Unit Overview: Reaction Times

Summary of learning goals

Who has the best reaction time? This inquiry presents a need for collecting data involving small decimal numbers. Students consider factors that may affect a person's reaction time and pose a question to investigate whether the factor has an influence. Collaboratively, students determine the kind of data they will need to collect and make further decisions about how they will organise their data (e.g. in stacked dot plots) to communicate their answer. Throughout this process, students will encounter the real problem of how to read, record and plot reaction times recorded as a decimal number of seconds or as whole numbers of milliseconds. This inquiry provides rich opportunities for students to experience all stages of a statistical investigation.

Australian Curriculum: Mathematics (Year 5)

ACMNA104: Recognise that the place value system can be extended beyond hundredths.

ACMNA105: Compare, order and represent decimals.

ACMSP118: Pose questions and collect categorical or numerical data by observation or survey.

ACMSP119: Construct displays, including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies.

ACMSP120: Describe and interpret different data sets in context.

Summary of lessons

Who Is This Unit For?

This sequence is for students who are beginning to work with decimal place value at least to thousandths. The problem of finding out who has the best reaction time involves ordering decimal numbers to represent time values. This requires students to make connections between the different decimal place values.

Lesson 1: Discover Phase

Students consider contexts where reaction times are important. They learn about tests for reaction times, test themselves and plot the times on a number line. They compare reaction times with other students.

Lesson 2: Devise Phase

Students pose a statistical question to compare the reaction times of two groups of students. They devise a fair test to collect data that will answer their question and plan ways to efficiently record and display the data they collect. They participate in creation of a dot plot, and consider how to modify it to compare data from two groups.

Lesson 3: Develop Phase

Students use the plans from the Devise Phase to conduct a statistical investigation. They organise and conduct data collection, record and interpret reaction times, construct appropriate displays to reveal patterns and communicate findings, and make generalisations.

We value your feedback after these lessons via https://www.surveymonkey.com/r/CV2TXTT

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Lesson 4: Defend Phase

Students defend their conclusions about reaction times. In inquiry, the evidence triangle helps students to connect conclusions they make to the inquiry question posed, and to the mathematical evidence they collect. Students consider the findings presented by others and offer their own interpretations of data sets in context, as part of the reflection process. The unit is reviewed along with the 4D inquiry phases.

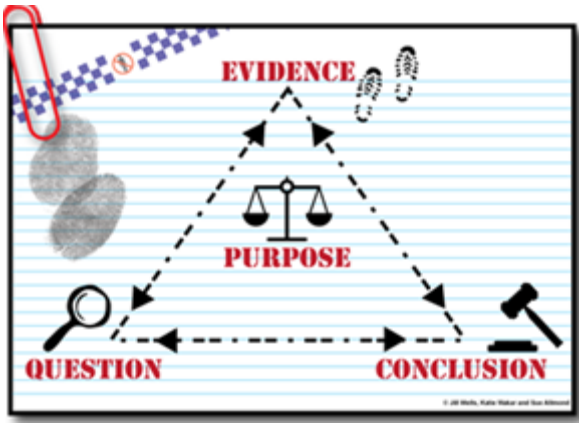
Reflection on this sequence

Rationale

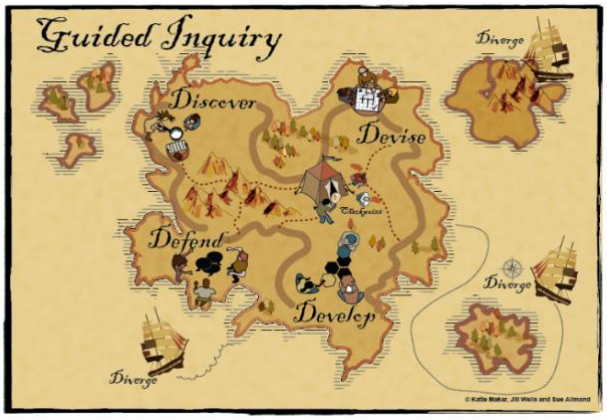
Students in Year 5 are introduced to the place value system extending beyond hundredths and benefit from multiple, meaningful opportunities to experience the place value aspects of decimals, including when linked to metric prefixes. The inquiry presents learners with a statistical investigation that involves the use of decimal numbers representing very small units of time: fractions of a second. Students are required to order and compare these times, plot them on a number line and relate the size of these numbers to quick reaction times. Units of measurement for time mostly relate to a base 60 system (60 seconds in one minute, 60 minutes in one hour, etc), but this pattern stops with seconds.

Throughout the inquiry, students use evidence they have gathered to support, justify and convince their peers that their solution answers the inquiry question. Lessons stress the need to gather mathematical evidence and the importance of explicitly connecting the inquiry question, the evidence and the conclusion, as shown in the Evidence Triangle (below, left). The unit is structured around the 4D Guided Inquiry model (below, right), which guides the teacher to support and scaffold students through each phase.

Further information is given in the *Mathematical Inquiry into Authentic Problems Teachers' Guide*.



The Evidence Triangle



4D Guided Inquiry Map

reSolve Mathematics is Purposeful

reSolve relies on the Mathematical Proficiencies of the Australian Curriculum: Mathematics to apply mathematical ideas and practices to everyday problems in authentic ways. This creates connections to deepen students' understanding.

Problem Solving: Students formulate and refine an authentic inquiry question related to their own statistical investigation, and plan how to investigate it.

Reasoning: Students work towards the Defend phase emphasises the links between evidence, conclusion and justification that are shown in the Evidence triangle.

Fluency: Students compare and order decimals that represent very fast and precise reaction times. They construct data displays, including dot plots, appropriate for the data.

reSolve Tasks are Challenging Yet Accessible

This inquiry presents an authentic purpose for working with decimals to thousandths. For students working below grade level, use concrete materials (e.g. Linear Arithmetic Blocks, decimats) or visual models to support decimal place value understanding. The statistical investigation poses challenge through the openness of the task. Students design the statistical question they wish to investigate and make decisions about the kinds of categorical of numerical data they collect. Students also need to design effective ways to organise and communicate the data they collect. Students work in groups to make sense of the data they collect. It is through conversations with peers that students justify and defend mathematical ideas they have.

reSolve Classrooms Have a Knowledge Building Culture

This inquiry provides opportunities for students to make decisions about their learning journey that might normally be undertaken by a teacher. Students pose the statistical question they wish to explore and continue to make decisions about the process of collecting data to answer the question, as well as how they will present it. When individual focus is diminished in favour of collective knowledge advancement of the community, decisions about the statistical process which are deemed effective by students can be shared, and other students can benefit by incorporating or building upon the idea. Although groups of students will explore different topics and be focused on different categories of information, the authenticity of the shared context makes sharing useful decisions about the statistical process of collecting and organising data a meaningful activity. Groups sharing and receiving knowledge throughout their investigation contribute to the knowledge advancement of all students.

Further Reading

Australian Association of Mathematics Teachers (2013). *Top Drawer Teachers. Unpacking categorical and numerical data: Teacher notes*. Retrieved from http://topdrawer.aamt.edu.au/Statistics/Good-teaching/Data-collection/Types-of-data/Categorical-and-numerical-data