Water Availability

Overview for teachers:

Your students will develop their understanding of "Handling Data" and "Proportional Reasoning," by investigating water scarcity in the Middle East and North Africa. Water scarcity is an important and underreported issue that may be more important than oil in understanding political tensions in this region. Students take the role of data analysts for an international aid agency charged with providing water resources to countries that are most in need. Students will determine how to fairly compare the availability of water in these countries to determine who should receive aid.

Students will come to recognize that a key aspect of data handling is determining the appropriate data to use to answer a question. They will also find that an appropriate analysis requires the creation of a compound measure, such as a *per capita* measure of water availability. This proportional measure requires combining measures of the available water and the total population of an area. It is important as it allows fair comparisons across countries (or any set of objects) of various sizes using a scaleable measure.

Overview for students:

Can maths be used fairly to make decisions about life-or-death situations? Learn why water may be more important than oil in the Middle East, and how maths can be used to make fair decisions that can help save lives.

Mathematical content:

The primary maths used in this unit are Number, Proportional Reasoning, and Handling Data. Students will engage in is making a convincing case with data, which requires that they create a proportional measure (*per capita* water use). Students should be familiar with using large numbers: if they are not, relevant extension activities are included for students (but their use may require that the case take more than 4 days).

Organisation and pedagogy:

The materials are designed for all students in Year 8, and there are extensions that will make this case appropriate for Year 9 and advanced Year 8 students.

The typical lesson consists of an introduction (conducted in a whole class discussion), student hypothesizing (whole class or small group), student investigations (small group), and reflections (whole class). The role of the teacher is to introduce the topic, and the monitor and guide students as they make sense of the data and learn to build compound measures. Homework is used for students to continue their investigations after class.

Resources:

***ICT requirements*:** Ability to play and project a ".mp4" movie (Quicktime™ or other movie playing software) is required in Lesson 1. All other technology use is optional, although it is recommended that student groups have access to Microsoft Excel™.

***Teacher materials*:** A one-page overview is provided for each lesson that describes the purpose of the lesson, appropriate preparation, outline of the activities, and the required and optional resources. In addition a 2-page detailed timed lesson plan is provided that provides detailed instructions as well as suggested prompts for students.

***Student materials*:** There is a 13-page required *Analyst's Guide* for each student (including the cover and copyright information). There are additional resources to be provided for each group, as detailed in the lesson overview documents.

***Extensions*:** There are suggestions for supporting students of different abilities, as detailed in the extensions document. For each lesson extensions can be found under the headings *Easy* (for struggling students), *Challenge* (for students who can use more challenging materials; these are often ICT-based activities), *Real-world Connections*, and *Multi-disciplinary Links*.

Teacher notes, supporting worksheets, and lesson plans:

Are provided as mentioned above, under "Resources".

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Details on mathematical content:

Key Stage 3 National Curriculum

Key concepts

- 1.1c selecting appropriate mathematical tools and methods, including ICT
- 1.2a combining understanding, experiences, imagination and reasoning to construct new knowledge
- 1.3b understanding that mathematics is used as a tool in a wide range of contexts

Key processes

- 2.3b consider the assumptions made and the appropriateness and accuracy of results and conclusions
- 2.4a communicate findings effectively

Range and content

- 3.1c application of ratio and proportion
- 3.2g units, compound measures and conversions
- 3.3a the handling data cycle

Curriculum opportunities

- 4c work on open and closed tasks in a variety of real and abstract contexts that allow them to select the mathematics to use
- 4d work on problems that arise in other subjects and in contexts beyond the school
- 4f work collaboratively as well as independently in a range of contexts