TRAINING SESSION 01:

Rethink how you make your maps.

User Guide

October 2023

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Contents

.....0
Section 1 Smart Mapping Using Different Mapping Styles.....3
Section 1 Exercise 1: Clustering.....3
Section 1 Exercise 2: Colour and Size.....6
Section 1 Exercise 3: Relationship Map.....7
Section 1 Exercise 4: Charts and Size.....10
Section 1 Exercise 5: Dot Density.....12
Section 2 : Arcade Expressions.....13
Section 2 Exercise 1 : Author Arcade Expression.....13
Section 3 : Crating Dynamic Data.....16
Section 3 Exercise 1: Configuring Pop-ups.....16

Objectives

After completing this training session, you will be able to perform the following tasks:

- Navigate Portal for ArcGIS
- Author and create beautiful and easy to understand policy maps in just a few clicks.
- Using a lightweight cross-platform expression language called Arcade.
- Configure Pop-ups to create dynamic data using symbology and pop-ups.

Training Services Account Credentials

Use the login credentials given by the instructor.
Record the information below:
Username:
Password:

Log in on ArcGIS Portal

- Portal Link: https://ucws.esri-southafrica.com/portal
- Data on the portal under Smart Mapping group

Note: ensure that you share your application to the "TRAINING SESSION 01: Smart Mapping

Smart Mapping

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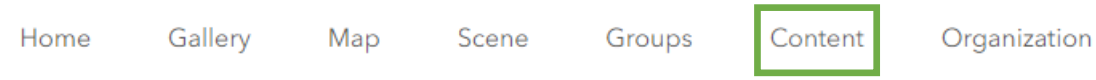
Section 1 Smart Mapping Using Different Mapping Styles

A policy map is a map that shows areas where policy intervention should be prioritized. It is also important to consider making the map clearly and readily understandable for politically elected officials who may not have expertise in a specific area you are advocating for. The map should also be compelling and motivating for action to move forward. You'll create a policy map that shows Low to No education levels across the Limpopo Province to emphasize areas where action might be needed.

The United Nations has set out that by 2030 all signatories to the UN charter should ensure inclusive and equitable quality education and promote lifelong learning. Despite The Government of the Republic having a significant budget expenditure, South Africa has made little progress in meeting United Nations Sustainable Development Goal 4-Quality and Equitable education.

Section 1 Exercise 1: Clustering

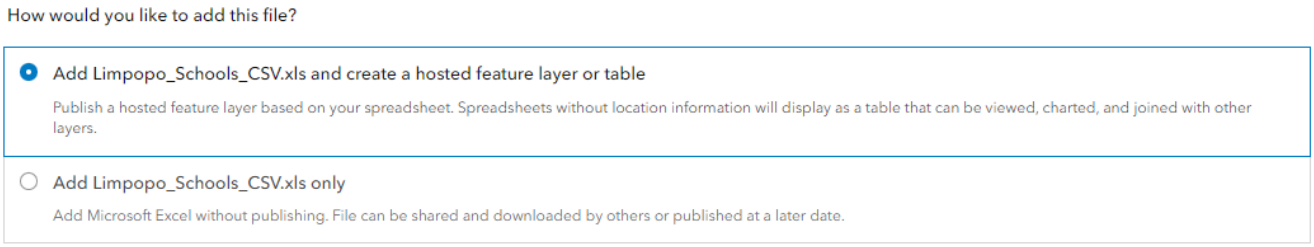
1. Login into **Portal for ArcGIS**
2. Click the **Content tab** and select the **New Item** option.



We will be importing and then mapping the Spreadsheet of Limpopo Schools

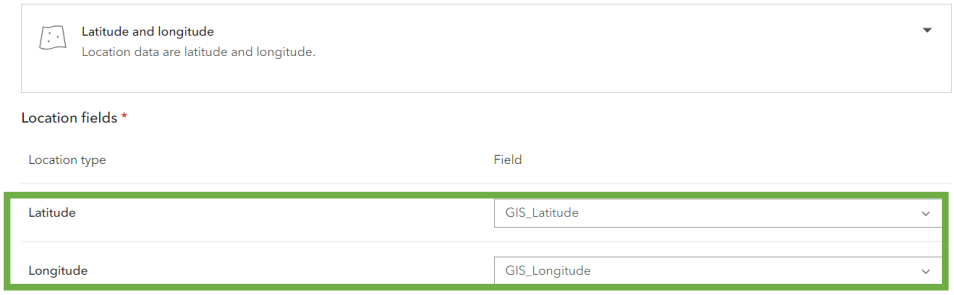
We have data of Limpopo schools in a Microsoft excel spreadsheet, we will be creating a policy map for education outreach using this and demographics of Limpopo Province

3. Click **Your Device** Option and navigate to \\data.esri-southafrica.com\data\ESAUC2023\TRAINING SESSION 1 - Rethink how you make your maps\UC Smart Mapping
4. Select the Limpopo_Schools_CSV



5. On the New item fields page, leave the field as default as above and click **Next** at the bottom right of the page.
6. For Field leave all the default settings and click Next
7. For location settings ensure **Latitude and Longitude** is selected, and under **Location Fields** the right of **Latitude**, click the down and choose **GIS_Latitude**. For **Longitude**, click the down arrow and choose **GIS_Longitude**. Leave all other parameters and Click **Next.**

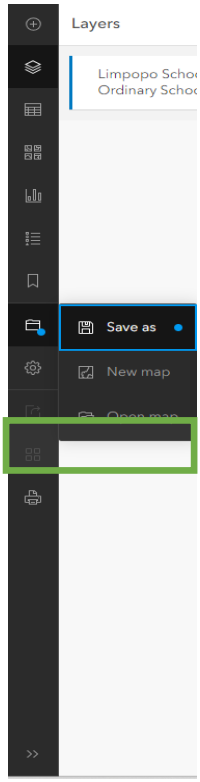
Note: Ensure your location setting matches the image below.



8. On the file page, for Title Name the item **Smart_Mapping<Your Initials>** and **Save.**

The spreadsheet is now saved as a feature layer and can be mapped.

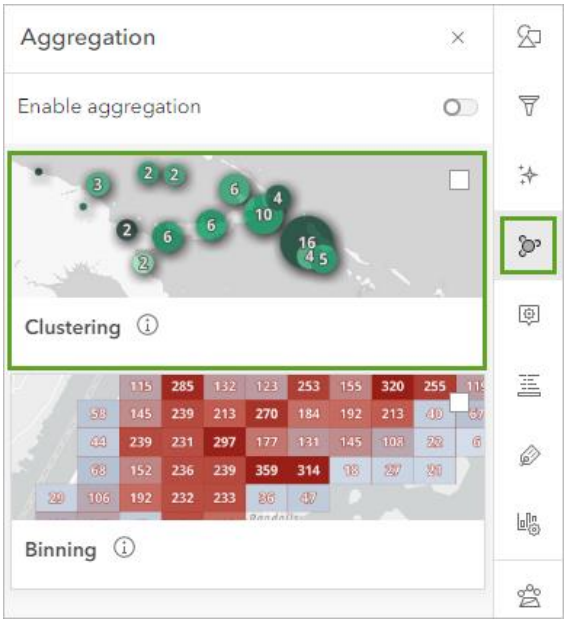
9. On the item details page, to the right click the arrow on the right of Open in Map Viewer classic and choose **Open in Map Viewer**



10. To distinguish your map from others, click the **folder icon** on the content toolbar and click **Save as** and give the map title as **Smart_Mapping<Your Initials>**

Checkpoint: On the map, the schools are represented as many points with possible which overlap, the map looks like noise rather an informative narrative for policy mapping. We will use aggregation more specifically clustering to lasso the data. Clustering will allow us to visualize patterns that would otherwise be hidden.

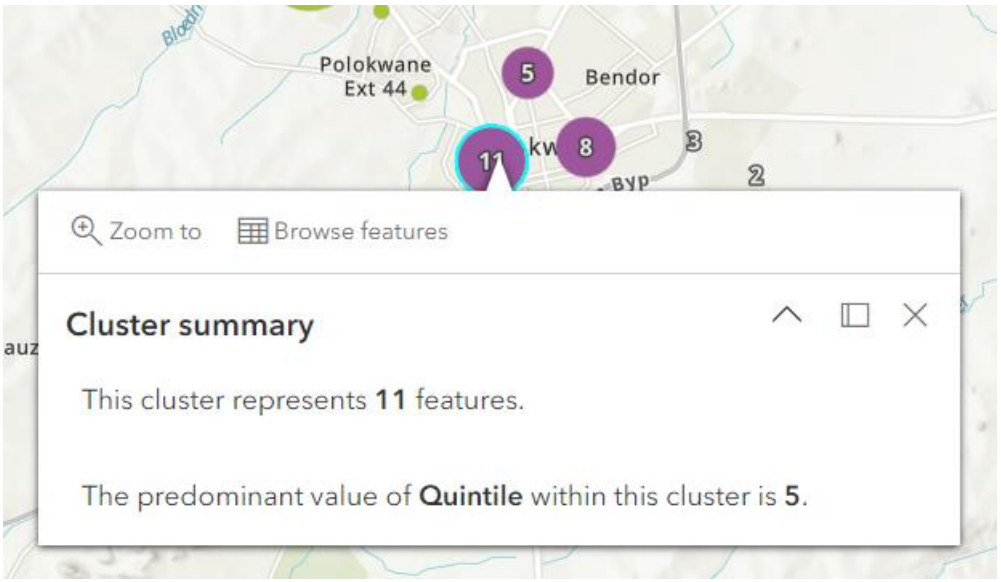
11. On the **Settings toolbar** (the light bar to the right) click the **aggregation function,** click enable aggregation and choose clustering.



The map symbology has been translated into clustered features.

12. For Clustering, choose **Options** from here we can control the Cluster (How big the search radius will be) and the Size Range. Play around with these two and see how the map clusters change. Click the pop-up.

    This basic example of Schools location gives us a better idea of where there are more/less schools. Clustering is possible on categorical maps; it will show the count of features and as well predominant value you choose. In the example below, within the Polokwane CBD, there is a cluster of 11 Ordinary schools and the dominant Quantile within the cluster are Quantile 5 Schools



13. Switch off the **Enable aggregation** function.

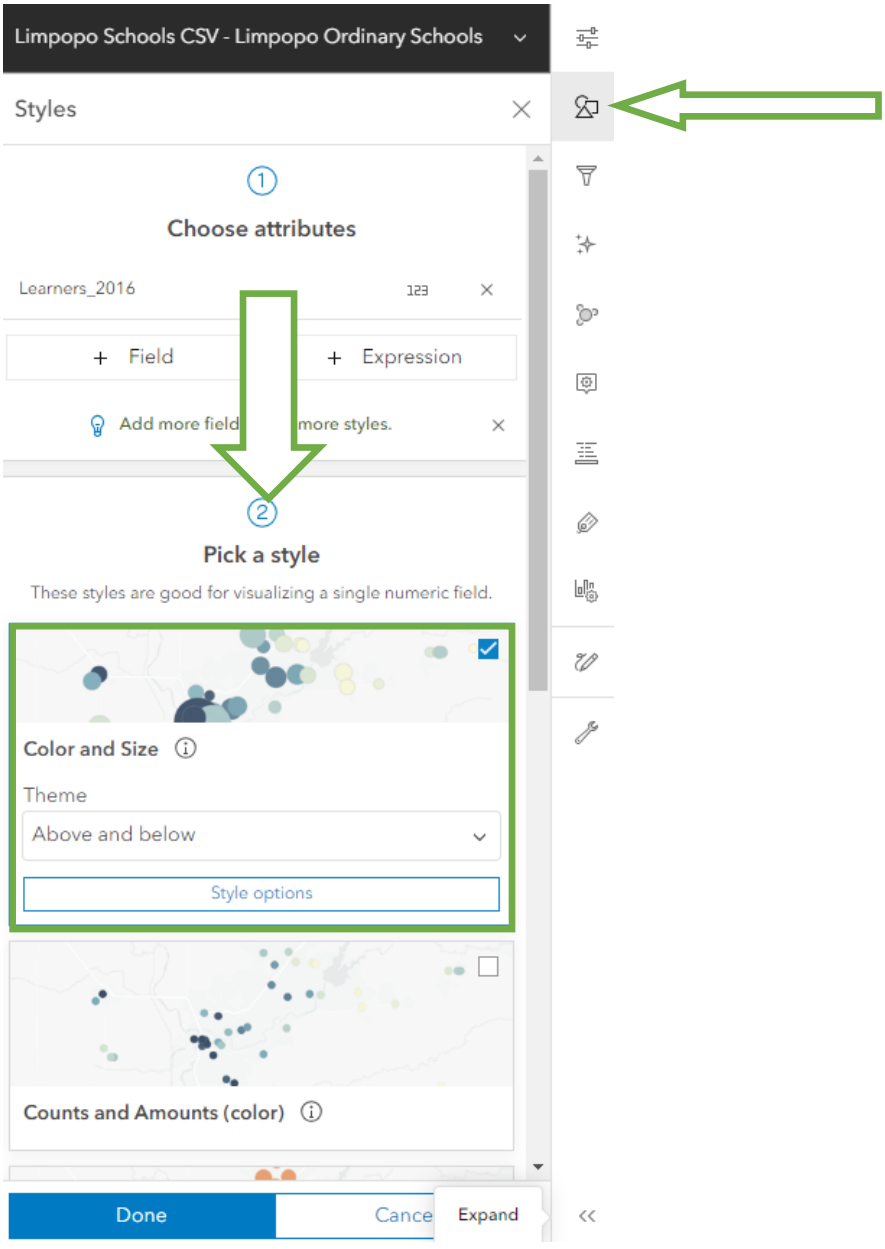
Section 1 Exercise 2: Colour and Size

A layer of points lets anyone see the location of these features relative to one another. Very often, these features on the map have numeric attributes associated with them. How can you discover and visualize meaningful patterns from these numerical attributes? How do you size these features on your map based on meaningful numbers in the real world, so that the patterns provide useful comparisons? We will use a mapping style that will enable allow us to visualize schools with learners above and below a 1000 student threshold

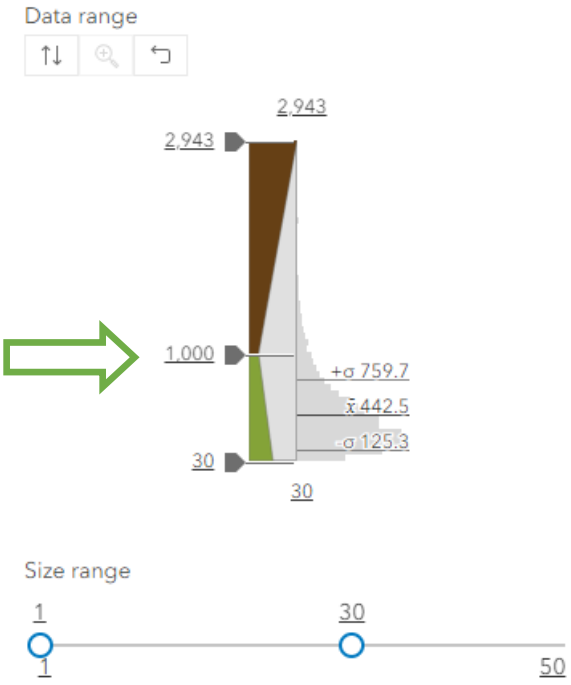
1. On the settings toolbar click **Styles**
2. From the choose attributes Click **+ Field** function, and from the list of available attribute fields select **Learners_2016** and click **Add**

   For the policy map of schools, we will set the ideal number of learners at 1500 per school. We are going to emphasize schools which have learners above and below this threshold.

3. From **Pick a style**, scroll down and Select **Color and Size** and for theme select **Above and Below**



4. Click the **Style options** immediately to the bottom of theme.
5. In the Data range, click the middle chevron and type 1000.



The chevron pointing up indicates all schools with Learners above 1000 and those pointing down indicates those below 1000.The Schools with those learners above a 1000 in a school may need interventions.

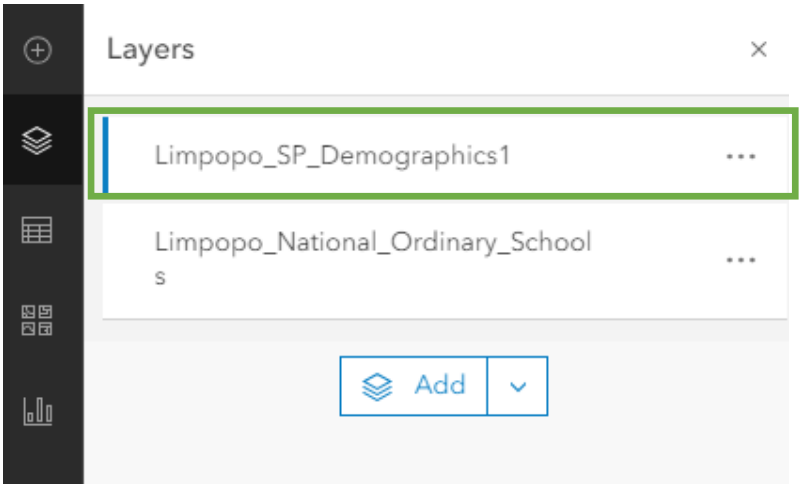
6. Click on the **Symbol pair** and change to any symbol of your choosing and change the **Symbol style** to any pair of colouring of your choosing.

   Hint: You can also control the sizes of the chevrons on Size Range

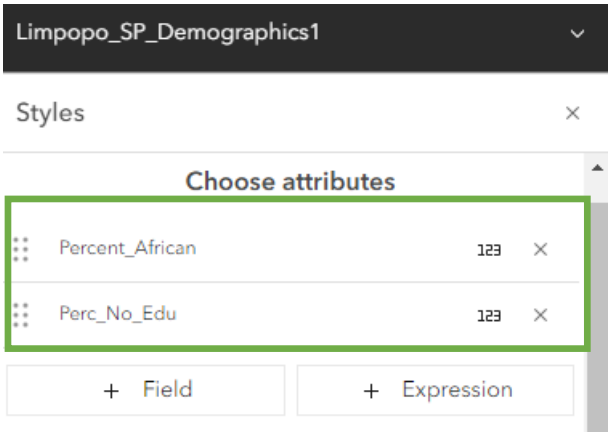
Section 1 Exercise 3: Relationship Map

Most maps of numeric data focus on a single attribute. Though, often we need to understand our data in relation to other attributes to explain the patterns we're seeing. For example, what is the relationship between the African population and Education Levels? Relationship maps are an easy way to visualize and compare multiple attributes. These maps allow you to find where the relationship between the attributes is most or least pronounced, all within a single map. In essence, a relationship map combines two data patterns to show where they converge and where they diverge.

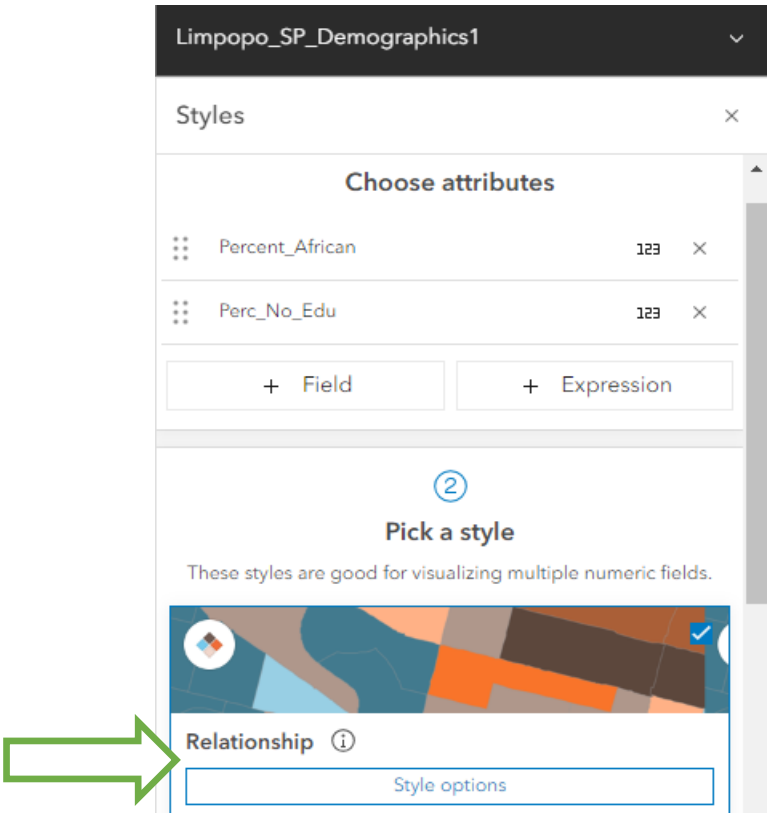
1. On the **Contents toolbar**, click the **Add** function.
2. Click on My Content and Choose **My Groups**.
3. Search for and add the **Limpopo_SP_Demographics** to your map.
   Ensure that on the content toolbar, Limpopo_SP_Demographics is selected. This will be seen by a blue strip immediate to it.



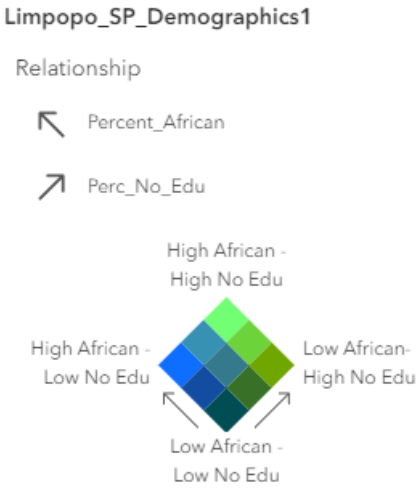
4. From the choose attributes Click **+ Field** function, and from the list of available attribute fields choose ***Perecent_African*** and click add and Click **+ Field** again and look for and choose ***Perc_No_Edu*** attribute field.



5. For **Pick a Style** scroll down and choose **Relationship**

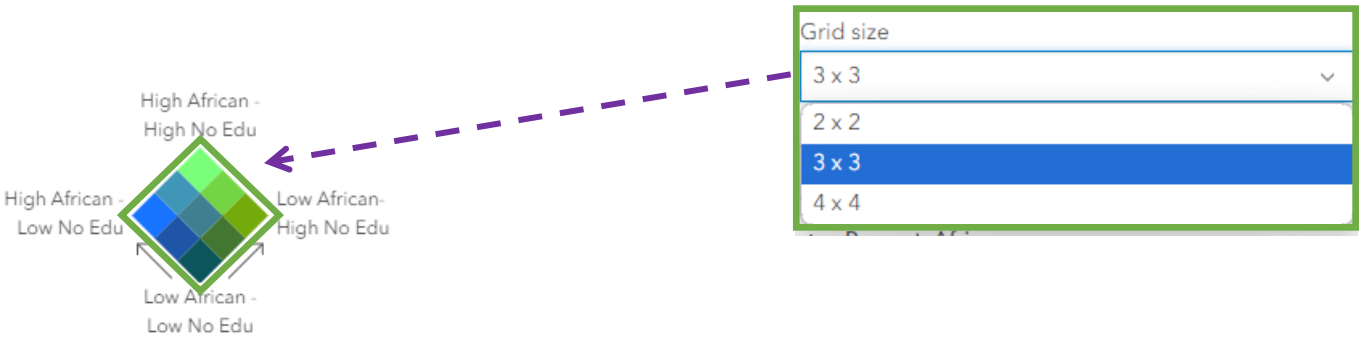


The resulting map shows an interesting pattern within the data, Sub Places in blue have a high quantity of Africans and Sub Places in green have High quantity of No Education

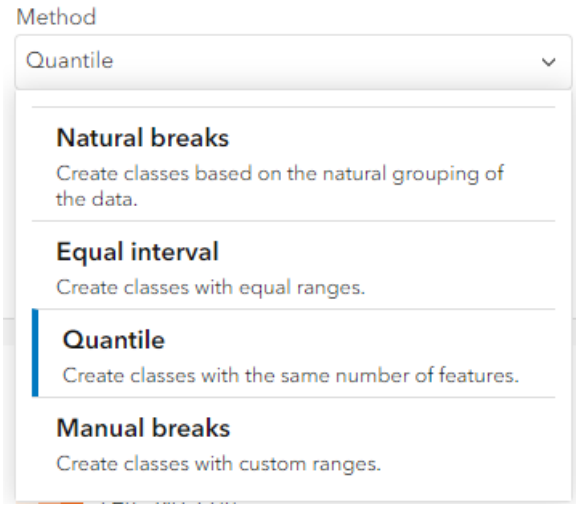


This map we have just generated using the relationship style is classically known as a Bivariate Choropleth map.

6. On the relationship style click style options, from here we can see a variety of ways to modify the relationship map.



There is an option to also change the classification method. This determines the data value breakpoints where the colours change. By default, the map uses the **Quantile classification** which enables that each colour has an equal number of features.



We can add a size component to add additional context to the map using a third attribute. Here we can show where the patterns coincide with areas of high or Low population.

7. Click the back arrow at the top of the pane to return to the Style pane.
8. Click **+ Field** and browse to the **Tot_Pop_Lim** attribute field and click **Add**.The map has switched to a **Relationship and Size style.**

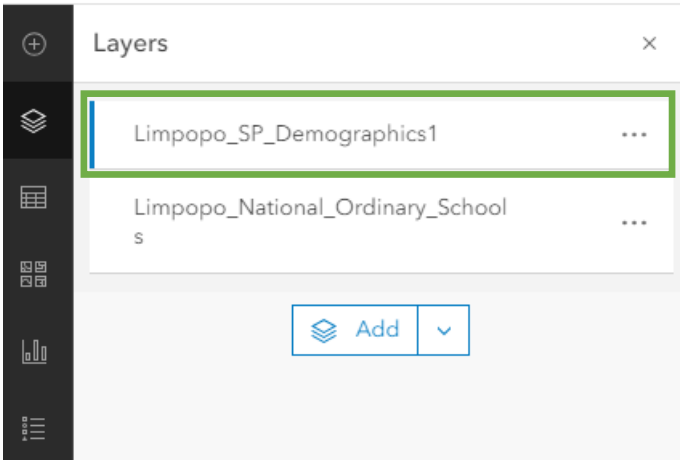
The map we have generated using relationship and Size is classically know as a Trivariate map.

9. Remove the three fields and click done on the style pane when finished.

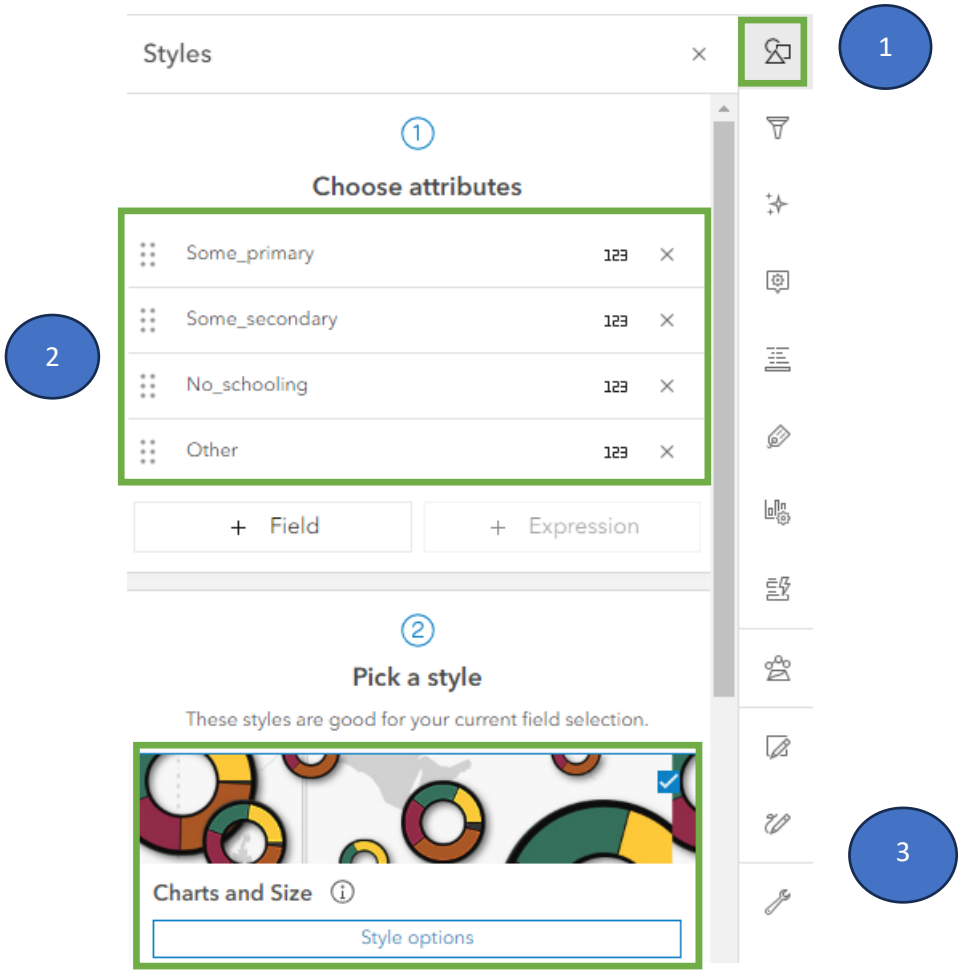
Section 1 Exercise 4: Charts and Size

The Charts style helps us compare relative proportions, or the relative predominance, of mulitple attributes. This drawing style works on either area or point data, using at least two or more numeric attributes from your dataset. For Example what is the relative predominance of People with no Schooling and those with Some Schooling?We will simultaneously compare the attributes , we can go further and add Size to our charts to show Predominance

1. On the settings toolbar click styles
   Ensure that **Limpopo_SO_Demographics** is selected, if necessary, select it



2. From the choose attributes Click **+ Field** function, and from the list of available attribute fields select **Some_primary , Some_secondary** and **No schooling.** Add all the fields.



You can immediately see the proportions of people who have Some primary schooling, Some secondary and No schooling. To learn more about the data and customize the map it is best practice to go into the style options to illuminate our proportional relationships.

3. Click on the **Style options** and click on the **Charts (Color)** style options to see the available options, from here you can style the chart in Variety of configurations.
4. Return to the **Style options** and **click style options for Charts(size)**. You can set the size of the chart from here.

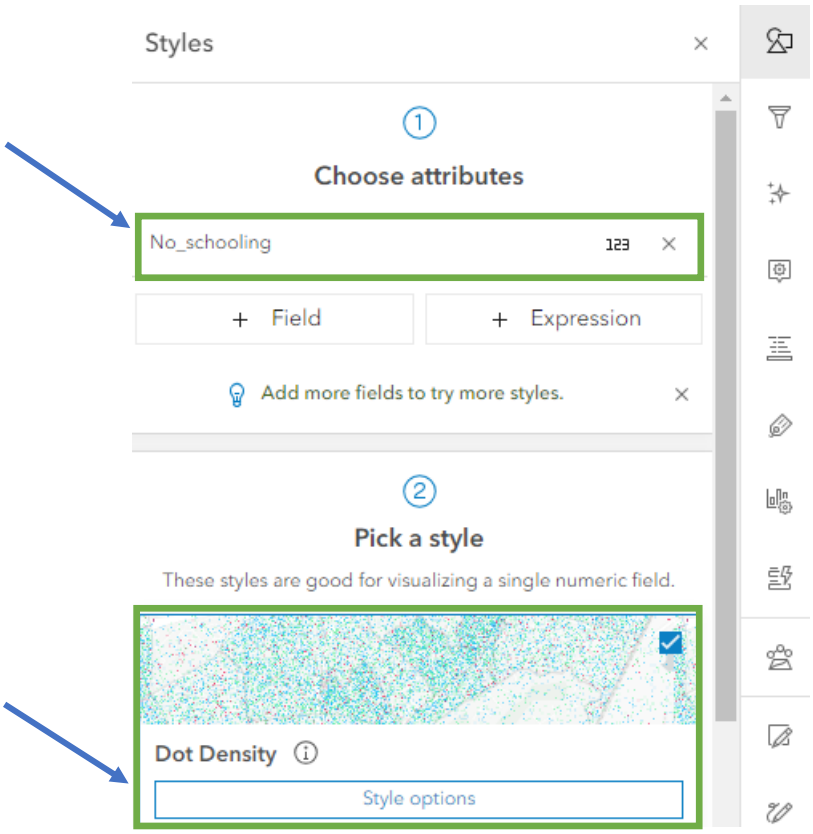
When we style our map using Charts and Size we include another capability of smart mapping call Predominance drawing style, you can reinforce the predominant category in each geography, and simultaneously emphasize the relative proportions of all categories.

5. Ensure to return the map to Default Single Style

Section 1 Exercise 5: Dot Density

Dot density allows us to visualize numeric data in a unique way. Instead of entirely filling a polygon with a thematic color, dots on the map represent counts from your data. When you want to map a polygon layer using a count of something like population, it's tempting to shade the entire polygon based its count, While mapping using polygons highlight major population centres it lacks the ability to show nuances in the data

1. On the settings toolbar click **Styles**
2. From the choose attributes Click **+ Field** function, and from the list of available attribute fields select **No_Schooling** and click add.
3. From Pick a style choose **Dot density.**



***Checkpoint**: When you want to map a polygon layer using a count of something like population, it's tempting to shade the entire polygon based its count. Why? The size of the polygons dramatically affects the patterns on the map, much more so than the actual data you are mapping. What's needed are map styles that fairly and evenly represent counts regardless of the size of the polygons in that layer.*

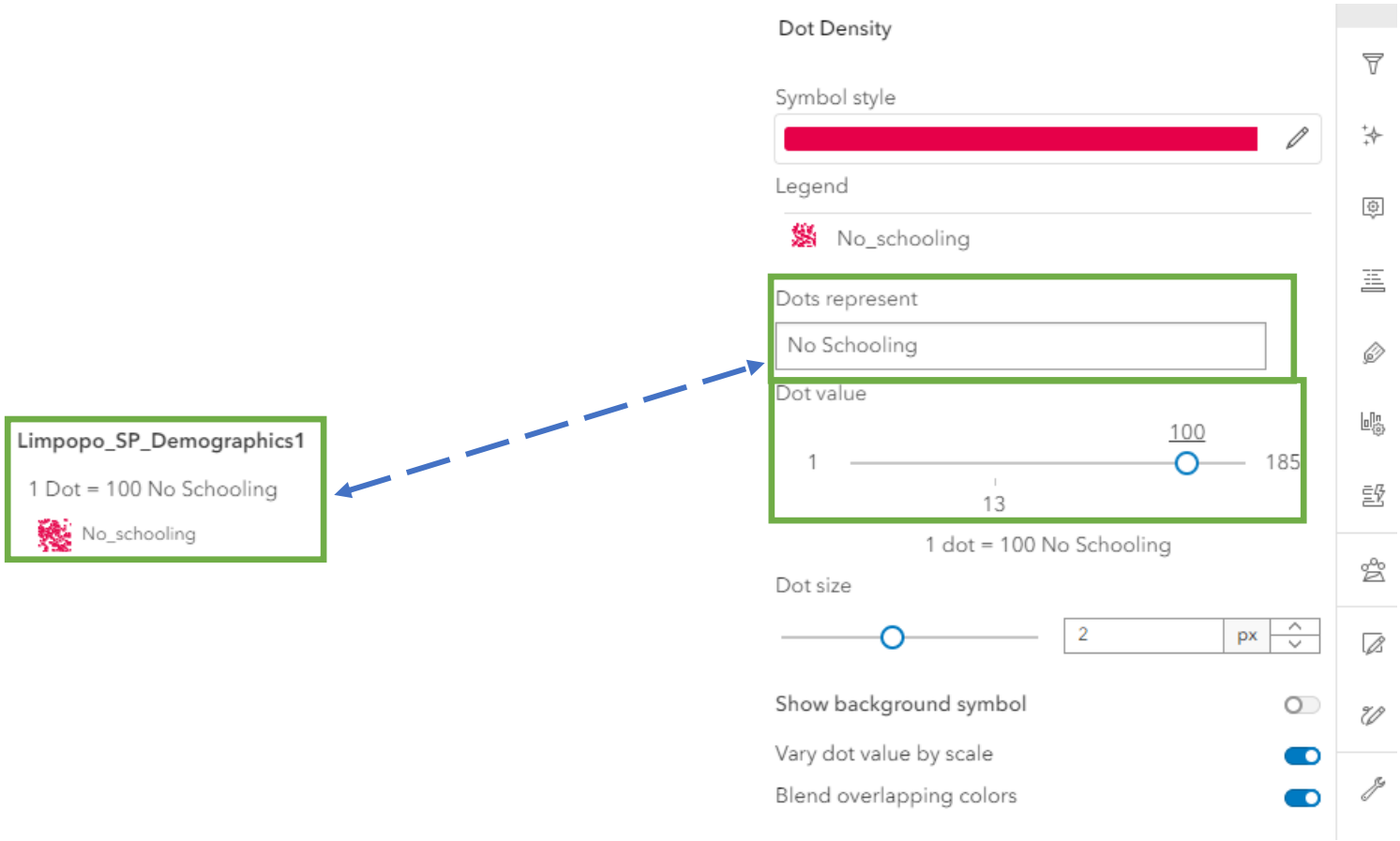
For example, if we want to map the population with no schooling in the sub places, one method we could use is to show the population of no schooling using size. While the size mapping style highlights major settlements, it lacks the ability to show nuances in the rural and suburban parts of the province. Dot density allows us to fill each polygon with dots that represent a count, in this case the count of people with no schooling, providing a representation of the no schooling density.

4. Click the style options.

Let's explore some of the ways we can use to customize the story of our map.

5. The best way is to tell our readers what the dots represent. Add the unit of measurement-Type 'No Schooling' in the box under **1 dot Represent.**
6. For the Dot value click on the value above the circle and type **100**

We can also adjust the size of the dots from here.

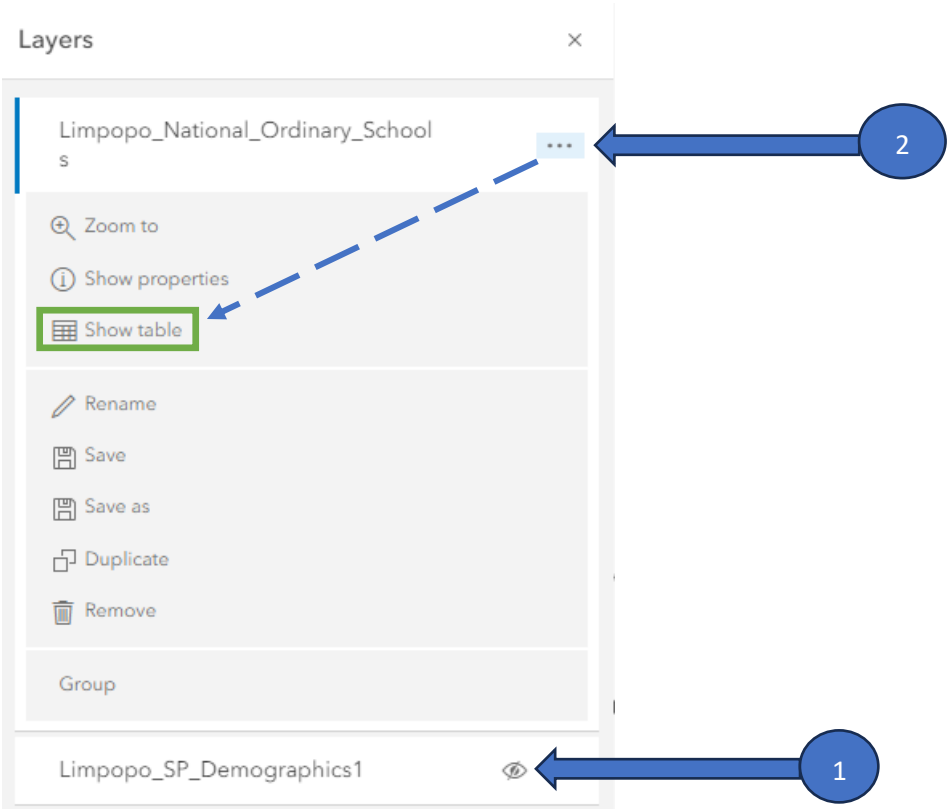


Section 2 : Arcade Expressions

Arcade is a lightweight, flexible expression language that allows you to work with data in real time in ArcGIS. You can use Arcade to style and label your map, create informative pop-ups, and perform field calculations on your data. For our Data to ensure Quality Education we will calculate the Learner to Teacher Ratio using Arcade and symbolize it by the newly created field

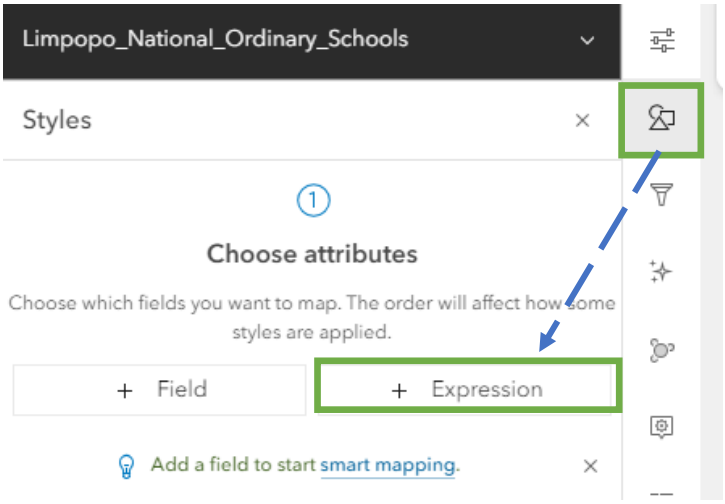
Section 2 Exercise 1 : Author Arcade Expression

1. On the **Content toolbar** select **Limpopo_National_Ordinary_Schools** and switch off **Limpopo demographics** by clicking the eye icon next to it.
   For education outreach purposes, we will need the Teacher to Learner Ratio, if we were to open the attribute table for Limpopo Schools, we will see there in no such attribute field.
2. Open the attribute table for **Limpopo Schools** by clicking the more options icon and clicking **Show table.**

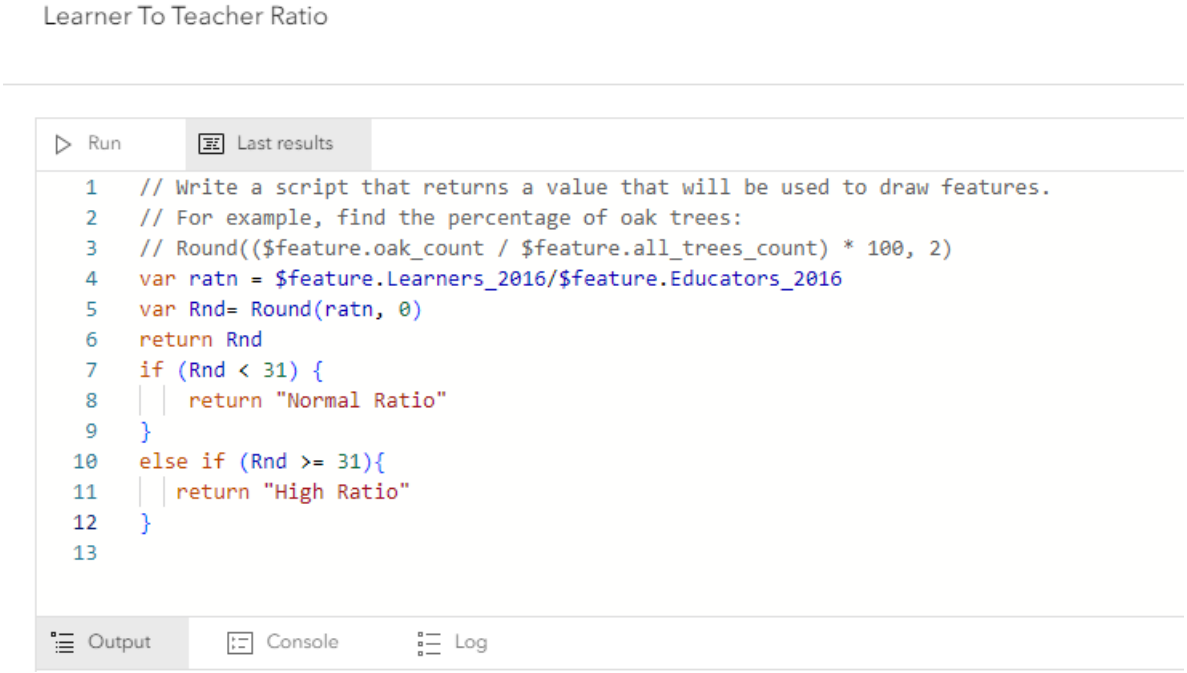


3. Duplicate your browser tab, return to the Portal for ArcGIS Landing page and click Groups.

4. Navigate to the **Smart mapping group**, click the group and download the item written **Arcade expression** by clicking on the item and clicking download on the item details page.
5. Navigate to where the item downloaded and click the folder and copy the code inside.
6. Return to the original browser tab and click the **Styles pane** and click **+ Expression**.



7. At the top where its written New Expression change the name to **Learner to Teacher Ratio** and finally paste the code into the sandbox. Your page should look like the below.



8. Click **done**.

We have calculated the **learner to teacher ratio using a short arcade script** and what we have done is set the ideal ratio to 1:30. The smart mapping capabilities of arcade allow us to calculate new variables and even symbolize our data using the new calculated field.

We can go further in our mapping by converting our data to a string and this will result in our map showing two variables, schools with a Normal Teacher ratio and Schools with a high Ratio which will be displayed on the map in two different colours.

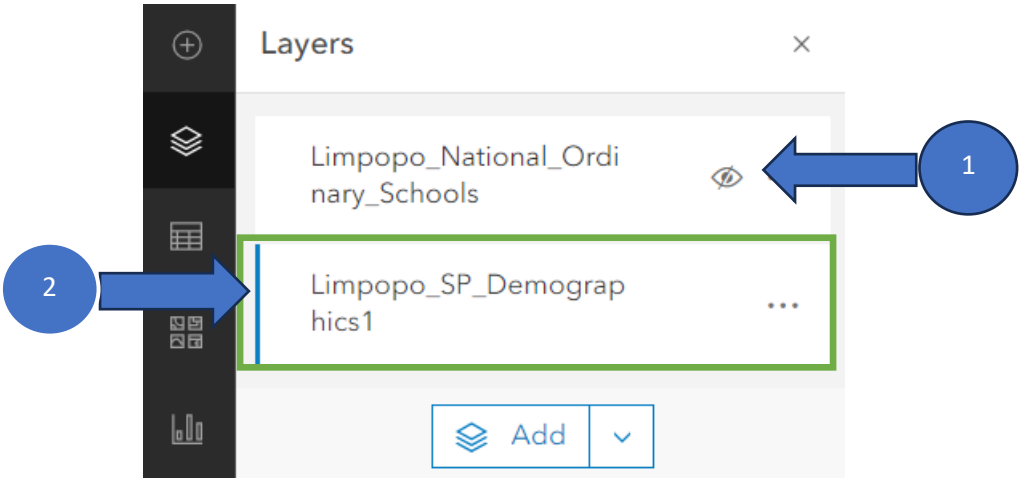
9. On our map we see that the schools in bigger circle represent schools with a very high Learner to Teacher Ratio

Section 3 : Crating Dynamic Data

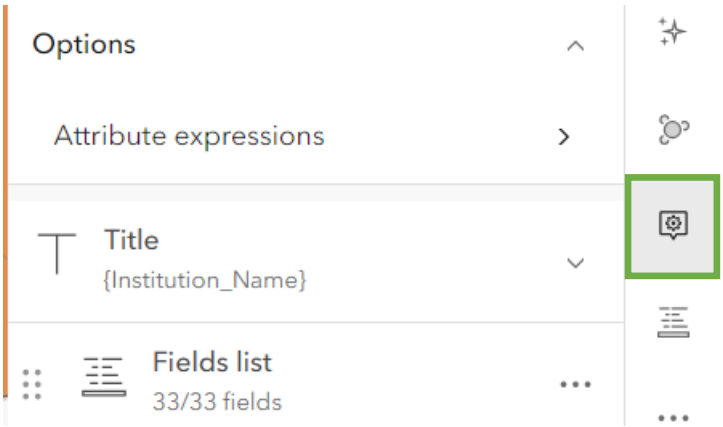
You are going to create an informative pop-up that will allow you to get useful information while interacting with the features on the map. At times there are attribute fields which are irrelevant tp our mapping needs and we will explore how to configure a pop up to show only relevant information.

Section 3 Exercise 1: Configuring Pop-ups

1. Switch off the **Limpopo_Schools** layer by clicking the eye next to it.
2. Ensure that on the content toolbar, **Limpopo_SP_Demographics** is selected.

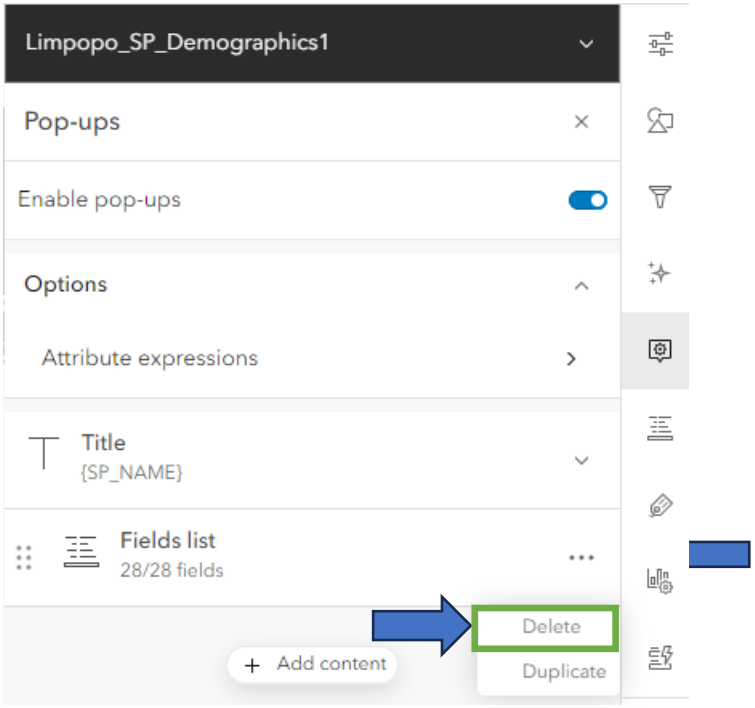


3. On the **Setting toolbar,** click the **pop-up icon.**



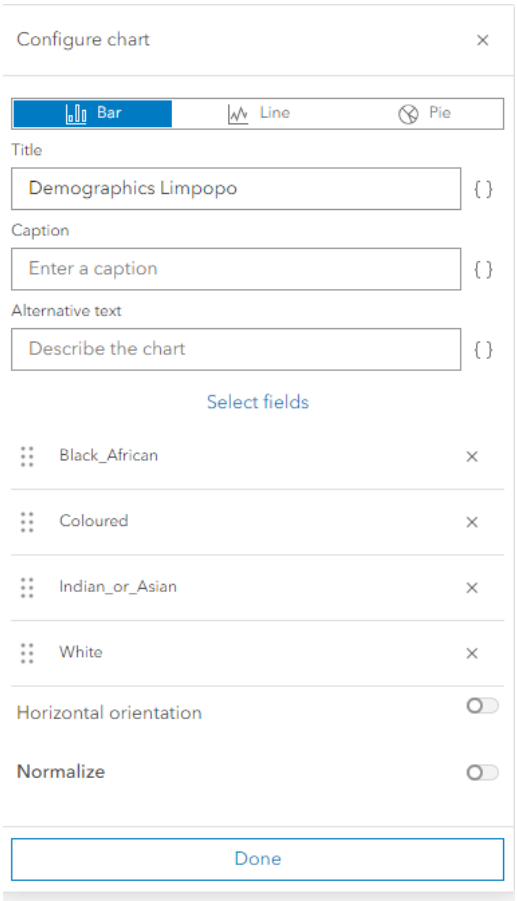
We want to create a bar graph of each sub_place indicating the racial demographics in the pop-up. We will first delete all the fields in the pop-up of Limpopo_SO_Demographics because there are too many field.

4. Click on the **more options** icon and click **delete**.



Our pop-ups contain the names of the sub-places. We will add the bar chart of the racial demographics.

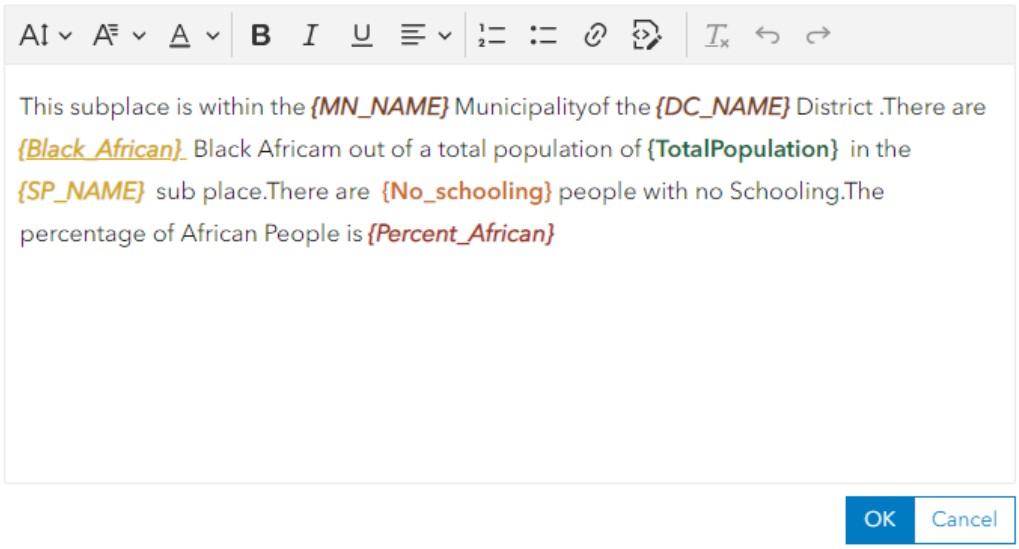
5. Click on + Add Content and select Chart.
6. For Title type Demographics: Limpopo then click select field and select **Black_African** , **Coloured** ,**Indian_or_Asian** and **White**.Click done.



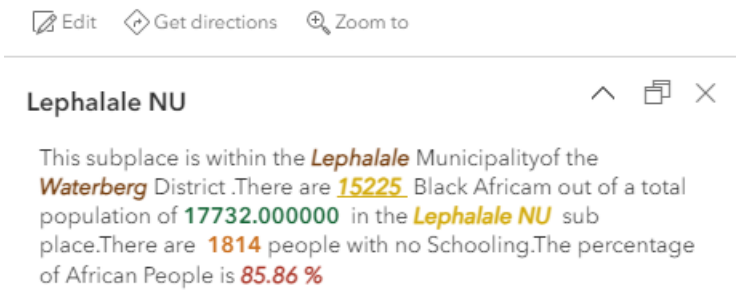
A bar chart appears. In the pop-up you can include Texts, Images and arcade expressions to make your maps pop-up more informative.

To enhance our pop – ups we with relevant information we Now will include Texts.

7. Still on the pop ups pane click **Add Content** and choose **Text.**
8. Repeat Steps 4 and 5 of **Section 2 Exercise 1** , but this time download the item written Pop Up Expression
9. Go **Edit text** and paste the Text into the Box and click **Ok.**



10. Your pop ups instead of being a lost of field now only has informative details.
11. Style every variable in {} to a colour of your choice and highlight the {} variables in Bold and Italic Font



Esri Resources

Take advantage of these resources to develop ArcGIS software skills, discover applications of geospatial technology, and tap into the experience and knowledge of the ArcGIS community.

Instructor-led and e-Learning resources

Esri instructor-led courses and e-Learning resources help you develop and apply ArcGIS skills, recommended workflows, and best practices. View all training options at esri.com/training/ catalog/search.

GIS bibliography

A comprehensive index of journals, conference proceedings, books, and reports related to GIS, including references and full-text materials. gis.library.esri.com

ArcGIS documentation and tutorials

In-depth information, tutorials, and documentation for ArcGIS products.

ArcGIS Online:arcgis.com

ArcGIS Desktop:desktop.arcgis.com

ArcGIS Enterprise: enterprise.arcgis.com

GeoNet

Join the online community of GIS users and experts. community.esri.com

Esri events

Esri conferences and user group meetings offer a great way to network and learn how to achieve results with ArcGIS. esri.com/events

Esri Videos

View an extensive collection of videos by Esri leaders, event keynote speakers, and product experts. youtube.com/user/esrit