check (Numeric only) |

This selection ID will be used to confirm orders.

The apparatus ID here is a secondary ID that will be linked to the data from the apparatus table as shown in the relationship diagram to reduce redundancy. If less equipment is needed the student can put NA.

**Order Equipments Tables -**

| Field Name | Field Type* | Field Properties (Rules/Input Masks)** |
|---|---|---|
| Order ID | Autonumber | Presence Check |
| Student ID | Short Text | Presence Check |
| Selection ID | Short Text | Presence Check, Character Check |
| Teacher ID | Short Text | Presence Check, Character Check |
| No. of Equipments | Number | Presence Check |
| Order Date | Date/Time | Presence Check, |
| Expected Reservation | Lookup Wizard | Presence Check, Value List (1 week, 2 weeks, 3 weeks, 5 weeks) |
| Delivery Date | Date/time | Presence Check, |
| Expected Returning Date | Short Text | Presence Check |
| Condition | Lookup Wizard | Presence Check, Value List (Borrowed or Returned) |

The character check (validation rule) will ensure that all values entered for secondary IDs (teacher ID/selction IDs) are numerical only.

This field will be used to create a query identifying all equipment that have been returned or are still borrowed or overdue.

Predetermined list of values for expected reservation. This will ensure that students don't exceed the maximum limit for reserving a particular equipment.

This field will also allow the teachers and lab technicians to follow-up on students that still have overdue equipment.

# Internal structure: Forms Design

The annotated designs below show the structure of the forms as per my client's requirement and their respective content. All designs have been self made by the candidate using a software called Lucid Chart. Form buttons (next record/filter/previous record/quit app etc.) are added to simplify the navigation between records. The background and the presentation of forms are consistent for effective navigation purposes only. The font "Britannic Bold" will be used consistently in all forms for normal text; however all titles will have the font "Castellar". All forms will appear as pop-ups.

| Home Navigation Form (Default Form) – for navigating a user | Teachers/Lab Technicians Form |
|---|---|



**Database Password** - The whole database will be encrypted with a password and this password will be available to all students and teachers and lab technicians and will be given to the client on a notepad file.

**School Logo** - The school logo will be provided by the client and it will be edited using photoshop and will placed on every form for authenticity.

**Buttons** - The buttons will navigate the user to the allocated database page (such as tables, queries, and relevant forms.

**Admin Button** - This button is password protected using a hard-code embedded password on this form. Authorized personnel, which are the department members and lab technicians only, will have access to this form, and they will be given the password on a saved notepad file. If correct password is entered the user will be proceded to another form with access to all relevant data and permission to change or manipulate the data.

**Home Navigation Form** - This is the home navigation form that is set as a default page on the database and will appear automatically as soon as the database is opened, for the sole purpose of navigation.

**End Database Button** - This button is placed for convenience to automatically close the database. If new content has been entered within any of the forms or tables, than the request to save will automatically appear.

**Background** - A chemistry related background will appear, which will be edited using photoshop to increase its transparency.

| Student Form (for Adding New students) | Apparatus/Equipment Form (for registering another equipment) |
|---|---|

**Student Form:**

Date: _____    Quit App

**IB DP Chemistry IA Equipment Request**    School Logo

- Student ID _____
- Forename _____
- Surname _____
- Date of Birth _____
- Nationality _____
- Age _____
- Grade _____ ▼
- School Email _____
- Gender _____
- Private Email _____
- Phone Number _____

Add Record    Save Record    Filter Record
Next Record    Previous Record    Close Form

**Date** – The date and time will automatically appear when any of the forms are opened at the top in the same font as the normal text**.**

**Drop-Down Buttons** – The drop-down buttons are for designated fields whose field-type is a lookup wizard. The drop-down menu will showcase the value list from predetermined set of values.

**Background** - A chemistry related background will appear, which will be edited using photoshop to increase its transparency.

**Navigation Buttons** – The navigation buttons below the forms will allow the user to navigate to other parts of the form such as the previous record, filter fields, add and save records.

**Apparatus/Equipment Form:**

Date: _____    Quit App

**IB DP Chemistry IA Equipment Request**    School Logo

- Apparatus ID _____
- Apparatus Name _____
- Date Bought _____
- Condition _____ ▼
- Type _____ ▼
- Uncertainty _____
- Concentration _____
- Volume _____
- Other Information _____

Add Record    Save Record    Filter Record
Next Record    Previous Record    Close Form

**Apparatus Form** – This form will be used by the lab technicians to add or amend records for adding new apparatus or changing the specifications of the old ones.

**End Database Button** - This button is placed for conveniance to automatically close the database. If new content has been entered within any of the forms or tables, than the request to save will automatically appear.

| Equipment Selection Form | Order Form |
|---|---|

**Equipment Selection Form**

Date: [                    ]   **Quit App**

IB DP Chemistry IA Equipment Request   School Logo

| Selection  ID | [                    ] |
| Student ID | [                    ] |
| Apparatus ID | [                    ] |
| Apparatus ID | [                    ] |
| Apparatus ID | [                    ] |
| Apparatus ID | [                    ] |
| Apparatus ID | [                    ] |
| Apparatus ID | [                    ] |
| Apparatus ID | [                    ] |
| Apparatus ID | [                    ] |
| Apparatus ID | [                    ] |
| Apparatus ID | [                    ] |
| No. of Equipment | [                    ] |

**Add Record**   **Save Record**   **Filter Record**

**Next Record**   **Previous Record**   **Close Form**

**School Logo** - The school logo will be provided by the client and it will be edited using photoshop and will placed on every form for authenticity.

**Equipment Selection Form –** This form will allow students to request for equipment as they feel necessary.

**Calculated Field –** This field will be a calculated field and will sum up the total values entered in the apparatus ID excluding the NA option.

**Request Equipment Button -** This button is for designated for proceeding students to the selection form and the order form to request the equipment they need for their internal assessment. These two forms will be opened from the home navigation form.

**Order Form**

Date: [                    ]   **Quit App**

IB DP Chemistry IA Equipment Request   School Logo

| Order ID | [                    ] |
| Student ID | [                    ] |
| SelectioN ID | [                    ] |
| Teacher ID | [                    ] |
| No. of Equipments | [                    ] |
| Order Date | [                    ] |
| Expected Reservation | [                    ] |
| Delivery Date | [                    ] |
| Expected Return Date | [                    ] |
| Condition | [                  ▼] |

**Add Record**   **Save Record**   **Filter Record**

**Next Record**   **Previous Record**   **Close Form**

**Order Form –** Once the student has completed the equipment selection form they will complete an order form which will be linked to the equipment selection form and in order to confirm their request and generate a receipt students must complete this form.
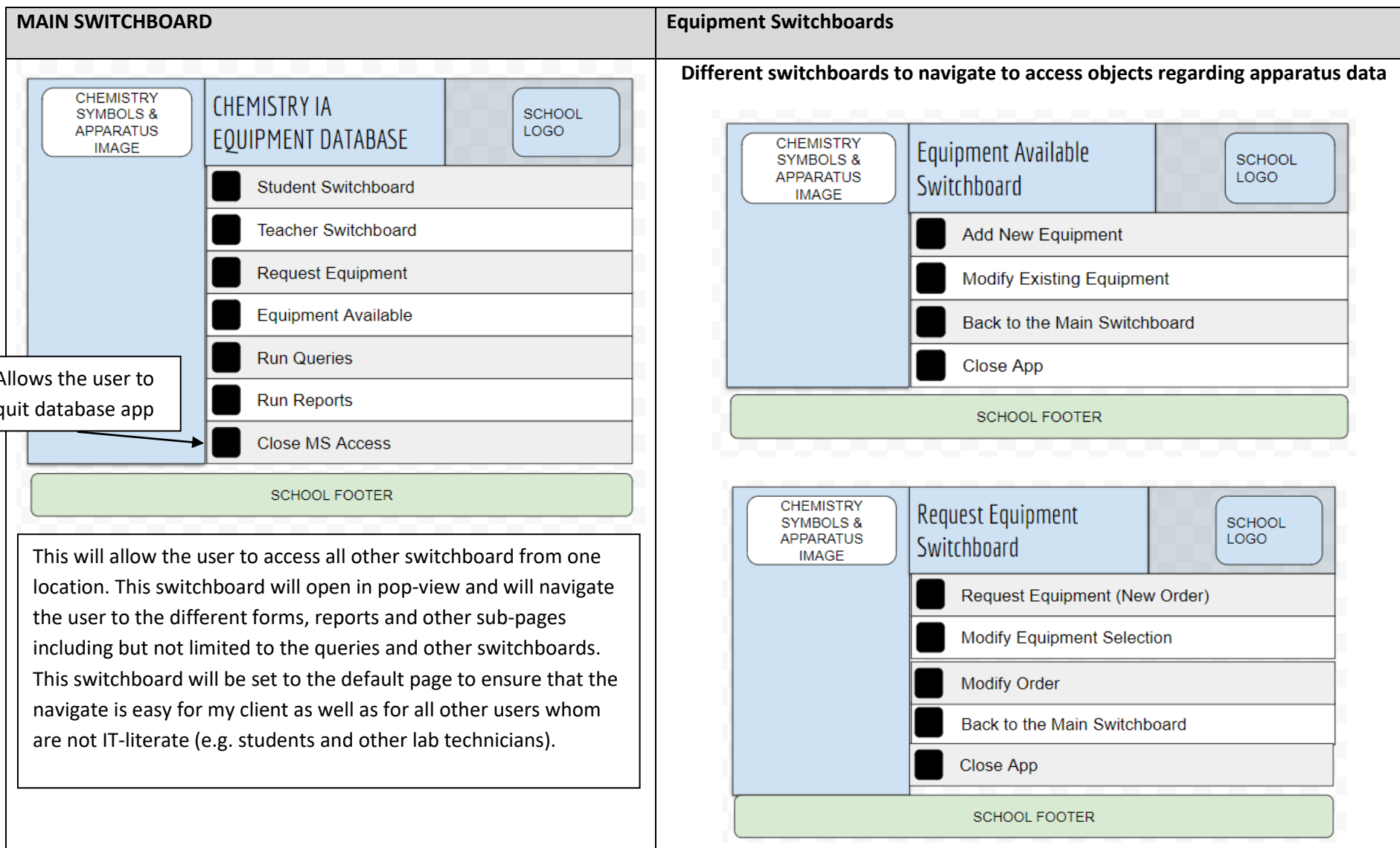
**Drop-Down Buttons –** The drop-down buttons are enabled to monitor whether the equipment is still burrowed/overdue or returned. This will help lab technicians to keep track of students whom still haven't return the apparatus.

**Button to close the current form only.**

**Switchboard Designs**

| MAIN SWITCHBOARD | Equipment Switchboards |
|---|---|
| | **Different switchboards to navigate to access objects regarding apparatus data** |

**MAIN SWITCHBOARD**

CHEMISTRY SYMBOLS & APPARATUS IMAGE

CHEMISTRY IA EQUIPMENT DATABASE

SCHOOL LOGO

- Student Switchboard
- Teacher Switchboard
- Request Equipment
- Equipment Available
- Run Queries
- Run Reports
- Close MS Access

Allows the user to quit database app

SCHOOL FOOTER

This will allow the user to access all other switchboard from one location. This switchboard will open in pop-view and will navigate the user to the different forms, reports and other sub-pages including but not limited to the queries and other switchboards. This switchboard will be set to the default page to ensure that the navigate is easy for my client as well as for all other users whom are not IT-literate (e.g. students and other lab technicians).

**Equipment Switchboards**

CHEMISTRY SYMBOLS & APPARATUS IMAGE

Equipment Available Switchboard

SCHOOL LOGO

- Add New Equipment
- Modify Existing Equipment
- Back to the Main Switchboard
- Close App

SCHOOL FOOTER

CHEMISTRY SYMBOLS & APPARATUS IMAGE

Request Equipment Switchboard

SCHOOL LOGO

- Request Equipment (New Order)
- Modify Equipment Selection
- Modify Order
- Back to the Main Switchboard
- Close App

SCHOOL FOOTER

## Teacher Switchboard

**CHEMISTRY SYMBOLS & APPARATUS IMAGE**

**Teacher Switchboard**

**SCHOOL LOGO**

- Add Teacher
- Modify Teacher Record
- Back to the Main Switchboard
- Close App

SCHOOL FOOTER

Directly linked from the home navigation form to allow all teachers and lab technicians to access and maintain data as necessary.

Teacher form will open to amend teacher

Teachers can view and alter any fields and tables as the feel necessary.

**CHEMISTRY SYMBOLS & APPARATUS IMAGE**

**RUN REPORTS**

**SCHOOL LOGO**

- Search Student by Grade (Alphabetical List of Students)
- Equipment Delivery Report
- Apparatus/Equipment Condition & Availability
- Broken/Used/New Apparatus
- Overdue Equipment Report
- Back to Main Switchboard
- Quit Application

SCHOOL FOOTER

This will allow the user to return back to the main switch board.

## Student Switchboard

**CHEMISTRY SYMBOLS & APPARATUS IMAGE**

**Student Switchboard**

**SCHOOL LOGO**

- Add Student
- Modify Student
- Back to the Main Switchboard
- Close App

FOOTER

Students have the option to amend any requests and orders they have made at a later date.

Allows the user to quit database app

## Student Info

**CHEMISTRY SYMBOLS & APPARATUS IMAGE**

**RUN QUERIES**

**SCHOOL LOGO**

- Parameter Query: Find Teacher (By Subject)
- Parameter Query: Find Student (By Grade)
- Simple Query: Find Returned Orders
- Simple Query: Find Available Apparatus
- Parameter Query: Find New/Broken/Used Apparatus
- Parameter Query: Search Overdue Equipment Orders
- Back to Main Switchboard
- Quit Application

SCHOOL FOOTER

Query retrieving information on the students enrolled in the current academic year.

**Report Designs:** The designs below show the different reports generated for print previews of data. All reports will be scaled to fit page so that when printed, they are appropriately sized. These design describe how the information on the reports will be displayed. The designs will remain consistent.

| Apparatus/Equipment(s) Registry | Reports Alphabetical List of Students |
|---|---|

Command Buttons that filter reports based on function enabled using SQL Filter and embedded macros.

These buttons are enabled using an Apply Filter Macro and particular 'Where Conditions' using an expression builder

Operation buttons (using macros) are placed to "Close Report," "Print Report," and "Quit App" to make the navigation easier for my client.

Data and Time info update automaticatically based on the local time zone and location.



This report allows my client to generate/filter a list of specific apparatus based on characterizations like availability, condition and type of equipment.

The data-set is placed inside fields of coloured alternating columns for better aesthetics.

This report is generated from a parameter query that allows my client to view the list (report) of students in a particular grade for convience. This report is given to lab technicians for the purpose of making them aware that which students are permitted to request/or place orders for practicals.

| Report: New/Broken Used Apparatus | Reports: Equipment Delivery Data |
|---|---|

**Report: New/Broken/Used Apparatus**

Close Report | Print Report | Quit App

Date:
Time:

School Logo

| Apparatus Name | Apparatus ID | Date Bought | Condition | Type |
|---|---|---|---|---|
| Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data |

SCHOOL FOOTER

Page Number

**Reports: Equipment Delivery Data**

Close Report | Print Report | Quit App

Date:
Time:

School Logo

| Student ID | Selection ID | Apparatus | Apparatus | Apparatus | Apparatus | Apparatus | Apparatus | Apparatus | Apparatus | Apparatus | Number of Equipments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data | Data |

SCHOOL FOOTER

Page Number

**Reports: Overdue Equipments Orders**

Close Report | Print Report | Quit App

Date:
Time:

School Logo

| Order Date | Order ID | Student ID | Number of Equipments | Expected Reservation | Expected Return Date | Condition |
|---|---|---|---|---|---|---|
| Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data |
| Data | Data | Data | Data | Data | Data | Data |

SCHOOL FOOTER

Page Number

Data is organized to ensure that column width are appropriate to display the entire data field.

School Footer is given by the client and will be placed below the report for convenience and to fullfill my client's specifications.

The page number will automatically update based on the report generated for specific records.

## Internal Structure: Content of Database Queries

| Query | Purpose/Description of the Query |
|---|---|
| Simple Query: Returned Orders | Returned Orders (Simple query to find equipment with a particular condition) is designed just for the convenience of my client to track all apparatus that are currently being lended to students and have been already returned. |
| Parameter Query: Overdue Equipment Orders | This query will allow Ms. McKeogh to view the names of students whom have overdue equipment pending to be returned. This will allow her to easily followup and to ensure that students do not forget to return them. This will be made using a parameter query that allows the user to search for equipment with a borrowed status with expected return of delivery before the current date. This will be designed by setting a criteria/parameter for the query to filter. |
| Parameter Qury: Equipment Selection | This query will allow the lab technicians to view the various equipment required by each student and arrange and prepare delivery of these equipment beforehand using this particular query. This query will only show the student ID and apparatus IDs (equipment that they have ordered. |
| Parameter Query: Unreturned Vernier and Digtal Equipment Query | This query is designed specifically to allow the lab technicans to follow up on students whom have not returned vernier and digital equipments. Since these equipments are extremely expensive and in available in limited quantity, it is vital that they are returned on time. This parameter query will only filter the names of the students whom have ordered a vernier or digital equipment and have not returned before the reservation time period. |
| Parameter Query: Alphabetical List of Students | Query to organize students by their alphabetical forname. This is a parameter query that allows the client to search/filter students by grade and organize them into a list assorted alphabetically by the students' forename. |
| Simple Query: Available Apparatus | This query will allow the lab technicans and chemistry department teachers to view all the available equipments for practical and experimental purposes. This will also help them for renovation and reinventory of the lab and stocks of chemicals and consumables and other glassware. |

# List of resources and techniques

| Resources | Details |
|---|---|
| School Logo | School logo will be provided by the client which will be edited using adobe photoshop to enhance its appearance. |
| Background | The school background will be given by client and will be related to the theme of chemistry will be edited using photoshop to increase its transparency (decrease its opacity) for better visibility of text over the background. |
| Pictures for the Database | Images and pictures that will be displayed on the background and as pictures of forms and navigation forms throughout the database will be provided by the client (Ms. Maeve). All images will be given in PNG format. |
| List of Student & their personal information | Data will be provided by Ms. Maeve with the list of all the students along with their personal information (such as their surname, nationality, grade, school/private email, phone number, age & date of birth etc.). This data will be collected in an excel spreadsheet by Ms. Maeve.<br><br>This data will then be imported from excel spreadsheet to MS Access. |
| Excel Spreadsheet with previously stored data | My client has been previously updating all her records in an excel file. Her previously stored data (with previously made equipment request, orders completed) will also be imported into the access database. |
| List of Equipment available in my Client's school | The list containing equipment available Ms. McKeogh's school would be provided in an excel file, with all the respective details necessary such as (apparatus name, date bought, condition, uncertainty, concentration, volume, type). |
| Tutorials and books used to learn and enhance MS Access Skills | In order to have a better understanding of Mirosoft access and enhance my knowledge and skills of MS Access, I read a manual for learning database and watched a few tutorials on Access functions and importing data from excel spreadsheets and editing logo's using photoshop. These tutorials also helped me have a better understanding of how to embed a hardcoded password on different forms for confidential purposes and insert a switchboard to navigate to reports and queries. |

Access 2013 Tutorial: Embedding Macros into Buttons ... https://upmybrand.in/access-2013-tutorial-embedding-macros-into-buttons-lynda-com/.

Access 2016 Tutorial Parameter Queries Microsoft ... - Youtube. https://www.youtube.com/watch?v=Z6k-9QZ3QlY.

MacDonald, Matthew. *Access 2010: the Missing Manual*. O'Reilly, 2010.

MrHolmesICT. "Access Form Password." *YouTube*, YouTube, 23 Sept. 2012, www.youtube.com/watch?v=2PYi85vc6ho.

Kershaw, Kirt. "Microsoft Access 2016 Forms: Switchboard." *YouTube*, YouTube, Videotrainingpro, 26 June 2019, www.youtube.com/watch?v=NF2GSvzV7qg.

gcflearnfree. "Access: Designing a Simple Query." *YouTube*, YouTube, 8 Apr. 2016, www.youtube.com/watch?v=LUL1nnxUz_c.

"Microsoft Access - Calculate Value from Fields in Multiple Tables." *YouTube*, YouTube, 15 June 2019, www.youtube.com/watch?v=q1MeWHN6YA4.

| Techniques | Details |
|---|---|
| Access Switchboard | A switchboard will allow users (like students and teachers) to navigate through all the forms, queries and reports that they have permission to amend and maintain data as per their regression. |
| Home Navigation Form | A home navigation form is a simple form that will open by default once the database is opened and will be used as the main form to navigate throughout the database, it will be also linked to other switchboards (to connect to reports and queries). |
| Hard-code embedded password on forms | To ensure that students do not have access to the complete data particular forms, especially the apparatus and teacher forms will be protected using a hard-code embedded password that only teachers and lab technicians are aware of to prevent students from opening these forms unintentionally and to reduce the risk of teacher's personal data being distributed amongst students. |
| Macros & Do commands | Macros will be used to automate some of my client's tasks for example printing data and do-commands will allow the user to perform simple commands like find next, previous data, transfer spreadsheet, save, run macro etc. |
| Parameter & Calculation Queries | Parameter queries will be used to retrieve particular data regarding the type of apparatus and burrowed and overdue deliveries of equipment. Calculated queries will be used to calculate the length of overdue or the margin of days the equipment has exceeded the reservation time period. |
| Encrypt Database with a Password | To ensure that only authorized personnel have access to database content, the main database will be encrypted with a password decided by my client and will be saved onto a notepad file for future needs. |
| Logo Creation | Logos and symbols related to chemistry will be created using editing software (like adobe photoshop). |
| Image Editing (Using Adobe Photoshop) | Tools like magnetic lasso tool, crop, slice tool, and spot healing brush will be used to modify and enhance the logo and the pictures provided by the client to increase its aesthetics. |
| Relationships | A relationship between tables will be created by the one-to-many relationship between the tables to reduce the redundancy and repetition of data indicated by connecting primary IDs with secondary IDs. |

# Test plan

| Test item | Test data | Part of system tested | Expected outcome | Actual outcome | Comments | Ref in product |
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| **Cover page testing – REQUIRED ELEMENT FOR CRITERION G** | | | | | | |
| **Web pages load from the cover page in three different locations** | **File naming to ensure access database is called**<br><br>**Chemistry_IA_Equipment_Database. accdb** | **Links on cover page are relative** | **Loads as required from 3 different locations** | The database can effectively be downloaded and opened from the cover page and the project files. | The functional prototype of the database is downloadable, loads from different locations and all functions are operating correctly on Microsoft Access. | Cover Page, Microsoft Access Database File |
| **Product testing** | | | | | | |
| The school logo must be visible on all forms and the access switchboard. | The school logo and footer is present on every form, report and switchboard and is appropriately sized to ensure that it is clearly visible to the user. This logo must be present to merchandise the scientific facilities offered by my client's schools. | Form, Reports, Switchboards | There is a school logo and footer is present on every form, report, and switchboard of the database. | The school name and logo is placed on the top right-hand corner and the footer is placed on the bottom of the page | The logo and footer are clearly visible and appropriately sized. The school logo is also modified to connect to the theme of chemistry as requested by my client. | Main switchboard, student form, teacher form and reports |
| The background | Ensure that the same office colour scheme (of cool colours) is used throughout each form and report, the | Forms and reports of the database | The background and colour scheme is | There was a white background on every form and | A consistent colour (of cool colours like purple, and green) | Microsoft Database, Forms, |

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| and colour scheme is consistent throughout the database. | colour scheme is appropriate and text is visible. The background for each form, report and switchboard are consistent and plain throughout. | | consistent on every page without any subtle colour differences. | report and the switchboard as well. All tables and queries had a white background colour by default. | scheme was used throughout for operation buttons, form headings, footer and the main switchboard manager. | Reports and Switchboard Manager |
| All operation buttons on the forms must be bright and distinct for visibility. | All form buttons are functional and perform the correct operation as displayed on the interface. The symbols of operations on form buttons (e.g. print form, save the form, quit application) should be easy to interpret and understood by the user. The form buttons should have a different colour relative to other fields in the forms for visibility. | Form Buttons | Form buttons are operational and visible using a different colour. Symbols and text on form buttons are easy to interpret and understand by the users. | The individual form operation buttons are functional and green coloured (different to the colour of the data field) that is distinct and visible. | The buttons are easy to interpret because of the written text like "Save Form"; They are consistently placed on each subform and are organized in the same position for quicker and more efficient navigation for the user. This makes the interface look appealing. | Operation Buttons on Navigation Forms and Subforms |
| All forms, receipts and tables are hyperlinked in one platform (switchboard). | All forms and receipts must be accessible from one navigation/ domain page using a switchboard manager and a switchboard home navigation form that will allow the user to open form forms, run reports and queries and quit the application from one place. | Switchboard, forms, Receipts, Navigation Form, Tables | The main switchboard has buttons to allow the user to navigate to the teacher, student and navigation forms, reports, and queries etc. | The main switchboard includes switchboards items that allow the user to modify and edit an existing form and run reports. Access Objects allow the user the view the different tables. | The main switchboard is opened by default as soon as the user is given access to the database. This allows the user to navigate to the different forms, tables and queries. | Main Switchboard Manager |

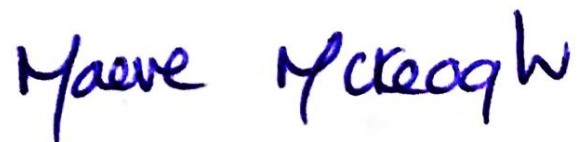| All equipment/lab apparatus is categorized into Vernier, Analogue & Digital. | The database should display a report/or query with all the apparatus list categorized separately into Vernier, Analogue, Digital, Available, and Unavailable apparatus. This is to conveniently monitor the distribution of select expensive equipment. | Apparatus Table | Queries or Reports that filter the apparatus table fields based on the type and condition of equipment (vernier, analogue broken etc.) | An embedded macro is used to generate the report of all the vernier, analogue and digital equipment from one location. | There is also a print command enabled on the report itself to generate a printed pdf report for the user of all the broken or used equipment directly from the database. | Reports (Titled: "Apparatus/ Equipment Table") |
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| Validation, verification rules are applied for fields where appropriate. | Integrity and correctness of data inputted into the tables. Validation rules are applied where it is necessary to ensure the correct data type and format is entered to increase authenticity. Appropriate Validation text is also allocated to guide the user to enter valid data. | Tables, Validation Rules | Appropriate validation rules like length checks, presence checks, input masks and non-zero lengths should be applied for appropriate data fields. | Validation rules for emails, predefined value lists for particular data fields and presence check (of required=yes) have been enabled to ensure that students properly input authentic and reliable data. | Additionally, the format for each data type is indicated for particular fields for example the Student ID is formatted to "DIA"000000 because the unique ID given to each student is within this format. Likewise, an appropriate validation text for example please enter a digit only or enter a valid email address has been enabled to ensure that users are prompted to enter valid and correct data. | Tables in Design View (Validation Rules) |
| The database has all forms appearing as | When forms and reports are opened from the switchboard, they should appear as pop-ups in the user's interface to make it user friendly. | Forms of the database | All reports and forms must appear in pop-up mode which is autosized to fit | From the perspective of a user interface, the forms reports and switchboard open | The pop-view was enabled for all access objects (including reports and forms), except queries which | Forms, Reports and Switchboard |

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| pop-ups. | | | the dimensions of the page. | on a separate window in a pop-up mode. | opened on the Access window frame. The pop-up view made the interface more interactive. | |
| All buttons, text boxes, the background is evenly orientated and centred. | There is an asymmetrical balance of access objects on forms, reports and main switchboard. The footer is evenly centred from the opposite ends. All space is efficiently utilized and forms are auto-sized to fit-page and there is no negative spacing. | Database Background and Design View of Forms, Reports and Switchboards | The orientation and organization of the forms and buttons, and footer and headings should be consistent and symmetrically centered. | There were no negative-spacing on any forms or switchboard and space was effectively utilized. There was a symmetrical balance of all access objects and they were evenly centered. | Orienting all access objects (including the buttons, the text boxes and footer) towards the center really preserved the aesthetics of the switchboard and forms. | Forms, Reports and Switchboard |
| The database is encrypted with a password. | For confidential purposes, when the database is opened the user should be given a message to enter the correct password. The user should not be allowed to access any files or data without authorization. | Database security and integrity of the database records. | The user is granted access provided that he/she has entered a valid password.<br><br>If an incorrect password is entered then the user must re-enter a valid password. | Every time the database application is opened the user is prompted to enter a password box. If an incorrect password is entered the user is denied access. When a correct password is entered, the user proceeds to the main switchboard. | This database password is stored on a Notepad and a PDF Document for convenience. The password is case sensitive. Confidentiality of the data is effectively maintained because the user is only granted access upon giving a valid password. | Database Password |

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| All operation buttons are functional and navigate to the correct forms. | Form buttons should be easily identifiable and functional. They should be easy to interpret by the user and must perform an appropriate function. Buttons can be either accommodated by written text or symbol (i.e. an arrow symbol to go the next record or printer to print a form) where appropriate. | Form Navigation Buttons and Report Command Buttons | The form button performs an appropriate operation as listed on the command button or symbol itself. These operation buttons are visible to the user and are easy to interpret. | There are numerous navigation buttons on forms that perform a valid command. For example, there is a print command, save the form, close form, go to the next or previous record quit application. | Each form navigation button has been enabled using a macro that performs the respective command once clicked. Even reports have specific buttons to run macros and do commands as per the client's requirements to generate specific reports. | Navigation Forms, Subforms, Command Buttons |
| The database opens by default with a home navigation form. | After the user enters a valid password, the database should automatically proceed to the main switchboard by default for convenient navigation. | Home Navigation Form, Main Switchboard | The main switchboard (home navigation form) should open once a valid password is entered into the database. | Once the user is authorized access, he/she automatically gets access to the main switchboard that allows him/her to navigate to all parts of the database and edit and modify data as seemed appropriate. | The main switchboard allows access to all other database pages including but not limited to: reports, forms, other switchboards and queries. Queries are linked by running macros. The user can also quit the application from the main switchboard. | Main Default Switchboard |
| The relationship page creates a one-to-many relations | There is a one-to-one relationship between primary and foreign keys to minimizing the redundancy and repetitiveness of data. This will prevent the users from inputting the data multiple times. The relationships | Tables and Relationships, Database Forms | There should be functional relationships that reduce the rendundancy of data and restrict | The Relationships are functional. When the user opens a field that is restricted with relationships, it | The relationships allow drop down fields in tables with foreign IDs to enforce referential Data integrity. The join | Relationship s and Tables |

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| between all primary and secondary IDs. | need to be functional. | | the user to enter a predefined value of data. | allows the user to only choose from certain IDs. | properties have been set to join fields from both tables that are equal. | |
| All data is only accessible to authorized personnel. | Ensure that the user is prompted to a database login page to enter valid credentials and ensure that particular data (like the teacher's personal contact information) remains secure from students and any unauthorized personnel. | Teacher Forms and Database Encryption | The teacher/ admin form should be encrypted with a hard-code embedded password and the database should be password protected. | As the teacher form is opened the use is proceeded by a message box to enter a valid password. The main database is also protected using database encryption that ensures that the data is secure | The hardcode-embedded password is placed on the teacher form using an if/then statement and validation text on Microsoft Visual Basic for Applications. This prevents any user from accessing private admin information. | Teacher Form and Microsoft Access Database Application |

## Agreement of client

I confirm that the requirement specification meets my needs and the designs above are appropriate for the creation of the product.

**(Client) Ms. Maeve McKeogh**

*MYP/DP Chemistry Teacher & Head of Chemistry Department*

**Signature Date:** 24th June 2021