



CHAOS THROUGH ICT

DIGITAL OPPORTUNITIES PROJECT



Case Study:
Car Speed Statistics
By Dean Stanley –
Brooklyn School, Wellington,
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MINISTRY OF EDUCATION

Te Tāhuhu o te Mātauranga

CAR SPEED STATISTICS:

An exploration into year five and six student capability to gather quantitative data using hand held devices and to analyse the data using spreadsheets.

Contributing towards:

CHaOS DigiOps pilot study two – Gathering information from outside the classroom

Contributing towards CHaOS DigiOps research questions:

2. How can Pocket PCs and Tablet PCs be used to help students gather information from learning experiences outside the classroom?
5. What infrastructure is required to optimise the use of Pocket PC and Tablet PC technology for gathering information from outside the classroom?
11. What impact does the use of Pocket PC and Tablet PC technology have on students' abilities to gather information from outside the classroom?

Teacher:

Simon Kenny

Year level:

Year 5/6

Learning Area:

Mathematics

Broad aim:

To investigate, develop, trial and report on ways in which new and emerging technologies can be used to collect data and information from learning experiences that take place outside the classroom.

Specific aims:

1. To explore how effective Pocket PCs and Tablet PCs are as tools for collecting fast changing quantitative data outside the classroom.
2. To investigate the difference in student ability to process statistical information using technology, compared with their ability to process the same information without technology.

Method:

The class was developing their understandings of statistics. The learning intentions for the passage of learning were to:

- Describe the value of statistics
- Analyse data and trends to pose a question and make statements

- Link a statistical investigation to our community
- Collect data through a variety of means
- Use ICT to assist in completing a statistical investigation

The teacher chose road statistics as a context for the passage of learning. The topic was introduced with students working in groups to discuss why we collect data and why we collect road statistics in New Zealand. Students then practiced developing and answering a set of questions about road statistics using data sourced from the Ministry of Transport. As the final part of the introduction, students were asked to describe what investigations they could undertake regarding road statistics close to school.

The students chose to investigate road safety around the school and fuel conservation, and decided to collect statistics on car speeds and passenger occupancy levels as a means of helping them in their investigations.

The class was split into four groups and with a borrowed speed radar gun from the Wellington City Council. Each group was given 90 minutes to gather data on vehicles passing the school gate. All students collected the speed of the car as well as one variable. The variables were:

- The number of passengers
- The driver's gender
- Whether the driver was wearing a seatbelt
- The direction the car was travelling
- The car's colour
- Whether or not it was a 4WD.

In each group, data were recorded in three ways:

- Pen and paper
- Tablet PCs database form
- Pocket PCs spreadsheet

The data were collected and collated to form a class set.

As one group collected data, the other groups worked on a research project using road crash statistics to identify New Zealand's high crash areas. From the data, the students designed a road safety poster.

The students were observed by the researcher as they collected the data from outside the school gates. Observations included the ease with which students could collect data using the devices as compared with pen and paper.

At the conclusion of the passage of learning students were given a questionnaire which focused on the how easy they found using the devices to collect quantitative data, and how easy they found it to use spreadsheets to analyse information.

Results:

From observing the students it became clear that collecting and recording the data on a tally sheet using a piece of paper and pencil was quicker and easier than using the Tablet PCs database or the Pocket PCs spreadsheet. Students found it hard to keep up with the number of cars going past, recording the speed, and obtaining the variable factor they were responsible for. Students using the devices, stylus pens, and character recognition software found their handwriting was not always

recognised immediately. Extra time had to be taken to re-enter data and resulted in data being missed, which negated the benefit of being able to enter data electronically.

In the second phase of this project, two groups of students were chosen to work through two sets of similar exercises which required them to analyse 170 records from the gathered data. The tools used to help in the analysis process were pens, paper, calculators and the Pocket PC's spreadsheet. Each group would complete both sets of exercises using each set of tools. A ten minute spreadsheet introductory lesson was given where the groups learnt how to use the sort, filter, count, sum and average functions. Group one completed the exercises using the Pocket PC's spreadsheet while group two used the pen, paper and calculators. The next day the groups swapped the tools over. The following are some examples of the kind of exercises they were asked to complete:

Questions with one variable

- What was the range of speeds from highest to lowest?
- What was the fastest speed?
- Were most people wearing safety belts?

Questions with two variables

- What was the average speed of cars going down the hill?
- Do cars with two people in them drive faster than cars with one person in them?
- Do drivers who don't wear seatbelts drive faster than drivers who wear seatbelts?

Questions with three variables

- What is the average speed of women four wheel drive drivers?
- What is the range of speeds for male drivers who don't wear seatbelts?
- Is the average speed of male drivers with extra passengers in their car faster than female drivers with extra passengers in their cars?

The research found that when the students used the pens, paper and calculator, on average 48 percent of their exercise answers were correct, compared with the Pocket PC's spreadsheet, where an average of 68 percent of questions were answered correctly.

Students were interviewed and asked to rate how easy they found it to use the three different modes of recording the car speed data. The following table documents the results from the questionnaire.

Table 1: Ease with which students were able to use different modes for collecting rapidly changing quantitative data

Mode	Very Hard	Hard	Easy	Very Easy
Pen and paper		4	4	
Spreadsheet on Pocket PC		1	7	1
Database form on Tablet PC		3	3	

The students who completed the second phase of this case study were asked whether they found it easier to analyse the data with the spreadsheet or without the spreadsheet. All students said they found it easier to analyse the data with the spreadsheet as it was quicker and easier to sort the data and do the calculations.

Conclusions:

Two conclusions can be drawn from this action research project. The first relates to the Tablet PCs and Pocket PCs suitability for collecting rapidly changing quantitative data outside the classroom. The second relates to the use of spreadsheets for analysing data at the Year 5 and 6 level.

Firstly, the students perceived they had no problems using the devices; however, the quality of their data was compromised as some weren't familiar with the character recognition software. If the devices are to be used for data collection, it is important that teachers spend time ensuring the interface allows students to keep up with the stream of data presenting itself. If this is achieved, then the technologies could be useful data collection tools.

Secondly, there is no doubt that students were able to process the data analysis exercises more easily with the spreadsheet than with the pen, paper, and calculator. Students had little difficulty in understanding what was required in the exercise, and the spreadsheets allowed for the more accurate analysis of the data. However, they did have difficulty in processing the volume of data (170 records), which was evident when they had to do a statistical function on filtered data with two or more variables.

This outcome has implications not only in mathematics, science and social studies, but across other learning areas where statistical skills are applied. Students could be more sophisticated in their data analysis in these learning areas if they are provided with access to spreadsheets and instruction on how to use them.