# Levels 7/8 Geography Activity

## Sports as Entertainment

## Introduction to Numeracy in Geography

A geographically-literate person understands space (location, distance, direction, pattern, shape, and arrangement) and place (relationships between physical and human characteristics). Space and place underpin all aspects of geographic study. To have geographical understanding is to understand location as well as the more multifaceted understanding and competence relating to the changing relationships between people, place, and the environment. To be geographically literate, one must be able to use mathematical skills to solve geographical problems. The term used to describe the use of mathematics in everyday life, and to appraise the use of mathematics for appropriateness, is *numeracy*. In geography, numeracy involves solving numerical problems and understanding the ways that numerical information is gathered by counting and measuring. Numeracy also involves understanding how data are analysed, described, and presented in graphs, charts, and tables. Thus, there is a wide range of knowledge, skills, behaviours, and dispositions relevant to geography that can be enhanced through developing numeracy. The geography curriculum is rich in opportunities for students to use their numeracy skills. By identifying the numeracy skills associated with the geography curriculum content, teachers can plan lessons to incorporate the development of the geographical skills through the application of numeracy skills.

A short audit of the numeracy demands relating to these understandings in Geography Years 7 to 10, as preparation for success in Year 11 and 12 Geography, highlights the following list of six competencies. Namely, students should understand:

* Percentage, rates, and proportion (e.g., per 1,000 as used in demography) and other quantifying numbers
* Statistics – basic survey skills, representation and interpretation of data, reading graphs (column, bar, pie, line, scatter, etc.) and trends in data
* Measurement – estimating and measuring area, distance, and height; comparing measurement units
* Numerical data on maps (proportional symbols, scale, position, location, etc.)
* Geometric properties
* Number patterns and algebraic thinking

Numeracy skills for deep understanding includes the effects of location, distance, and spatial distributions, and the design and management of space within a place. In the short audit, the following are all important geographical numeracy skills: counting, time, measurement, distance, area, scale, creating and analysing tables and graphs, and calculating and interpreting basic statistics.

In the Australian Curriculum, numeracy is one of seven general capabilities to be addressed through the learning areas. The key ideas for numeracy are organised into six interrelated elements in the learning continuum, and are readily aligned with geography:

* Using spatial reasoning
* Using measurement
* Interpreting statistical information
* Using fractions, decimals, percentages, ratios and rates
* Recognising and using patterns and relationships
* Estimating and calculating with whole numbers

## Developing Numeracy Understanding in Geography

In the Victorian Curriculum: Humanities (Geography), teachers are required to provide opportunities for students to develop geographical numeracy skills in an applied environment. Students need to be able to generate and analyse primary data, as well as analyse secondary data. Students need to construct and interpret graphs and maps, and describe space and place using latitude and longitude (Donnelly & Martin, 2018). However, students often fail to make progress in these concepts, especially when the focus becomes numerical (Davidson et al., 1998). In order to support students’ numeracy development in geography, it is important to:

* *Develop students’ mathematical and numeracy confidence* – teachers may have emphasised a right or wrong answer during prior mathematics learning experiences. By considering and fostering the development of Dweck’s (2006) growth mindset, students who have struggled in mathematics in the past can become more confident in using mathematics and increase their belief in their mathematical abilities.
* *Improve the perception of mathematics* – mathematics is sometimes considered too abstract, and perceived unrelated to real life. This is often an artefact of students’ negative perceptions of mathematics transferred to their learning in geographical contexts. Teachers can help students to recognise that mathematics derives from sensible concepts and ideas, and underpins much of what we do in science and real life.
* *Use and explain mathematical language* – the use of mathematical conventions, symbols, and interpretation can be cryptic to many students. Misunderstanding may develop due to the presence of homonyms in mathematics that mean something quite different in science (e.g., product). Teachers should always explain terms, especially where they have multiple meanings.
* *Increase students’ familiarity with mathematical concepts and skills* – students may not have familiarity with a mathematics concept, which can cause problems for the geography teacher who might assume that students understand the concept. The most common problems relate to place value – large numbers, negative numbers, ratio, proportion, percentage, scale factor enlargement, scales, and compound measures.

Providing access to spatial technologies that facilitate interactions with real-world locations can often ameliorate these issues. For example, the use of virtual maps, satellite images, global positioning systems (GPS), geographic information systems (GIS), remote sensing, and augmented reality, can aid students in visualising, manipulating, analysing, displaying, and recording spatial data (Catling & Willy, 2009). Goos et al. (2019) outline that attitudes are critical to developing numeracy across the curriculum. All teachers should reinforce positive feelings towards mathematics, encouraging students to use their numeracy skills to interpret geographical data. By not emphasising hand-drawing graphs, and instead using a spreadsheet program like Excel, time can be spent on understanding what the graphs and statistics mean. However, the teacher will need to ensure students understand the correct graph type to use and why. Discussing the link between the data in a spreadsheet format and the graphical display, often leads to improved understanding of the issue being explored. Data relating to students’ known experiences, which they have generated themselves, have a personal meaning and also contribute to a more positive attitude towards the use of mathematics concepts in geography.

## Lesson Plan: Sports as Entertainment

A variety of numeracy skills align with the Place and Liveability sub-strand. Activities relating to common aspects of suburban life will foster engagement due to students’ familiarity with the context. Here, we focus on one such activity, Sports as Entertainment*,* but acknowledge this is just one of many activities that would contribute to a liveability unit of work. For example, you may choose to look at access to health care, education, or part-time jobs for youth.

To explore the spatial characteristics of sporting opportunities in their suburb and surrounds, students conduct a survey of the most popular Sports as Entertainment. Students then examine the distance from home or school as measured on a Melways-type map using a ruler or string (using formal or informal distance measurements) or using Google Maps.

Comparisons can be made between “as the crow flies” distances and the real paths that must be travelled by road or on bicycle paths. The scales on the maps should be converted to real world distance measures. Hence, conversion of distance units may be needed (e.g., mm/cm to m/km). The means of moving around the suburb are explored by considering public transport availability by exploring timetables, routes, and costs online. Comparisons can be made between using public transport or private cars, cycling, and walking/running.

In discussion, or as part of the task, students should be able to critique/justify their interpretations/results/conclusions. In this particular lesson sequence, a student-led survey can be incorporated into a geography class focused on sport as a form of entertainment, and access to the sporting facilities as a component of liveability. The survey topic can be made to relate to any aspect of suburban life.

## Prerequisite/Corequisite Knowledge: Geography

* The extent of ‘place’: What is the geographical area that students are exploring? Where are the suburban boundaries? What are the surrounds?
* Basic map reading skills and symbols (roads, train lines, paths, scale, etc.)

## Background Mathematical Skills and Understandings

Geography teachers are not expected to teach the mathematical knowledge and skills that students will draw on when engaging with this activity. The students will have learnt and should be adept with the required mathematical knowledge and skills to complete the activity. According to the Victorian Curriculum Mathematics, the required mathematical knowledge and skills should have been developed in earlier years of schooling, that is, by the end of Level 6.

For this activity, the background mathematical knowledge and skills needed to complete the activity are:

* Planning methods of data collection for one or more variables
* Gathering and collating data
* Creating data displays in lists, tables, picture graphs, and simple column graphs (with or without technology)
* Selecting relevant data to use in displays
* Interpreting and comparing data displays
* Knowledge of units of measurement (time and distance)
* Identifying and using timetables
* Identifying times in different formats
* Using time and distance instruments to make measurements (formal or informal units)
* Converting common metric units of measurement to allow comparisons to be made
* Using simple scales, legends, and directions to interpret information contained in basic maps

## Lesson Description

In this sequence of lessons, students explore the variety of sporting opportunities in their suburb, as a form of entertainment that students enjoy. Initially, students create a survey to determine what sports they enjoy and can access. Then, they explore the proximity of access within their suburb or surrounds.

### Favourite Sport Survey

Use a whole-class discussion to identify the sports that students enjoy in their immediate suburban location, and then further afield.

Students create a survey relating to Sports as Entertainment and they survey their own class. Break the class into small groups and have each group write three questions relating their allocated topic that will be used in their survey. Students need to consider the format of each question (yes/no, open response, Likert scale, etc.). For example, the students who write a question about the available sports in the suburb can decide if they list all the sports (tennis, AFL, soccer, etc.) in the survey or have respondents identify the sports in which they participate.

Topics might include:

* Available sports
* Scheduled times of sports
* Training requirements
* Competitive nature
* Personal involvement
* Entertainment value

Bring class together and use the student-generated survey questions for a discussion and possibly modify for survey use. You might like to use SurveyMonkey so that graphs are automatically created of the results, or Google Docs to facilitate pooling of data. Students will return to these groups to analyse the data generated from their questions.

1. The students should conduct the survey within their class and then, whether working individually, in pairs, or in small groups, gather data from five other people. This method will provide sufficient data for students to analyse, report, and discuss. It may be easiest if you arrange for students to collect data from a neighbouring class.
2. Pool all the data that the students collect. Have students return to their question-writing groups to analyse the whole-group pooled data. To facilitate this analysis, conduct a whole-class discussion where you guide the students through the analysis, and students use the same analysis process with their set of data. For example, you may want students to find the range of responses to a question. Discuss why such a pattern might exist. Is there a gender or year level difference?
3. Depending on the method used to collect the data, have the students create a [graph](https://www.thoughtco.com/frequently-used-statistics-graphs-4158380) for each question. Students can use Excel or a similar program, if available. Alternatively, the teacher can facilitate the creating of the graph as a whole-class activity on the whiteboard. The aim is to use the graph to help students to understand the data, not to teach graphing, so you can also provide students with pre-prepared axes to save graph drawing time. Discuss what data are represented on the vertical and horizontal axes. Have students complete their graph and then write two explanatory sentences about their findings. Each group will present their graph and explanations to the whole class.
4. Allow the students to critique the survey design (question and/or response format) and the ways that the results were displayed. Encourage students to think about how things might have been done better/differently.

### Considerations of Place

Since this survey sequence of the lesson is part of a liveability unit, the survey results must be interpreted in terms of the place to which the data refer. The list of sports from the survey is used to explore the places where they are offered in the suburb.

1. Using the school as a base site, explore the relative location of each sport facility (e.g., if tennis was identified, where are tennis courts in the suburb?), the most efficient means of transportation to get there, the route that would be taken, and the distance from the school. Discuss alternative routes from different starting points for different means of transportation.
2. Distance from any location to a sporting facility can be compared as measured on a Melways-type map using a ruler or string (using formal or informal distance measurements) or using Google Maps. Comparisons can be made between “as the crow flies” distances and the real paths that must be travelled by road or on bicycle paths.
3. If available, use trundle wheels or have students count their foot steps (paces) to sporting facilities around the school.
4. The scales on the maps should be converted to real world distance measures. Hence, conversion of distance units may be needed (e.g., mm/cm to m/km). Moving around the suburb and surrounds is explored by considering public transport availability – using timetables, routes, and costs online. Comparisons of time spent travelling can be made between using public transportation or private vehicles, cycling, and walking/running.
5. Provide guidance on how the data could be analysed and reported in terms of liveability. Liveability is the sum of the factors that contribute to a community’s quality of life, and “Sports as Entertainment” is just one factor. Have the class determine if their suburb has been well planned and well facilitated in terms of sports facilities and access to these, in terms of liveability.

Table 1: Links to the Victorian Curriculum – Geography

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| Strand | Content Description (Code) | Elaboration(s) |
| Geographical Concepts and Skills | Identify, analyse and explain spatial distributions and patterns and identify and explain their implications (VCGGC100)  Identify, analyse and explain interconnections within places and between places and identify and explain changes resulting from these interconnections (VCGGC101)  Collect and record relevant geographical data and information from useful primary and secondary sources, using ethical protocols (VCGGC102)  Analyse maps and other geographical data and information using digital and spatial technologies as appropriate, to develop identifications, descriptions, explanations and conclusions that use geographical terminology (VCGGC104) | Comparing accessibility to, and availability of, a range of services and facilities  Comparing student access to, and use of, places and spaces in their local area and evaluating how this affects perceptions of liveability  Gathering from a range of primary and digital sources, for example, from GIS layers, observation, annotated field sketches, surveys and interviews or photographs, relevant data about the impacts of and responses to a hydrological hazard, or the factors influencing decisions people make about where to live  Reviewing the results of an analysis to propose and defend answers to a question, emphasising at least one of the geographical concepts of place, space, environment, interconnection, sustainability, scale or change |
| Geographic Knowledge | Factors that influence the decisions people make about where to live and their perceptions of the liveability of places (VCGGK111)  Influence of accessibility to services and facilities; and environmental quality, on the liveability of places (VCGGK112)  Environmental, economic and social measures used to evaluate places for their liveability, comparing two different places (VCGGK113)  Influence of social connectedness and community identity on the liveability of places (VCGGK114)  Strategies used to enhance the liveability of places, especially for young people, including examples from Australia and Europe (VCGGK115) | Investigating their and others’ interpretations of the concept of liveability and why what makes a place liveable may vary from person to person according to age, education, income, cultural background and other variables  Comparing student access to, and use of, places and spaces in their local area and evaluating how this affects perceptions of liveability  Comparing objective measures of liveability such as transportation infrastructure, with subjective measures such as people’s perceptions  Examining the role transport plays in people’s ability to access services and participate in activities in the local area  Developing a specific proposal to improve an aspect of the liveability of their place, taking into account the needs of diverse groups in the community, including, for example, young people through fieldwork in the local recreation area or Traditional Owners by developing bilingual signage or indigenous garden projects |

Table 2: Links to the 21st Century Numeracy Model (Goos et al., 2014)

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| Aspect of the Model | How This Aspect is Addressed by the Lesson |
| Attention to Real-Life Contexts   * Citizenship * Work * Personal and Social Life | Students will select and apply mathematics relevant to the distribution of sporting facilities in their suburb and surrounds. The suburb is the context for numeracy in this activity. |
| Application of Mathematical Knowledge   * Problem Solving * Estimation * Concepts * Skills | Students can make use of, and sense of, the mathematics selected by using it to explore their suburb. Students will have interpreted a suburban problem (the distributions of sports facilities) in a mathematical way (by determining popularity of sports amongst their peers) and select the relevant data (the survey data) to graph. Students will also calculate distance measurements between the school and the sporting facilities. |
| Use of Tools   * Physical * Representational * Digital | Students will explore suburban problems through the use of physical (trundle wheels and measurement tapes), representational (graphs, maps, and tables), and digital (computers, calculators, and smart phone apps) tools. |
| Promotion of Positive Dispositions   * Confidence * Flexibility * Initiative * Risk | Students will feel confident to show initiative to select, use, and interpret mathematics to solve suburban problems. Students will be willing to engage with and then persist when challenged by problems found in their suburb. The links to “real world” experiences will enhance students’ disposition towards mathematics. |
| Critical Orientation   * Interpreting Mathematical Results * Making Evidence-Based Judgements | Students will develop an interpretive, evaluative, and analytical stance towards their studies of their suburb, by considering the sporting facilities. Students will form evidence-based opinions and make judgements or decisions concerning the spatial distribution of sporting facilities. |

## References

Catling, S., & Willy. T. (2009). *Teaching primary geography*. Learning Matters.

Davidson, G., Stevens, B., & Williams, A. (1998). Developing numeracy through geography. *Teaching Geography, 23*(4), 174–177.

Donnelly, D., & Martin, M. (2018). Geography and numeracy. In M. Sellars (Ed.), *Numeracy in authentic contexts: Making meaning across the curriculum* (pp. 197–224). Springer.

Dweck, C. S. (2006). *Mindset: The new psychology of success*. Random House Publishing Group.

Goos, M., Geiger, V., Dole, S., Forgasz, H., & Bennison, A. (2019). *Numeracy across the curriculum: Research-based strategies for enhancing teaching and learning* (1st ed.). Allen & Unwin.