**Levels 7/8 English Activity**

**Interpreting the Language of Statistics**

**Introduction to Numeracy in English**

Literacy and numeracy are the foundational “building blocks of knowledge, skill and understanding” (Australian Government Department of Education and Training, 2018, p. 5) and a key indicator of quality education. Consequently, the study of English is not only a foundational learning area but is vital for developing young people into informed and active members of society as they “learn to analyse, understand, communicate and build relationships with others and with the world around them” (Victorian Curriculum and Assessment Authority [VCAA], n.d.-a, para. 1). In particular, as students engage with the English curriculum, they are tasked with developing their critical reading and viewing skills, and are exposed to a variety of multimodal texts, in which information is conveyed in linguistic and non-linguistic ways. Statistics can be used as rhetorical devices to inform and persuade readers (Quiring, 2018). Given the increase in social media and the rise of ‘fake news,’ there is a need to ensure that students are equipped with information literacy skills (Cooke, 2018). In the intersection between literacy and numeracy, it becomes vital for young people to develop and apply critical literacy skills to understand and interrogate the ways in which statistics are used within a range of texts. When students critically inquire about how statistics can be used to inform, persuade, and/or mislead, students’ critical thinking and reading skills are developed. Furthermore, by developing these skills, students become informed, active citizens.

The English curriculum is structured by three modes (reading and viewing, writing, and speaking and listening). Within each mode, there are three strands:

* language: the English language (how it works and how to use it)
* literature: the study of and engagement with a range of literary texts
* literacy: the interpretation and creation of texts, and understanding of how literacy applies to everyday life

Numeracy underpins all three of these strands. First, the location and presentation of statistical information in a sentence, paragraph, or text can influence how information is communicated and interpreted. Second, given the concerns relating to the rise of social media and the credibility of online media texts (Cooke, 2018), it is important for students to examine the credibility of statistics used within such texts. Finally, by understanding how statistics can be used to inform and persuade readers, students can apply statistics, as a rhetorical device, in their own written and spoken texts.

In the study of English, students develop and apply their numeracy capabilities when they analyse, interpret, and communicate statistics in a range of texts. Given that statistics can be employed as a rhetorical device to persuade others, students need to be able to:

* identify this type of rhetoric in a range of texts
* develop critical literacy skills to interpret and analyse this type of rhetoric within texts, including those in which current local and world issues are depicted
* create texts in which credible statistics are used

**Developing Numeracy Understanding in English**

Students need to develop critical statistical literacy skills in order to become informed citizens within modern societies, which are “increasingly shaped by and driven by data-based arguments” (Weiland, 2017, p. 33). Statistical reasoning is required in order for individuals to cope with the obligations and responsibilities of citizenship, as individuals must interpret, analyse, and evaluate arguments in which statistics are incorporated. There are often missed opportunities to explore the intersection between numeracy and literacy, particularly within the context of wider social and political issues (Gutiérrez, 2013; Weiland, 2017). As Weiland (2017) argues,

it is crucial for students to have opportunities to tackle complex sociopolitical issues in conjunction with learning powerful statistical concepts and practices in an effort to be able to read and write both the word and the world with statistics as critical citizens. (p. 45)

Similarly, Goos et al. (2014) suggest that informed and critical citizens must also be numerate citizens as data are incorporated in every public issue: “In an increasingly complex and information-drenched society, numerate citizens need to decide how to evaluate quantitative, spatial, or probabilistic information used to support claims made in the media or other contexts” (p. 85). Although drawing upon mathematical knowledge and tools to analyse the appropriate and/or credible uses of statistics is crucial, it is also important to understand how language is used to rhetorically frame statistics in a way that might shape how they are interpreted. For example, consider the following stylistic choices that were made to present the same statistic:

“The numbers rose by 25%.” (no defined timeframe, so it is left up to interpretation)

“The numbers rose by 25% in one day/week/month/year.”

“The numbers rose by a *mere* 25% in one day/week/month/year.”

“The numbers rose by a *whopping* 25% in one day/week/month/year.”

Additionally, structural choices are made by authors when situating statistics within a particular structure or genre, such as a social media post, a chronological sequence of events, or a news report. The structural choices made in a text help in identifying the purpose, as well as the intended audience. For example, the decision to compare the statistics across different states or countries, or to position statistical data within a particular and familiar context is shaped by both the author’s purpose and their intended audience.

Young people need to be equipped to interrogate the language used within texts in order to understand how structural and stylistic choices shape meaning. There are times that mathematical and statistical terms are used incorrectly, often unintentionally, within texts. For example, the word “significant” is synonymous with words such as “important” or “outstanding,” which can be used as descriptive words that are used to signal the author’s purpose. However, in statistics, “significant” refers to the statistics not *likely* being due to chance, which can denote a completely different meaning than the author is attempting to portray.

**Lesson Plan: Interpreting the Language of Statistics**

The purpose of this lesson is to develop students’ critical statistical literacy skills by providing students with the opportunity to explore a range of online media texts and to present an analysis of the use of statistics in a text of students’ choosing. Students will examine several online newspaper articles to identify the purposes of using statistics and the ways that statistics are linguistically and visually represented to readers. The online texts used for this lesson are situated within a recent, complex socio-political issue: the COVID-19 pandemic. Given the plethora of statistics available and the attention that these statistics have received, students will explore how statistics are portrayed and discussed within online texts (e.g., newspaper articles), as well as how they are positioned within a larger social and political context. In addition, students will present and communicate what they have learnt by summarising their analysis of 1–2 online newspaper articles based on key discussion prompts.

**Prerequisite/Corequisite Knowledge: English**

Students need to have and/or develop the ability to:

* understand how text structures and language features and patterns can be used for emphasis (reading and viewing; writing)
* analyse and compare information in different texts, explaining literal and implied meaning (reading and viewing)
* identify and present specific details to support a point of view (writing)
* listen and discuss with others, clarifying content and challenging others’ ideas (speaking and listening)

**Background Mathematical Skills and Understandings**

Teachers of English 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 skills and knowledge are:

* evaluate, analyse, interpret, and compare data displays representing two variables
* describe and interpret data sets and displays presented in digital media and from other secondary sources
* interpret tabulated data
* knowledge of fractions and simple ratios

N.B. Students may require assistance in recognising that case fatality rate (i.e., the number of people who have died from the disease divided by the number of people who have been infected, or D/I) is a ratio/fraction that can be evaluated and represented in decimal form.

* Compare and sequence case fatality rates(when represented in decimal form)
* Knowledge that for comparisons to be made, units of measurement must be the same

**Lesson Description**

*Setting the Scene*

To begin the lesson, locate and share the [graph](https://www.globaltimes.cn/content/1179405.shtml) entitled Coronavirus Outbreak in Chinese Mainland.

As a class or in small groups, have students answer the following questions:

* What is this graph about? How do you know?
* Why do you think that the number of patients increased so dramatically in one day?
* If you were writing a report using this graph, what types of language might you use to describe what is happening? Why?

The purpose of the discussion is to identify what students already know about the reporting of case/patient numbers (for the COVID-19 pandemic or any other pandemic). For example, do students know that there was a change in how public health officials in Hubei, China classified new COVID-19 cases or patients? Do students know that there were concerns raised about how different countries had different criteria to identify a case/patient?

*Explicit Teaching and Scaffolding of Terms and Concepts*

Share with the class a website where statistics about the pandemic are presented (e.g., <https://www.youtube.com/watch?v=NMre6IAAAiU> or <https://www.worldometers.info/coronavirus/?utm_campaign=homeAdvegas1?%22%20%5Cl%22countries>).

As a class, discuss what these statistics mean and what must be considered when comparing the number of case numbers and deaths in different countries (e.g., population, population density, the way that cases and deaths are reported). Return to the Hubei graph to discuss the reason for the increase in numbers (<https://www.globaltimes.cn/content/1179405.shtml>). To support diverse learners in your class, consider using a range of graphs/visuals that provide visual representation of concepts such as population and population density. For example, provide a graph that shows data based on case numbers only, and then show a graph where the data are organised by population and/or population density. These graphs can be viewed and discussed as a class or in groups.

After viewing a range of different graphs and discussing how statistics can be presented, present (e.g., on the board) the phrase: case fatality rate. Have students try to unpack or guess what this phrase might mean. Provide the following explanation:

Case fatality rate is the number of people who have died from the disease (D) divided by the number of people infected (I). This statistic (D/I) represents how deadly a disease is.

*Interpreting and Analysing an Online Newspaper Article*

* Have the students read the following article: <https://www.nytimes.com/2020/02/18/opinion/coronavirus-china-numbers.html>.
It may be helpful to discuss and compare the different types of newspaper articles (e.g., news article, opinion, editorial) in order to provide some background to why a mathematics professor is writing an article for the *New York Times* newspaper.
* For EAL learners, consider modifying the text by using any of the following strategies:
	+ adding additional visuals or pictures
	+ simplifying the text (making the text as a whole shorter and/or reducing the complexity of each sentence)
	+ identifying and highlighting key words in the text and providing a simple glossary of terms
* After students have read the text, have them, in groups, create a concept map in which they summarise the key points made in the text. Allow students to view others’ maps. If this work is being completed online, students can use Google Docs and view others’ concept maps using that platform.
* The following questions can be used during the concept mapping activity or afterwards to prompt discussion:
	+ What are the challenges of providing an accurate fatality rate?
	+ What role does the media (particularly online, 24/7 news reporting) play in our understanding of key issues, such as in this case with the COVID-19 pandemic?
	+ What do we need to do to be informed and to ensure that we are interpreting the statistics correctly? (e.g., What resources might we need to check?)
* Either independently or in small groups, have students search Australian newspapers, such as *The Age* or *The Australian*, and look for articles in which authors report statistics on COVID-19. The purpose of this activity is for students to examine 1–2 online newspaper articles in order to identify the different ways that data about COVID-19 are represented and discussed. Here are some discussion prompts to help students to frame their analysis:
	+ Where do the data come from? What do the data represent?
	+ What are different ways that these data could be interpreted? Is there information not presented that you think should be?
	+ What type of language is used to describe the data (e.g., adjectives, adverbs)?
	+ Who is the article written by? Is the author named?
	+ What type of article is it, and what does this tell you about the purpose (e.g., opinion, commentary, editorial, news article)?
	+ What is the purpose of the article (inform or persuade)? How do you know this? What language features are used to support your claim?
	+ Who do you think the intended audience is? How do you know?
	+ Can you detect any particular bias (e.g., political leanings)? How do you know? Who benefits from this information?
	+ Identify one sentence from the article and see if you can manipulate it to provide a slightly different interpretation of the data. For example, instead of “only 5% of young people have contracted the COVID-19 virus” you say “a whopping 5% students have devastatingly contracted the COVID-19 virus.”
* Have students provide a brief summary of their analysis and, as a class, synthesise the summaries in the following table:

|  |  |  |
| --- | --- | --- |
| Purpose(s) of article | Language used (e.g., list adjectives and adverbs) | Potential bias (Why?) |

* Finally, co-construct a list of ways to improve how we, as responsible and informed citizens, should go about interpreting and reporting data (e.g., reviewing the language that we use).

**Table 1: Links to the Victorian Curriculum – English**

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| --- | --- | --- |
| **Strand and Sub-Strand**  | **Content Description (Code)** | **Elaboration(s)** |
| Language* Text structure and organisation
 | Analyse how the text structures and language features of persuasive texts, including media texts, vary according to the medium and mode of communication (VCELA398)  | Discussing how particular perspectives of the same event are portrayed through the combination of images and words in various media texts |
| Language* Expressing and developing ideas
 | Recognise that vocabulary choices contribute to the specificity, abstraction and style of the texts (VCELA401) | Experimenting with vocabulary choices in a range of written and spoken texts and assessing the different effects these choices generate |
| Literature* Responding to literature
 | Understand and explain how combinations of words and images in texts are used to represent particular groups in society, and how texts position readers in relation to those groups (VCELT405) | Recognising the similarities and differences between types of texts (for example a complex picture book and a feature film) in order to understand how different combinations of words and images lead readers to interpret visual texts in particular ways, according to audience, purpose and context |
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| Literature* Responding to literature
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**Table 2: Links to the 21st Century Numeracy Model (Goos et al., 2014)**

|  |  |
| --- | --- |
| Aspect of the Model |  How This Aspect is Addressed by the Lesson |
| **Attention to Real-Life Contexts*** Citizenship
* Work
* Personal and Social Life
 | The COVID-19 pandemic is a real-life public issue for which students can explore and interrogate the role of statistics within the public realm (e.g., online media texts). Students will understand that in order to be informed and reflective citizens, they must be able to analyse how quantitative data are used and portrayed for different purposes.  |
| **Application of Mathematical Knowledge*** Problem Solving
* Estimation
* Concepts
* Skills
 | Students will make sense of data that are presented visually through graphs, tables, and infographics. More specifically, students will be able to examine how the same data sets are presented differently, using ratios, percentages, and raw numbers, and to identify how different presentations of data can lead to different interpretations.  |
| **Use of Tools*** Physical
* Representational
* Digital
 | Students will understand how data are digitally represented through both live and static visual, digital representations of data. Graphs or tables, as representational tools, will be analysed by students in terms of how large data sets (e.g., COVID-19 data) are presented.  |
| **Promotion of Positive Dispositions*** Confidence
* Flexibility
* Initiative
* Risk
 | Students will gain confidence in analysing and interpreting statistics as they will be guided and scaffolded through the use of key prompts to interrogate how statistics are used within texts. Students will have an opportunity to analyse a range of statistical representations as a class, in small groups, and individually, to increase their awareness and exposure to the various purposes of statistics. As this lesson is situated with a recent socio-political event, students’ positive dispositions towards mathematics will increase as they will realise the need for critical statistical literacy skills. Additionally, students are familiar with the topic, so they will have more confidence to discuss and explore it mathematically.  |
| **Critical Orientation*** Interpreting Mathematical Results
* Making Evidence-Based Judgements
 | Students will exercise their ability to act as informed and active citizens by analysing statistics that are portrayed in online texts and considering how statistics can be (mis)interpreted. Employing their critical statistical literacy skills, students will identify the different ways that data can be presented and how differences in data presentation can lead to different interpretations. Students will not only be asked to interpret how statistics are presented and portrayed in online texts; they will also provide a summary of their analysis of two news articles (based on key prompts). |

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