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Assessment 4: tableau dashboard and report

MA5830

**MA5830 and Data Visualization**

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| **Assessment Task** | Assessment Task 2 |
| **College** | James Cook University |

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# 1. Dashboard Purpose

**Domain**

The domain for this dashboard is the education sector in Queensland, with a specific focus on the geographical distribution of schools across various regions. The target audience comprises school district policymakers and government officials involved in education resource allocation and infrastructure planning.

**Assumptions**

Data Accuracy: The report assumes that the 2014 school location data accurately reflects the distribution and categorization of schools during the given time. The assumptions about the reliability of the ABS Remoteness Area classifications and the relevance of the sectoral divisions (Government, Catholic, Independent), has been included as well.

Target Experience: The audience is presumed to have a strong understanding of school policy and planning, allowing them to interpret data visualizations and utilize them for the decision-making purposes.

**Primary Intent**

The dashboard intends to facilitate informed decision-making by providing clear insights into the distribution of schools across various regions of Queensland. Besides, it is designed to enable users to quickly identify imbalance in school availability based on variables such as geographical remoteness and sectoral classification.

**Task Abstractions**

According to de Jong (2010), the use of interactive elements aligns with theories of cognitive load reduction, enabling users to process complex data more effectively. The incorporation of filters, such as the remoteness category, suburb and school sector parameter, draws on the concept of task driven visualizations, which emphasize the alignment of visual tools with specific user needs.

1. Exploration: Users can explore the geographical distribution of schools, filtered by various features such as school sector, remoteness, suburbs and campus, to identify patterns and outliers.

2. Comparison: The dashboard allows for comparison between different regions (e.g., major cities vs. remote areas), different campuses (e.g., School head campus, School Single Entity) and various school sectors, to assess how school distribution varies across different regions.

# 2. Dashboard Layout

A white paper with black writing on it

Description automatically generated

Figure 1: Wireframe for dashboard

The dashboard is designed to provide a clear, interactive, and user-friendly experience for analysing the distribution of schools across Queensland. The layout is structured to facilitate easy navigation between different data perspectives while ensuring that key insights are readily accessible.

**Worksheets**

1. Interactive Geographic Map

The map is placed on the left side of the dashboard, occupying the largest portion of the space.

It displays school locations across Queensland, color-coded by remoteness category (Remote, Regional, Urban). As the primary visual element, the map provides an immediate, intuitive understanding of school distribution across regions, making it a significant starting point for users.

2. Pie Chart by School Sector

This chart is positioned to the right of the map, the chart displays the proportion of schools by sector, providing a quick visual summary of how schools are divided among different sectors. This chart offers a sector-based overview that helps users understand the broader composition of schools, which is essential for sector specific evaluation.

3. Bar Chart by Suburb

The bar chart is located beneath the pie chart, filling the remaining bottom right section of the dashboard. This chart displays the number of schools in each suburb, making it easier for users to compare school density across different suburb. This chart complements the map by offering a more detailed, quantitative view of school distribution within specific suburbs or groups of suburbs.

4. Line Chart by ABS Remoteness Area

Placed below the pie chart, filling the remaining bottom left section of the dashboard. It shows the distribution of schools across different remoteness categories, with trend lines where applicable.

This chart focuses on the impact of geographical remoteness on school distribution, which is a key concern for policymakers aiming to ensure equitable access to education.

5. Filters

Filters are placed at the top of the dashboard, above the worksheets, to ensure they are easily accessible without overwhelming the main visualizations. It includes filters for school sector, suburb grouping, school type and remoteness category. Placing filters at the top allows users to quickly refine the data displayed across all worksheets, ensuring a seamless interactive experience.

6. Annotations

According to Pfleegor(2024), annotation provides context and guide the user’s interpretation of the data, making it easier to identify important insights without needing external references. Therefore, annotations are embedded within the line chart, where specific data points may require additional explanation. It highlights critical areas, such as regions with a high number of schools or significant differences in school density across remoteness categories.

7. Navigation Elements

A navigation button has been placed beside the header of all the charts. It helps user to navigate to the corresponding worksheet, where the specific chart is present. Besides, navigation helps users efficiently move through the worksheets without getting lost, enhancing the overall user experience.

8. Highlights

Highlights are integrated within the worksheets, particularly in the map and the dashboard. When a user hovers over on a data point, related data in other charts is highlighted (e.g., selecting a suburb on the map highlights the corresponding bar in the bar chart). Thereby, improving the interactivity of the dashboard, making it easier to see connections between different data points across multiple visualizations.

# 3. Dashboard Visualization Themes

The visualization themes for the dashboard are designed to ensure clarity, consistency, and effectiveness in communicating complex data. The themes include markers, channels, and aesthetics, each playing an essential role in making the data accessible and actionable for the target audience.

**1. Marker Themes**

Markers are the visual symbols or shapes used to represent data points on the dashboard. In this dashboard, the following marker themes are applied:

Map Markers (Geographic Map)

* According to Gestalt principles of design, circles are closed shapes, they naturally draw attention to the centre, helping viewers focus on the data point they represent. Therefore, circles are used as markers to represent individual school locations in the map.
* A gradient from light to dark blue are assigned to the circles based on the remoteness category of the suburb (Remote, Regional, Urban) respectively. The colour naturally conveys a sense of intensity. Lighter shades can represent areas with lower remoteness (closer to urban centres), while darker shades can represent areas that are more remote (farther from urban centres). Consequently, helping target audience understand the increasing remoteness as the colour deepens. The size of the circle varies slightly to indicate the school sector in the given region, though this is secondary to color-coding.

Bar Chart Markers

* As bars are straightforward and ideal for comparisons, rectangular bars have been used to represent the number of schools in each suburb, making it easy for target audience to see differences in school numbers across suburbs.
* The bars are consistently coloured to match the remoteness categories displayed on the map (gradient from light to dark blue), ensuring a cohesive and intuitive experience. Besides, using the same colour scheme across both the map and the bar chart, target audience can effortlessly interpret the data, enhancing the overall clarity and flow of the visualization.

Pie Chart Markers

* A pie chart is ideal for showing how different sectors contribute to the total number of schools. Each slice of the pie represents a school sector, allowing users to quickly understand the proportion of schools within each sector relative to the whole.
* The light-to-dark blue gradient is intuitive, making it easier for users to quickly comprehend the distribution of schools among the sectors, especially when the same colour scheme is applied across all the visualizations.

Line Chart Markers

* The line chart illustrates the distribution of schools across various ABS remoteness categories such as major cities, regional, and remote.
* A gradient from light to dark blue is used to differentiate the lines representing each remoteness category, ensuring consistency with other visual elements in the dashboard. The use of lines is ideal for displaying trends across these categories, allowing users to easily see how school distribution changes with increasing remoteness.
* A linear trend line is included, which slopes downward from left to right, indicating a decrease. However, it's important to note that the total number of schools is higher in very remote areas compared to remote areas, despite the overall trend.

**Note on Colour Choice:** A single colour gradient across different charts helps users easily compare and understand related data points without the distraction of multiple colours. Besides, blue is often associated with trust and stability (Cherry, 2024), which aligns well with the educational context, encouraging a sense of reliability in the data presented.

# 4. Worksheets Overview

Each worksheet in the dashboard has been carefully planned with specific intents, visualization types, and task abstractions. Below is a detailed analysis of each worksheet.

1. **Worksheet 1: Geographic Map**

* Intent

The primary intent of the geographic map is to provide a spatial overview of school distribution across different regions

of Queensland. The map aims to highlight the concentration of schools within various suburbs and their associated

remoteness category (Remote, Regional, Urban).

* Visualization Type

Interactive Geographic Map with coloured markers (gradient light to dark blue circles) representing different remoteness category.

* Task Abstraction

Users can interact with the map by selecting markers and applying filters for remoteness categories, school names, campus types, suburb names, and school types. For suburb filtering, users can either type in a suburb name manually or select from alphabetically grouped suburb categories (A-H, I-P, Q-Z). This dual approach enhances user experience by making it easier to find and select specific suburbs, as noted by Raghuvanshi (2023). Tooltips provide additional details about each suburb, including school sector, remoteness category, and the total number of schools, which enhances data accessibility and user understanding, aligning with the principles of effective data visualization (Midway, 2020).

**Alignment**

* The intent of the map aligns with the dashboard’s goal of providing a comprehensive view of school distribution, aiding users in understanding spatial patterns and making location-based decisions.
* Given the audience’s familiarity with maps and the importance of location-based decisions in educational planning, the map serves as an effective visualization tool. For instance, a school district planner can use the map to quickly identify regions with a high concentration of schools, such as urban areas, and compare them with areas having fewer schools, such as rural regions.
* The map’s interactivity - allowing users to filter other charts by selecting specific regions, enhances the dashboard’s effectiveness by enabling dynamic, user-driven exploration. For instance, when a user selects a suburb, the map updates related charts to show data specific to that area. This functionality helps users identify local trends and make precise decisions by focusing on detailed, region-specific information, thereby supporting actionable insights.

**Worksheet 2: Bar Chart by Suburb**

* Intent  
  The bar chart’s intent is to visualize the number of schools in each suburb. It helps users compare the distribution of schools across different suburbs and understand which areas have higher or lower concentrations/number of schools.
* Visualization Type

The bar chart displays school counts across various suburbs, with each bar representing a suburb and its length indicating the total number of schools.

* Task Abstractions

The bar chart allows users to filter by alphabetic groups of suburbs, enabling them to focus on specific regions. Its interactivity facilitates a clear comparison of school counts across the selected suburbs, making it easier for target audience to analyse and compare data based on their chosen criteria.

**Alignment**

* The bar chart’s intent aligns with the dashboard’s goal of understanding school distribution by offering a detailed view at the suburb level. It complements the map by offering a breakdown of school counts, allowing users to compare and assess data across various suburbs.
* Visualization Type

The bar chart is a straightforward and familiar visualization for the audience, effectively displaying school counts across various suburbs. It facilitates easy comparison of school numbers by suburb, meeting the audience’s need for clear insights into how school distribution varies across different regions.

* Task Abstractions

The filters used in the bar chart allows users to drill down into specific regions by applying filters such as school type, campus type, and suburb name. This functionality aligns with the dashboard’s intent to provide a customizable, in-depth analysis based on target audience selected criteria. Additionally, the data drill feature allows users to click on a bar to view detailed information, including the names of schools in that suburb and their remoteness categories, offering a thorough view of school distribution.

**Worksheet 3: Pie Chart by School Sector**

* Intent

The pie chart is designed to show the proportion of schools within each sector (Government, Catholic, Independent). It provides a quick, visual representation of how schools are distributed across different sectors, highlighting any imbalances or prevalent categories.

* Visualization Type

The pie chart shows the distribution of schools across different sectors, with each slice representing the proportion of schools in each sector. This allows target audience to quickly see the relative counts and proportions of different school sectors within the selected region, school type and/or campus type.

* Task Abstractions

Users can interact with the pie chart to highlight or isolate specific sectors, enabling focused analysis of each sector’s share in the overall school distribution. Additionally, filters for school type, campus type, suburb, and remoteness are available to refine the data further.

**Alignment**

* The pie chart’s intent aligns with the dashboard’s goal of providing an overview of school distribution by sector, aiding in sector-based decision making and analysis.
* Pie charts are easily understood by most audiences, making them suitable for quickly conveying the distribution of schools across sectors. This visualization type is particularly effective for the audience, who need to make comparisons immediately.
* The pie chart’s interactive features, such as isolating and highlighting specific sectors, support the worksheet's goal of delivering detailed, sector-specific analysis. By allowing users to focus on individual sectors and apply filters like school type, campus type, suburb, and remoteness, the pie chart helps users gain precise insights into school distribution. This interactivity aligns with the dashboard's intent to facilitate comprehensive exploration and understanding of how different sectors contribute to the overall distribution of schools.

**Worksheet 4: Line Chart by ABS Remoteness Area**

* Intent

The line chart aims to analyse the distribution of schools across different ABS remoteness areas. It visualizes trends in school distribution relative to remoteness, helping users understand how remoteness affects school availability and access.

* Visualization Type

The line chart is particularly suited for illustrating trends in school distribution across different ABS remoteness areas. By plotting school counts over time or across remoteness categories, the line chart effectively shows how the availability of schools changes relative to remoteness. This enables users to track patterns and fluctuations, providing a clear view of how remoteness impacts school distribution and accessibility.

* Task Abstractions

Users can filter the chart by selecting specific remoteness categories, allowing them to focus on trends within a particular type of region (e.g., Major Cities, Remote Australia). The chart may also feature trend lines to highlight patterns.

**Alignment**

* The line chart’s intent complements the dashboard’s overall purpose by providing insights into how remoteness influences school distribution, which is crucial for understanding educational accessibility in different regions.
* Line charts are effective for showing trends over time or across categories, making them ideal for the audience who needs to analyse patterns related to remoteness. The use of a line chart aligns with the audience's need to observe trends and changes in data.
* The ability to filter by remoteness category, campus type, suburb and school type, and the inclusion of trend lines align with the dashboard’s intent to provide dynamic, trend focused analysis. This interactivity supports the audience in exploring how remoteness impacts school distribution over different areas.

# 5. Dashboard Data Overview

The following table summarizes all the original and derived variables used in the dashboard, detailing their role, calculations, and where they are utilized in the worksheets.

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable/Parameter Name** | **Type** | **Description/Summary** | **Usage in Dashboard** |
| Original Variables | | | |
| School Name | String | Name of each school | Filter by school name in all the worksheets. |
| Suburb | String | The suburb where each school is located. | Filter by suburb (grouped alphabetically and manually) in all the worksheets. |
| School Sector | String | The sector to which each school belongs (Government, Catholic, Independent) | Used in Worksheet 3 (Pie Chart) for sector distribution. |
| ABS Remoteness Area | String | ABS-defined remoteness area where each school is located (e.g., Major Cities, Inner Regional Australia). | Used in Worksheet 4 (Line Chart by ABS Remoteness Area) as a line series category. |
| Latitude/Longitude | Decimal (Number) | Geographic coordinates for mapping school locations. | Used in Worksheet 1 (Geographic Map) for plotting school locations |
| School Type | String | The type of school, such as primary or secondary. | Filter option in all the worksheets to narrow down data by school type. |

Table 1: Original variables used in the dashboard

|  |  |  |  |
| --- | --- | --- | --- |
| **Derived Variables/Calculated Fields** | **Type** | **Description/Summary** | **Usage in the dashboard** |
| Sector Filter | Integer | Calculated field to filter schools by the selected sector in the parameter. | Filters all the worksheets according to the selected school sectors. |
| Total Number of Schools | Integer | A measure of distinct number of schools in all the suburbs. | Used in summary table and all the worksheets to get the total number of schools. |
| Alphabetical Suburb Group | String | Categorizes suburbs into alphabetical groups (e.g., A-H, I-P, Q-Z) for easier filtering and visualization. | Filters all the worksheets according to the selected alphabetical suburb group |
| Remoteness impact Score | integer | Score calculated based on ABS remoteness category. Changed the string value to integer. | Plotted in Worksheet 4 (Line Chart by ABS Remoteness Area) to analyse distribution by remoteness impact. |
| |  | | --- | | Select Remoteness Category |  |  | | --- | |  | | Parameter | Grouped the regions under three main categories (remote, regional, urban) | Filters by select remoteness category in all the worksheets |
| Type School Name | Parameter | Filter school name based on distinct values | Filters by school name in all worksheets. |

Table 2: Derived/Calculated variables used in the dashboard

# 6. Dashboard Interactivity

a. Interactivity Elements

|  |  |  |
| --- | --- | --- |
| **Interactivity Element** | **Description** | **Worksheet(s) involved** |
| Filters | **Remoteness category**: Allows users to filter schools based on their remoteness category (Region, Remote, Urban). | All four charts can be filtered with it. |
| **Suburb Group Alphabetically**: Enables filtering of suburbs grouped alphabetically (e.g., A-H, I-P, Q-Z). | All four charts can be filtered with it. |
| **Campus Type:** Allows users to filter schools based on their campus. | All four charts can be filtered with it. |
| **School Type:** Enables users to filter schools based on their campus. | All four charts can be filtered with it. |
| **ABS Remoteness Area**: Users can filter schools based on their ABS remoteness area | All four charts can be filtered with it. |
| Highlights | **Remoteness Category:** Highlights schools all the worksheets based on the selected remoteness category. | All four charts can be filtered with it. |
| **School Sector:** Highlights schools on all the worksheets based on the selected school sector. | Worksheet 1 (Geographic Map), Worksheet 3 (Pie Chart) |
| |  | | --- | | Navigation Buttons |  |  | | --- | |  | | Buttons to navigate to different worksheets. | Available for all the worksheet |
| Action Filters | **Map to Bar Chart**: Selecting a marker on the map filters the bar chart to show only schools in that suburb. | Worksheet 1 (Geographic Map) Worksheet 2 (Bar Chart) |
| Annotations | Number of schools(highest) and Number of schools(lowest) in ABS remoteness area have been annotated. | Worksheet 4 (Line Chart) |
| Tooltips | **summary table**: Displays the count of selected summary. | Summary Table |
| **School Info**: Displays additional details like total school number, suburb, latitude and longitude, when hovering over map markers | Worksheet 1 (Geographic Map) |
| **Remoteness Impact**: Shows detailed remoteness category and related info when hovering. | Worksheet 2 (Bar Chart)  Worksheet 4 (Line chart) |
| **School sector:** Shows details like sector and total number of schools | Worksheet 3 (Pie chart) |

Table 3: Dashboard interactivity

* Audience Assumptions

The audience are expected to be familiar with educational sectors, geographical remoteness classifications, and statistical regions. The audience should be familiar with different school sectors and campus type as well.

* Dashboard Intent/Desired Response

The dashboard is designed to provide an interactive and insightful analysis of school distribution across Queensland, segmented by various factors such as geographic remoteness, school sector, school type, campus type and suburbs. The intended responses include:

* Desired Responses

Resource Allocation: Encourage policymakers to allocate educational resources more effectively, particularly in remote to extremely remote areas.

Strategic Planning: Drive strategic planning initiatives, such as the construction of schools or the refinement of existing infrastructure in regions where the data reveals gaps.

Equity in Education: Promote equity by highlighting regions where students have limits to educational facilities, prompting efforts to improve the education sector.

# 7.Major Implementation deviations

The following table outlines significant deviations from the original visualization plan to the final implementation in Tableau. Each deviation is discussed and justified based on visualization principles or relevant theory.

|  |  |  |  |
| --- | --- | --- | --- |
| **Planned Implementation** | **Final Implementation** | **Reason for Deviation** | **Justification** |
| Use of Area in Square Kilometers for School Density | |  | | --- | | Omitted School Density Calculation |  |  | | --- | |  | | Lack of available area data in the dataset, making accurate density calculation impossible. | According to *Data-Ink Ratio* principle by Tufte, unnecessary elements that do not add value should be removed. Including inaccurate or estimated area data would reduce clarity. |
| User of Suburbs for charts | Used Alphabetical Suburb in three groups | The large number of suburbs made the initial suburb selection too granular and overwhelming for users. | Simplifying the grouping enhanced usability, aligning with the *Cognitive Load Theory*, which emphasizes reducing complexity to avoid overwhelming users. |
| Line Chart by ABS Remoteness Area | Line chart by converting ABS Remoteness Area to Numbers | With the direct use of ABS Remoteness Area, the trend line could not be generated as it was a categorical data | Converting ABS Remoteness Area to discrete data helped in designing a line chart with the trend line. This trend lines helps in identifying patterns and highlighting deviations in various regions. |

Table 4: Major implementation deviations

The deviations were guided by existing visualization principles focused at enhancing the clarity and usability of the dashboard. Adjustments such as removing unclear calculations, simplifying grouping, and choosing more effective chart types ensured that the final product meets the audience's needs. This approach aligns with the principles of Tufte's Data-Ink Ratio and Cleveland & McGill’s work on graphical perception, ensuring that the final dashboard communicates information clearly and efficiently.

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