

14-16 YEARS SESSION 1: Setting the scene / Scatter Graphs

Subject: Mathematics

Age range: 14-16 years

Time: 1 hour

<p>Outline</p> <p>Learners are introduced to Ethiopia and learn to plot the relevant associated data as a scatter graph.</p>		
<p>Learning objectives</p> <ul style="list-style-type: none"> To learn how to plot a scatter graph, including a line of best fit. To understand the differences between correlation and relationship of bivariate data. To be able to apply the correlation of a scatter graph to its greater context. To develop basic geographical knowledge about Ethiopia 	<p>Learning outcomes</p> <ul style="list-style-type: none"> Learners will be able to plot their own scatter graph and recognise a correlation. They will be able to apply this correlation to the context from which the data was collected and infer further conclusions. Learners will use maps, writing and photos to develop an idea of what Ethiopia is like and an understanding of the activities and outputs of the collective action groups 	
<p>Key questions</p> <ul style="list-style-type: none"> What is Ethiopia like? How could you find out more about the people, places and activities we are learning about in this lesson? What are the benefits to using a scatter graph to show this information? How could we get a more accurate picture of how age relates to wealth amongst the women in Ethiopia? 	<p>Resources</p> <ul style="list-style-type: none"> Session 1 PowerPoint <i>Learner worksheet 1A: Honey Production in Ethiopia</i> <i>Learner worksheet 1B: Scatter graph</i> <i>Learner worksheet 1C: Scatter graph wealth index/education</i> 	
<p>Curriculum links</p>		
<p>England</p> <p>Maths</p> <ul style="list-style-type: none"> Apply statistics to describe a population Use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing 	<p>Wales</p> <p>Maths</p> <ul style="list-style-type: none"> Use a scatter diagram to make predictions about the data from a line of best fit drawn by eye Understand the effects of extrapolation and interpolation on reliability 	<p>Scotland</p> <p>Maths</p> <ul style="list-style-type: none"> I can evaluate and interpret raw and graphical data using a variety of methods, comment on relationships I observe within the data and communicate my findings to others <p>MNU 4-20a</p> <ul style="list-style-type: none"> I can select appropriately from a wide range of tables, charts, diagrams and graphs when displaying discrete, continuous or grouped data, clearly communicating the significant features of the data. MTH 4-21a



Starter (10 min)

Questioning images

Show learners images of women taking part in honey production on slide 3 in Slideshow 1. Ask learners to generate a question they have about the image.

Ask some learners to share their questions. There may be questions that you cannot answer at this stage, the point is to get learners thinking. You might want to record any difficult questions and come back to them in a later session and/or ask learners to research the answer.

Explain to learners that the women are producing honey in Ethiopia and that you will be finding out more about these women, activities and country in this lesson (and the ones that follow).

Display the photos on slides 4-7 in the slideshow, to introduce learners to Ethiopia and develop their sense of place. These images have been chosen to show a broader picture of what life is like in Ethiopia and contrast the rural setting of Oxfam's study. Point out to learners that not everyone lives the same lifestyle as the women farmers that learners will be studying.

Slides 9-11 show further images of honey production from the study. Ask learners what they think the images tell them about honey production in this rural part of Ethiopia from the images.

Introduce the Oxfam Women's Collective Action project on slide 12 and highlight that the photos, data and case studies being used in this session are from a group of women who produce honey in Ethiopia.

Activity 1.1 (10 min)

Background information

Get learners to work in pairs. Each pair should have a copy of learner worksheet 1A: *Honey Production in Ethiopia*. Each learner needs to use the information from their worksheet to write a paragraph or series of bullet points describing the country, the activity and the women working to produce the honey. Encourage learners to feedback their answers to the class.

Activity 1.2 (10 min)

Quick Quiz

Using slides 13-18 explore the issue of wealth and employment inequality faced by women globally.

If appropriate, set up the classroom so that the left, back and right walls correspond to answers A, B and C. Ask learners to move around the classroom and stand by the wall of their choice.

Ask learners if they are surprised by the data and if so, why? Allow time for the class to discuss this issue of inequality and explore reasons for this.

Activity 1.3 (25 min)

Scatter Graphs

Ask learners what the highlighted point represents on slide 19. Ensure that learners understand that each point represents a woman farmer who has both an age (x-axis) and wealth index (y-axis). Point out the outlier that can be seen on the x-axis. "An outlier is a piece of data that doesn't fit the trend. It would make a significant difference to the average wealth index and could cause us to conclude that the non-WCA members in Ethiopia have a wealth index that is lower than it really is."

Consider the idea of a relationship between age and wealth. It would appear that as the women get older, they have more wealth and hence the data shows a positive correlation. Point out any of the outliers and ask: "Does this woman fit the trend?" "But we just said that the older you are, the higher your wealth index." Get learners to understand that, just because there appears to be a trend, this does not necessarily mean that data has to fit it. Use both the words 'outlier' and 'anomaly'. Also, make reference to the fact that these women are not WCA members.

Move to slide 21. Learners need to understand that a line of best fit must try to represent the data by having roughly an equal number of points on each side. A line of best fit may then be used to make predictions about data we do not have. Ask learners the average age they would expect a woman to be if she has a wealth index of 30. Explain to learners that to make such an estimate, they need to draw a horizontal line from the '30' on the y axis (Wealth index) until it reaches the line of best fit. They should then draw a vertical line perpendicular to their horizontal line down to the x axis (age of women). This gives an answer of 30. This is, of course, an estimate using the data we have.

Discuss the limitations of this. "Does this mean to have a wealth index of 80, I need to be over 90 years old?" Also make the point that over the age of 50 there's a wide a range of wealth in the women studied i.e. some 60-70 year olds are wealthier, but others are poorer. Encourage learners to think about the reasons for this e.g. some older women may become less productive because of their health and also a women's wealth is very dependent on household/men's wealth. Other women will have husbands who have accumulated assets, and others are widowed and dependent on children. It would also be good to get learners thinking about the situation in the UK, e.g. do you need to be old to have a high wealth index in the UK?

Now consider the Ethiopia WCA members' scatter graph (on slide 23). Discuss the fact that the graph appears to show far less of a relationship between the data. "What does this imply about the impact the WCA has on the women of Ethiopia?" Also ask learners to consider other reasons why there is not a pattern e.g. sample size is too small, WCA groups have been specifically promoted with younger women and women who are single-parents who then change the trend that it's only as you get older that you can accumulate some assets. Some of the women in the WCA groups have their own independent source of income/livelihoods and don't have to depend on the household/men's livelihoods to accumulate wealth.

Show learners slides 24 and 25 and ensure they understand the differences between correlation and relationships.

Hand out Session 1 Learner Worksheet B and ask learners to complete the scatter graph and accompanying questions. Note that this uses data from women producing shea butter in Mali. Learners will focus on this on more detail in Session 2.

Plenary (5 min)

Look at slide 27. Match the words on the left to their definitions on the right. Understanding the differences between 'correlation' and 'relationship' is key at GCSE. Refer back to the examples from the data and set this within the context of the group of women producing honey in Ethiopia.

Hand out Session 1 Learner Worksheet 1C and ask learners to look at the graph. It would be valuable for learners to consider data that doesn't line up neatly across the graph. Make reference to the fact that such a small proportion of the women have had education that it makes it difficult to find a trend. There would appear to be a weak positive correlation in those who have had some years in education but we would need a much greater sample size to be able to know this for sure. Education has clearly not been a limiting factor as the wealthiest women have had no education at all. Remind students that the wealth index only compares the women to each other and not to women around the world. It might be worth reminding learners that the data in this study only shows relative wealth. In other words the wealthy women in the study are only wealthy compared to the others surveyed, and they are still much poorer than most women in the UK.

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