



Case Study 06

Basic data

Title of Research Teaching Unit	Descriptive Statistics
Unit created by	Istituto Comprensivo “Malaspina” – Massa (IT)
Based on Concept	Descriptive Statistics
Concept created by	BORG Deutsch-Wagram (AT)
Date of teaching	27.11.2023
Number of students in class	24
Number of migrant students	2

1. Unit Description of Research Teaching Unit

Title	Descriptive Statistics
Age of students/grade	Grade 6
Length of the unit	2 hours
Mathematical topic	Dive into and use the main concepts of descriptive statistics
Prerequisite knowledge	<ul style="list-style-type: none"> • Know the meaning of some recurring terms in statistical surveys such as "statistical population" (all entities to which the survey refers), statistical and variable unit, sample, representative sample • Know the concept of ratio between two quantities (to calculate the "absolute, relative and percentage frequency") • Know various types of graph (ideogram, orthogram, circular/pie areogram, Cartesian diagrams) and know how to derive information from them.
Materials needed	<ul style="list-style-type: none"> • Piece of paper or booklet to solve the tasks if there is not enough space on the information sheet • Stationery • Calculator • PC with Excel calculation software if the teacher wishes to achieve even goals related to computer skills
Objectives	<ul style="list-style-type: none"> • Students learn about statistical indicators such as mean, mode and median and learn how to use them. • They apply mathematical content to everyday problems. • They improve their reading comprehension. • They get to know different ways of presenting data. • They improve their team skills.
Notes on work with migrant students	<ul style="list-style-type: none"> • The teacher can prepare material to improve the understanding and memorization of some terms (print out terms wrapped in foil, create a worksheet) • At the first brainstorming, the teacher can choose to provide short mathematical input or the correct mastery of statistical terms prerequisites • If there are migrant pupils, cooperative work in pairs is certainly more suitable because it allows a continuous activation of students and the overcoming of any difficulties of linguistic understanding that the teacher alone cannot foster. • Applying statistical survey to real-life contexts improves understanding of statistical concepts for all students • Articles may be written in a language that is difficult for students. In addition, they contain a wealth of new words and expressions, which should be discussed with the learners in advance. Pupils in particular, for whom the text was not written in their mother tongue, could have major problems here. However, this linguistic hurdle can also arise for students whose mother tongue corresponds to the language in the text. Many expressions are rarely used in everyday life and are therefore often unfamiliar. The teacher will be careful to choose articles suitable for age and language level.

Lesson plan

Step 1

Types of representation

The teacher at the beginning of the lesson distributes some newspapers and places terms such as “bar chart”, “pie chart” and “boxplot” on a table. The students have the task of cutting out different types of representation of data from the newspapers and assigning them to the terms.

After that, all the types of representation mentioned will be discussed and reproduced using an example they have chosen. In this phase, the students themselves are active.

Step 2

Analysing a set of data

The coming phase is designed more as frontal teaching. For the self-chosen example, data related to the body (e.g. the shoe size, eyes colour, height) could also be used but we do not recommend it if the class is turbulent and at risk of teasing; it is better to provide exercises with a set of similar data that saves the time of data collection itself. The term "original list" can be discussed and this list can be sorted. Here it is particularly suitable to address the terms "minimum", "maximum", "range", "mode", "median" and "arithmetic mean". This exercise can be complemented by the notion of a quartile and the creation of an associated boxplot.

In order to take up the presentation of data again, the absolute frequencies of the individual values are first found out with a tally and noted as a number. After that, these values can be grouped. This grouping results in new absolute frequencies. Based on this, a pie chart, a histogram and a column chart are now created.

Here are some exercises that can be used as an example:

Exercise n° 1

The P.E. teacher took a test run with the pupils of the first classes, measuring the time taken to walk 30 m.

He/she obtained the following data in seconds:

4,3	4,7	5,2	5,1	4,4	4,2	4,4	4,8	4,9	5,0	4,6	4,5	4,5
5,1	5,3	5,0	4,3	4,8	4,9	4,2	4,7	5,2	4,5	4,8	5,0	5,1
4,4	4,9	4,5	4,8	4,2	4,4	4,6	4,9	5,0	4,1	4,3	4,4	4,8

- ❖ The teacher would like to group the data in a chart by grouping them into level bands, help him/her....
- ❖ And now he/she wants to evaluate the three statistical indicators of MODE, MEAN and MEDIAN. What would he/she calculate?
- ❖ A colleague from another school asks him/her: "What was the FIELD OF VARIATION of your tests?" What should he/she answer?

Exercise n° 2

The Maths teacher wants to organize afternoon classes and asks his/her students about a preference for the day they are free. Then he/she collects these choices:

<i>Day</i>	<i>Preferences</i>
Monday	Ayesha, Luca, Francesco, Aurora
Tuesday	Anita, Andrea, Sofia, Laura, Paolo, Camila
Wednesday	Amir, Christian, Natalia, Stefano
Thursday	Gemma, Ali, Claudia, Simone
Friday	Matteo, Sara

- ❖ The teacher wants to calculate the ABSOLUTE and RELATIVE FREQUENCY and the PERCENTAGE of this situation.

Exercise n°3

The following table gathers the data of the RELATIVE FREQUENCY of the votes obtained in the third year. Taking into consideration that 90 students have taken the exam, fill the empty cells in the table.

<i>Mark</i>	<i>Absolute frequency</i>	<i>Relative frequency</i>	<i>%</i>
6		0,1	
7		0,4	
8			
9		0,2	
10		0,1	
Total 90			

Step 3

Assessment of achieved competences

At the end of the activity, to verify the achievement of the teaching objectives, a survey/interview can be proposed by the students on their classmates or other students. The topic will be chosen by them (practised sports, number of books read in a month, owned pets,...) and the interview can be oral or by means of a table as in the exercises proposed above. The students will then process the collected data by calculating some statistical parameters and creating a suitable graph.

2. Interview Analysis

The teacher teaching this unit has 16 years teaching experience. The length of her mathematics teaching practice is 16 years. Her other subject is Science. She never received a training for teaching in multicultural classrooms, neither in her initial teacher training, nor in her in-service teacher training.

She had never taught mathematics to migrant students before.

Lesson plan was used without any additional materials, but some of its activities/materials were left out:

- Step 1 - Reason: short time available
- Exercise 2 - Reason: short time available

It is possible to make different modifications, replace materials, add or leave out activities according to the students, the type of the class and the time available.

3. Improvement Suggestions

Lesson plan has been evaluated suitable in the current form. However, in her teaching, as described in the previous section 2. *Interview Analysis*, some parts of the lesson plan can be replaced by different activities.

4. Classroom observation

The first phase was designed as a frontal teaching: realize a survey about data related to shoe sizes and collect data.

The second phase was designed as group work: realize a table with absolute frequencies; create an histogram.

The third phase was designed as a discussion: talk about the results and take feedback.

No cross-links were made with other disciplines.

Length of teaching: 1 hour, instead of 2 hours as originally planned.

All the students were involved in the activities and took part actively in the lesson.

The working climate was positive: students worked hard and carefully.

Compared to other teaching units, there were no differences in attitude between students and students, and students and teacher.

From a motivational point of view, group working motivated students and created an inclusive climate, especially for migrants students. The teacher had to be careful to choose activities suitable for students' age and language level.

From a cognitive point of view, applying statistical survey to real-life contexts improved understanding of statistical concepts for all students. However, many words and expressions are rarely used in students' everyday life and are therefore often unfamiliar.

No evaluation tests were administered.

The proposed teaching unit made it possible to carry out an effective recovery effort for students in difficulty, thanks to the creation of different activities in pair work or tutoring.

The teaching unit make it possible to carry out an effective stimulus action for the brightest students as they could be an example for their weakest classmates, so that they could also achieve their goals

Cooperative work in the class was the main methodological choice and inclusion strategy: it was certainly more suitable because there were two migrant pupils. It also allowed a continuous activation of students and the overcoming of any difficulties of linguistic understanding that an alone teacher could not do.

In light of the experience, the teacher suggests to add a brain storming phase, in which the teacher can review:

- the meaning of some recurring terms in statistical surveys such as "statistical population" (all entities to which the survey refers), statistical and variable unit, sample, representative sample;
- the concept of ratio between two quantities (to calculate the "absolute, relative and percentage frequency");
- the different types of graph (ideogram, orthogram, circular/pie aerogram, Cartesian diagram) and know how to derive information from them.