Excellence
Intended for teacher use only

For Achievement with Excellence the student response includes:

Introduction

Our class has been investigating travel patterns and traffic near our school. I noticed that there were some differences in the ways that people travelled to school between primary and high schools. Something else I noticed was that me and my friends had all gone to different primary schools and lots of us had just gone to the school down the road but that's not true for high school. Some of my friends said that they walked to school when they were in year 6 but since they started college they had to take the bus each day because it was too far to walk. When we completed a school survey about what primary we had gone to, I noticed that there were people who had come from lots of different places in Auckland, some not even that close to our school. I think it could be something that is true for lots of students around the country - that their primary school is quite close to home but their high school is further away. Because of this I am going to investigate whether Year 9 students tend to take longer to travel to schools than Year 6 students.

Q: I wonder if students who are in year 9 tend to take longer to travel to school than students who are in year 6 from all students who have completed the 2023 census at school questionnaire.

Group 1 = Year 6 students
Group 2 = Year 9 students
Measured variable = time taken to travel to school to the nearest minute
Population = all year 6 and 9 students who completed the 2023 census at school questions
Sample = 100 of each group from census at school

I predict that the sample will show similar results to what we noticed in class and that the year 9 students will tend to take longer than the year 6 students.

As well as being interesting to me (and my friends) this information might be useful for parents looking at shifting to a new house or just organising their days when their kids move to high school

Below is picture of the question from the survey that students fill in that shows the instructions for students.

15. How long does it usually take you to get to school? Answer to the nearest minute.

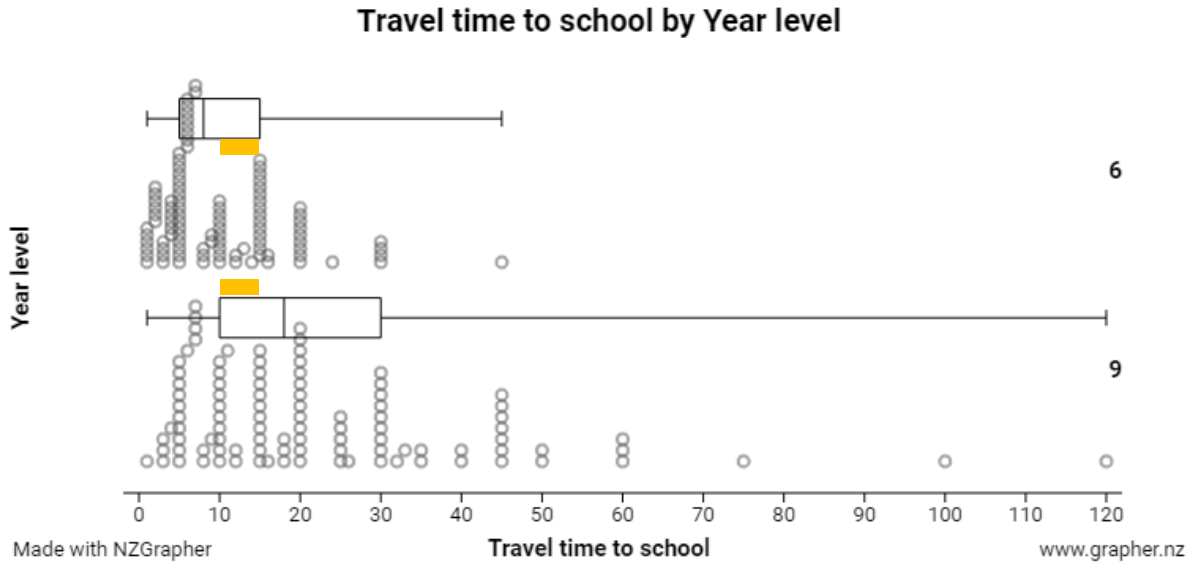
minutes

In collecting this data from a range on students in a range of schools, there a number of ways that variation could have occurred in the data. The frist is natural/real variation (or individual to individaul variation) This happens because all of the students who answered the survey live in different locations and would likely have several different ways they travel to school. For example two people who live in the same street might travel to school by car but one of the people always drops off another family member at work before the go to school. Because their distance is longer, their time taken to travel to school will be longer. A student who walks will probably take longer to get to school than a student who bkes the same

distance. This type of variation in the data is managed by taking a sample of size 100 from the data base. Even though sampling variation will always occur, with a sample of 100 per group I should still get a reliable set of data from which to make a call for the whole population, there is less variation in the results between a sample of size 100 compared with a sample of size 10. Having a sample of 10 year 9 students could leave me with a lot of variation but with a sample of 100 year 9 students, this level of variation is likely to be less.

Another source of variation in the data occurs when the measurement of time takes place. I looked through the teacher guide and there were no more instructions about how to measure the time. This has been managed in two ways. The first is that students are asked how long it **usually** takes to get to school. This is also helps control occasion to occasion variation. The second is by asking students to give their answer to the nearest minute. I would assume that for students in year 6 and year 9 the teacher would have given some guidance as to how to record times like 2 and a half minutes as 3 minutes. By giving a clear instruction variation caused by meaurements has been managed.

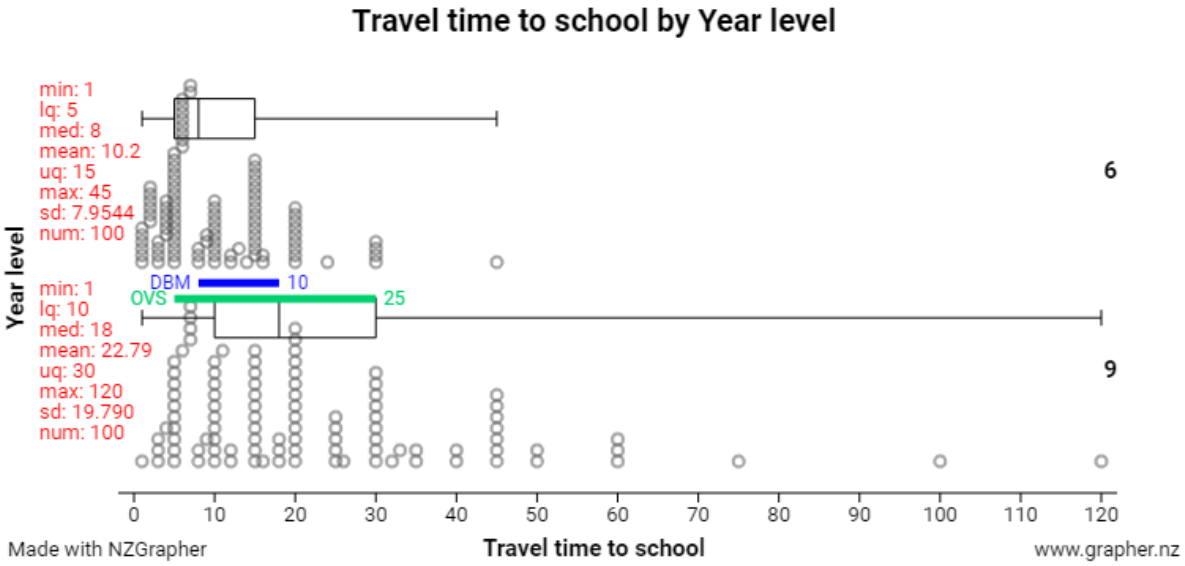
Visualisations and Analysis



From the graph I can see that in my sample the year 9 students had a higher median than the year 6 group and the middle 50% for year 9 is higher up than the middle 50% for year 6 students. The average year 9 student takes 18 minutes to get to school and the average year 6 student takes 8 schools. The year 9 data has an interquartile range that goes from 10 to 22.79 minutes (LQ and UQ) and the year 6 data has an interquartile range that goes from 5 to 15 minutes. Using these two features together I can say that in my sample the average student and the middle group of students for year 9 both take longer to get to school than the year 6 group.
There is some overlap between the middle 50% sections of the two groups, the yellow sections on my graph. This shows that there is not a lot of overlap in travel times between the two middle 50% sections. More than half of each middle 50% for each group lies outside this section. It looks like it is about 3 minutes in time span. For this sample, half of the year 9s sits higher than the upper quartile for year 6 – half of the year 9 takes longer to get to school than three quarters of the year 6 students.
There are couple of very large values for the year 9 group. 8 year 9 students took longer to get to school than the longest time taken by a year 6 in this sample (45 minutes). This is might suggest that those students live further away but I would need more information to say

that this is what was causing the time increase. I was really surprised that two year nines took over an hour and a half to get to school regularly! I wonder if they regularly take that long to get home again each day and where they live that makes that travel for that long each day.

Conclusion (including inference)
Using the distance between the medians and the overall visible spread for samples of size 100, I can make a call about the population because you can see that the blue line is more than 1/5 or 20% of the green line. (graph on the next page) This confirmed by the numbers with 10/25 being quite a bit bigger than 1/5. On the basis of my sample I am able to say that for all students who completed the census at school survey in 2023, students who are in year 9 tend to take longer to get to school than students who are in year 6. Unfortunately I didn't sample many other variables when I took my sample from census at school (and I really regret it!) If I had included the region where the student had come from I might have been able to get some better information around the times taken to get to school – particularly if the students came from regions that don't have many high schools compared with primary schools. It would also be interesting to know (not asked in the survey) what kind of school the students went to – if it was a catholic school for example. Where I live in Auckland there are more catholic primary schools than high schools. So if you went to a catholic school in year 6 and then in year 9 you might have to travel further. I also wish I had downloaded the method of travel for the sample I took. These other variables could reveal more about the data than my analysis currently does.



91944 Excellence Exemplar Notes:

The student has written a well-developed introduction that includes several elements of an enquiry cycle (without naming any specific model they follow or using headings that indicate what they are following). The student's purpose indicates that personal interest played a part in the "why" for the investigation and noted that it may be of use or interest to parents.

In explaining sources of variation, the student has discussed two different types. With measurement variation they have looked at how the question is structured to manage the many ways the measurement should be made. As part of this section the student has started to explain the choice of sample size noting the differences between samples of 10 compared with samples of 100. Further knowledge of this concept lies at higher curriculum levels.

The student has produced the same graph twice, showing different things in each, with the summary statistics referenced shown on the second graph. There are other features in the graph that could have been discussed but these were not needed to meet the requirements of the Standard. They have justified the visible features by using measures and shown statistical and contextual knowledge in their introduction, at the end of their analysis, and in their conclusion, reflecting on their process.

In writing their conclusion the student has given thought to what they have done (or not as the case may be), reflecting on further variables they should have included in the data set and how these could have had some influence on the result. The student has used visually applied the distance between the medians as a proportion of overall visible spread. They have included the calculation which is not required to make the call.