

DIRECTORS

Digital data-dRiven
EduCaTion fOR kids



Open Educational Resources

for Teaching Data Literacy

to ISCED Level 1 Pupils



Digital and data literacy are crucial today, especially for younger generations. The **DIRECTORS (DIgital data-dRiven EduCaTion fOR kids)** focuses on **promoting data literacy in primary education** through innovative teaching methods and materials. The project is implemented by the University of Zagreb in Croatia and the Delft University of Technology in the Netherlands, as part of the Erasmus+ programme co-funded by the European Commission.

As part of the DIRECTORS project, we developed **three workshops** for lower primary education (ISCED level 1), each consisting of two sessions. The workshops are structured around three levels of data literacy, with each level tailored to the age and prior knowledge of the pupils. Workshop 1: **Data in Our Hands (and Mobile Devices)** introduces basic data skills; Workshop 2: **Geospatial Data (and Maps) in Our Hands** targets intermediate skills; Workshop 3: **Data Sources** encourages the development of advanced data literacy.

Each workshop includes two sessions, and each session consists of two 45-minute school periods. The activities are carefully designed to offer pupils hands-on experience through “learning by doing,” enabling them to apply the acquired concepts in real-world contexts and covering the **entire data cycle** – from (1) data collection carried out by the pupils in their own environment, through (2) data processing in a “child-readable” format with error checking and cleaning if needed, (3) data analysis by asking questions and drawing insights, (4) data visualization to support clear communication and spatial thinking, to (5) critical reflection and interpretation, drawing conclusions both from the data and about the data itself.

In the first session of each workshop, pupils engage with the material offline, using manual methods. In the second session, the same content is transferred to an online environment using digital technologies. The workshops are based on an interactive and practical approach that actively involves pupils in working on concrete tasks.





young children
ISCED level 1



DATA COLLECTION
*by children from the
real-world environment*



DATA PROCESSING
*"children-readable form",
checked for possible errors,
and cleaned if necessary*



DATA ANALYSIS
*ask questions, extract
insights form data*



DATA VISUALISATION
*depict data in a clear manner,
encourage spatial thinking*



CRITICAL THINKING
*drawing **CONCLUSIONS**
from the data and about the data*





WORKSHOP 1

Data in Our Hands (and Mobile Devices)

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You are viewing the educational materials for implementing **Workshop 1: Data in Our Hands (and Mobile Devices)**, **Session 1: Mobile Device Usage Data**. All materials are also available on the website of the DIRECTORS project: www.kidsdirectors.eu.

Workshop 1: Data in Our Hands (and Mobile Devices) will introduce the pupils to the **world of real-life data**, from data collection to processing and critically evaluating results. Pupils will explore real-world data by looking at their own use of mobile devices – for example, their favourite games or video channels, the amount of time spent on a particular app, and so on.

During the *first session*, they will estimate their use of mobile devices and create data cards with their estimates and favourite apps. They will then learn how to group, categorize, and clean data and how to visualize it in a word cloud.

In the *second session*, pupils will learn how to collect, adapt, and enter actual mobile phone data into a dataset. They will investigate similarities and differences between the entire class's data and their own data and compare their estimates to the data they've collected. They will also learn how to visualize real-world data, why it's important for data to be entered accurately, and how to preserve privacy when adding personal information to a shared dataset.

Digital data dRiven EduCaTion fOR kidS | Open Educational Resources for Teaching Data Literacy to ISCED Level 1 pupils | Workshop 1: Data in Our Hands (and Mobile Devices) by Ivana Bosnić,

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WORKSHOP 1

Data in Our Hands (and Mobile Devices)

Session 1: Mobile Device Usage Data



1. Required Materials and Preparatory Activities

- ✦ A computer with internet access and a projector or smartboard.
- ✦ Slides – prepared for the presentation (available on the project website).
- ✦ Data cards and forms for in-group discussion – should be printed (available on the project website).
- ✦ Word cloud data visualisation tool (our recommendation: wordart.com) – ready to be used live.
- ✦ Instructions for homework – printed or prepared to be distributed electronically (available on the project website).
- ✦ Calculators for pupils – if needed, for simple calculations.

If possible, it would be helpful to involve two persons, especially when preparing data for a word cloud. If only one teacher is present, pupils can continue the group discussion while the teacher prepares the data.

2. Basic Information About the Topic

Pupils will learn about data by using information already collected by their mobile phones or other electronic devices: **data related to their mobile phone usage**. This topic was chosen because the data is widely available, easy to collect, is varied and includes several variables (such as total time spent using the device, time spent on each individual app, screen-on time, etc.). The aim is not to discuss the pros and cons of using a mobile phone or tablet, but to focus on how pupils can evaluate their own data on usage and compare their estimates with those of their peers. In the first session, pupils will estimate their mobile phone usage without checking the actual data on their device.



3. Lesson Organisation

The table below outlines the structure of the lesson, with approximate durations for each activity. Since the activities are flexible, in some cases multiple **options or variations** are offered. Certain activities may also include additional elements (marked as "EXTRA"), such as extended discussion points. The estimated duration of each activity is shown as a range. The actual time needed may vary depending on the pupils' age and prior knowledge.

Activity	Duration (minutes)	Method	Description 
Introduction	10-15	Whole-class discussion	Introduction to the topic with icebreaker questions.
Discussion about Mobile Phone Data	10-20	Whole-class discussion	A discussion about mobile phone usage – how often and for what purposes pupils use their phones, their favourite games, apps, and so on.
Data Cards Creation	10-15	Individual work	Pupils fill in the data cards themselves – one data card per pupil, with four types of data (details provided in the activity description): Mobile games / Video games YouTube / Video channels Chatting on the device General mobile phone usage.
Data Cards Grouping and Sorting	10-20	Teamwork	Pupils take their data cards and group themselves according to their favourite game, gathering in the corners of the room. Within each group, they discuss similarities and differences and sort their cards into subcategories. Optionally, they also fill in short data tables recording the duration and number of times they pick up their device. They add up the values in minutes, convert them into hours, and discuss these figures.
Analysis and Discussion	10-15	Whole-class discussion	Discussion of similarities and differences between individual and group results, different groups, and various data types. Comparison of global and individual usage. Presentation of a visualisation of favourite games/channels/groups in a word cloud chart. Discussion about how the word cloud helps us, what we can and cannot see from it.

Activity	Duration (minutes)	Method	Description
Conclusion and Reflection	5	Whole-class discussion / Individual work	Pupils summarize what they did and learned? The teacher gives his conclusion: What have we learned today? Has the teacher learned anything new?
Homework and Teaser for the 2nd Session	5	Whole-class discussion	Homework description for the 2 nd session.
Total	60-95		

4. Learning Outcomes

4.1 Learning Outcomes – Teacher Language

By the end of this lesson, the pupil will be able to:

- ✦ Recognize the data in the real world.
- ✦ Identify different types of data.
- ✦ Classify, categorize, and group data.
- ✦ Analyse the similarities and differences in data.
- ✦ Answer investigative questions that can be answered with real-life data.

4.2 Learning Outcomes – Pupil Language

You will learn what we mean when we say the word "data" and that you can collect different types of real-life data. You will learn how to group similar data, such as the same games you play on your mobile phone. By grouping this data, you will see similarities and differences between yourself and your classmates. You will discover that data can help you learn something more or new about your classmates. You will use data to provide answers to real-life questions.

5. Fun Facts

Using these fun facts is optional – their inclusion depends on the pupils' age and the teaching context. You can include them as you see fit, choose just a few, or skip them entirely. It's recommended to use those that are most relatable to the pupils' own experiences and surroundings.

- ✦ Did you know that people almost always think they spend less time checking their mobile phones than they actually do? On average, people spend about 5.5 hours a day in front of screens. Even children under the age of 6 spend at least 2 hours a day on screens¹.
- ✦ Most children aged 14 to 18 in Croatia reported spending 2 to 4 hours a day using their smartphones, while their actual screen time averages 5 hours and 29 minutes per day.
 - ☆ Data from 2019 (source: <https://hrcak.srce.hr/289576>)
 - ☆ Preschool-aged children spend an average of 2.4 hours in front of screens on weekdays and 3 hours on weekends. Data from 2016/2017 (source: <https://www.medijskapismenost.hr/rezultati-istrazivanja-kako-hrvatski-predskolci-provide-vrijeme-uz-ekrane/>)
- ✦ *CoCoMelon* – the most popular children’s channel - <https://www.youtube.com/@CoComelon>
 - ☆ Details: https://en.wikipedia.org/wiki/List_of_most-subscribed_Youtube_channels
- ✦ Most frequently downloaded free apps on the *Google Play* platform
 - ☆ <https://www.androidrank.org/android-most-popular-google-play-apps?price=free>
- ✦ Most downloaded games of all time on the *Google Play* platform
 - ☆ *Subway Surfers*, *Candy Crush Saga*, *Free Fire*
 - ☆ The number of downloads, whether total or within a single month... is enormous. Compare it to the population of ... [your country / Europe].
 - ☆ Details: <https://appradar.com/blog/most-downloaded-games-in-google-play>
- ✦ Most downloaded games by category
 - ☆ *Roblox* – adventures
 - ☆ *Subway Surfers* – arcades
 - ☆ *Clash of clans* – strategies
 - ☆ Details: <https://www.androidrank.org/>
- ✦ A short animated history of the most downloaded games on the *Google Play* platform
 - ☆ Interesting for the data visualisation and animation method <https://youtu.be/gYucHINoDnI>
- ✦ Most downloaded communication apps
 - ☆ *WhatsApp*, *Facebook Messenger*, *SnapChat*
 - ☆ Details: <https://www.androidrank.org/>

¹ Fabio Duarte (2025), Alarming Average Screen Time Statistics (2025). April 24, 2025, <https://explodingtopics.com/blog/screen-time-stats>

6. Activity Flow

6.1. Introduction

- ✦ Start with discussion starter questions:
 - a. Hands up: "Who has a dog as a pet?" Count the hands.
 - b. Hands up: "Who has a cat?" Count the hands.
 - c. "So, if X of you have a dog and Y of you have a cat, does that mean there are more cats than dogs?"
 - d. Let pupils respond spontaneously ("yes", "no", "I have 2 cats and 1 dog"; "I have a hamster, why don't we count them too?")
 - e. **EXTRA:** Follow-up questions: "What would be better questions if we wanted to find out how many pets you have or what kinds of pets you have?" Give pupils a moment to think, then review their answers, e.g. "You should have asked each child if they have a pet, or how many pets and what kind." Keep the discussion brief.
- ✦ Introductory questions:
 - a. "Have you ever heard the word 'data'?"
 - b. **EXTRA:** "Can you think of another word for 'data'?"
 - c. "What do you think data is?" Wait for pupils to respond. Use additional questions to start the conversation:
 - i. "Where can you see data?"
 - ii. "What about prices in the supermarket?"
 - iii. "Who has the highest score in a game or sport?"
 - iv. "What about your school grades?"
- ✦ Questions:
 - a. "Why do we need data, what can it tell us?"
 - b. "How is data created?"
 - c. "Can you create data yourselves?"
 - d. "How can we collect data?" Allow a few minutes for responses.
- ✦ Explain what the pupils will be doing in this lesson (if applicable, show a slide with the learning objectives in the pupils' language).

6.2 Discussion about Mobile Phone Data

1. Hands up: "Who has their own mobile phone?"
Count the raised hands as this information will be needed for the second session.
 - a. Follow-up questions for those who answer "yes":
 - i. Do you use your mobile phone every day?
 - ii. What do you use your mobile phone for most often?
 - b. **EXTRA:** Follow-up questions for those who answer "no":
 - i. Do you share a mobile phone with your brothers and/or sisters or parents?

- ii. Do you have a tablet or laptop at home?
 - iii. Is this your own device or do you share it?
 - iv. What do you mostly use this device for?
- 2. Question: "Can you estimate how many apps you used yesterday/last weekend?"
If pupils stated they only use a mobile phone or tablet occasionally: "Can you guess how many apps you used last week?"
 - a. Follow-up questions:
 - i. Can you guess how long you used your device?
 - ii. **EXTRA:** Do you sometimes use your device while doing something else at the same time? For example, do you listen to music while playing games or doing your homework?
 - iii. **EXTRA:** Have your parents set time limits on your device usage?
 - iv. **EXTRA:** Do you pay attention to those limits, or do you wait until they remind you?
 - b. **EXTRA:** Do you have a favourite platform for, for example, playing games or watching videos?
 - c. **EXTRA:** Do you use chat apps? Follow-up question:
 - i. Hands up for WhatsApp.
 - ii. Hands up for Snapchat.
 - iii. Hands up for another app. Which other apps do you use, e.g. JustTalk, Viber?
 - d. **EXTRA:** Do you mainly use chat apps for one-on-one conversations or group chats, such as a family group or a sports team group?
- 3. Questions:
 - a. "Do you think you use the same apps as your friends? How do you know?"
 - i. If no: "Why not?" Allow pupils to give positive answers, such as "I prefer to play with them."
 - b. "Do you think you use your mobile phone/tablet more or less than your friends? How do you know?"
 - c. **EXTRA:** "Do you think you use your mobile phone/tablet more or less than your parents? How do you know?"

6.3 Data Cards Creation

- ✦ Give each child a blank data card (see next page) on a sheet of paper, downloaded from our website and prepared in advance. You can choose how many categories you want to include. You can:
 - ☆ print the full template with four categories and decide on the spot which categories to work with,
 - ☆ or print a simpler version with fewer categories in advance.



GAMES



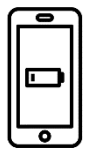
VIDEO



CHAT



MOBILE



Option 1: Choose two categories from the data cards.

Video games are the most suitable. The second category can be chosen based on pupils' answers about mobile phone use; usually, video channels or general mobile phone usage work best.

Option 2: Use all four categories.



Depending on the chosen option, work with 1, 2, 3, or 4 categories of data using the following components:

✦ **Mobile phones / video games:**

- ☆ what is your favourite game?
- ☆ how many minutes per day do you play games?
- ☆ how many times per day do you pick up your device to play games?

✦ **YouTube/video channels:**

- ☆ what is your favourite channel?
- ☆ how many minutes per day do you watch the videos?
- ☆ how many times per day do you pick up your device to watch the videos?

✦ **Chatting on the device:**

- ☆ what is your favourite chat app?
- ☆ how many minutes per day do you chat?
- ☆ how many times per day do you pick up your device to check for chat updates?

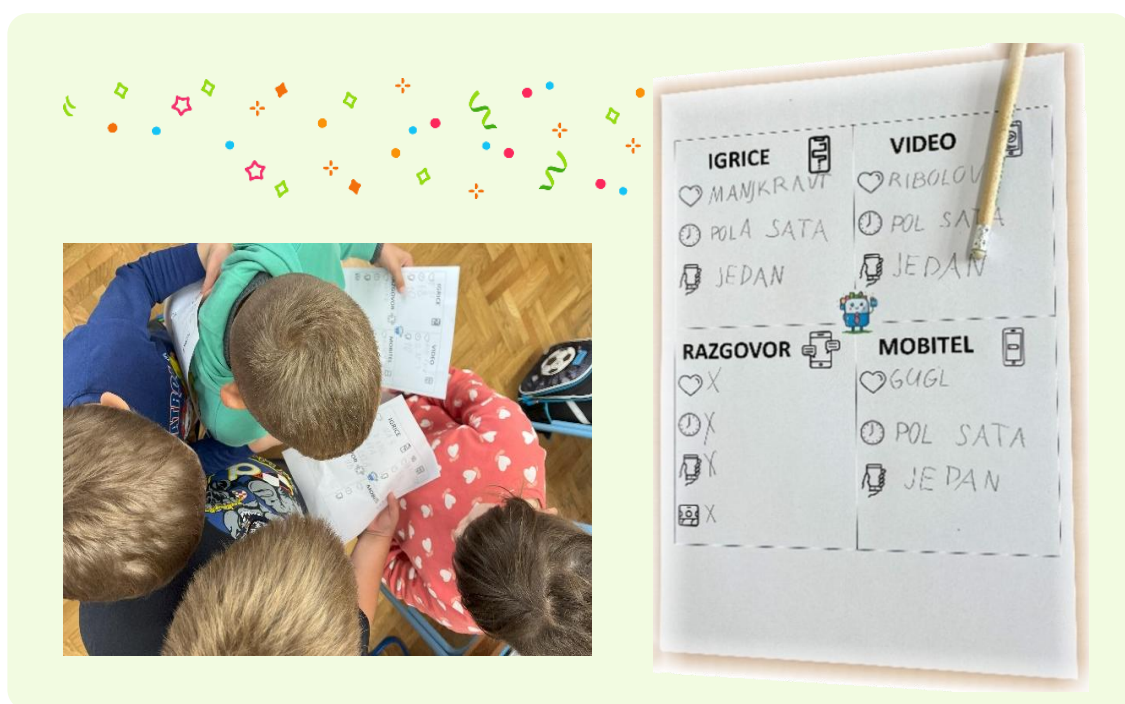
✦ **Global mobile phone usage:**

- ☆ what is your favourite app that is not a game, YouTube or a chat app?
- ☆ how many minutes per day do you use your device?
- ☆ how many times per day do you pick up your device?

1. Explain to the pupils that they will now describe their own mobile phone usage, which may differ from how everyone else uses theirs. However, it may also be more or less similar to others' usage, and as a group, we can draw some interesting conclusions. Also, explain that this is only an estimate, and the actual data may differ from our perception of it.
2. Ask the pupils to write their names on the front or back of their data cards. While walking around the classroom, check once more that they have done this (they will need to return their cards in the next session). During your walk, also take note of the most popular games so groups can be arranged in the corners in the next activity.

6.4 Data Cards Grouping and Sorting

1. Ask all pupils which their favourite game is, as written on their data card. Based on the answers, choose 3–4 most frequently mentioned games (grouping doesn't have to be exact). Assign each of the four corners of the classroom to one of these favourite games and **ask pupils to group themselves in the corners according to their answers.**
2. Suggest that pupils compare their data cards within the groups to see:
 - a. Are there pupils who also share the same favourite channels and chat groups (even if they didn't fill in this data, they can still talk about it)? Are there any who have at least one of these in common?
 - b. Are there pupils who spend a similar amount of time playing the same game (even if they didn't fill in this data, they can still discuss it)? More time, less time? What does "similar" mean to them?



Option 1: If time is running short, you can end the group work at this point.

Option 2: Give each group a sheet of paper, downloaded from our website and prepared in advance. The sheet is a template the group needs to fill in:

- a. Game title.
- b. For each person: number of minutes spent daily playing games.
- c. For each person: how many times per day the mobile phone is picked up to play games.

EXTRA: The team should add up the minutes (use a calculator if needed).



APP NAME: _____



NAME		
TOTAL		



PLEASE NOTE: If everyone chooses the same game as their favourite (*so that four groups cannot be formed*), the activity described above can be done using *YouTube* channels or chat apps instead. Alternatively, groups with the same favourite game can be formed, for example, boys and girls. If almost everyone has chosen the same game, create a second group with the remaining pupils and have them discuss their differences.

The activity can be repeated by grouping according to other categories/criteria if the first activity (games) is completed very quickly.



6.5 Analysis and Discussion

During group work, the teacher should prepare data for the word cloud by entering the words mentioned during the previous activity. These steps can help you:

- ✦ Take a photo of each data card (or several data cards per photo),
- ✦ Enter the names of favourite games (*without correcting any mistakes!*) into a computer; the easiest way is to prepare a list in *Notepad* or a similar simple text editor.

Our recommended app for creating word clouds is: <http://wordart.com>. For this website, the list should contain each reported game on a separate line. If the same game appears multiple times, it should be repeated in the list. Spaces should be replaced with the tilde (~) symbol. Example:

```
Roblox
Roblocks
ROBLOKS
ROBLOKS
Robloks
MineCraft
Minecraft
Majncraft
Subway~Surfers
Subway~Surfers
Subway
```

PLEASE NOTE: This task might be tiring for teachers and needs to be done quickly. Try practising it in advance or ask an extra person to help you.

PLEASE NOTE: You can find a short video tutorial on how to create word clouds on our website.

1. **Copy the prepared data into the application** to create a word cloud about the games, as follows:
 - a. **Prepare three word clouds.** We recommend opening three separate browser windows with the word cloud generator so you can display them quickly when needed.

- i. Use the "Import" option, which will calculate the number of repeated words.
 - ii. Adjust the display settings as desired (fonts, colours, cloud shape, etc.).
- b. **Word Cloud #1 – Raw data, with repetition:**
 - i. Copy the original list without any edits.
 - ii. In "Options", use "Repeat all" to fill the space with all repeated words (regardless of word count).
- c. **Word Cloud #2 – Raw data, no repetition:**
 - i. In "Options", use "Repeat none" to display each word once, but in different sizes.
- d. **Word Cloud #3 – Cleaned data, no repetition:**
 - i. Edit the list to clean up the data: correct spelling so game titles are accurate.
 - ii. In "Options", use "Repeat none" to display each word once, but in different sizes.

After the group work and the preparation of the word clouds, the analysis begins.

1. Ask the pupils: "Did each of you choose a different game, or did some of you choose the same one?" Explain that now we will look at all the data brought together in one place.
2. Show Word Cloud #1, **with repeated words**.

Discuss the following:

- a. The word cloud – what do you see? How would you describe it?
- b. Is there another way to display these words in a word cloud? What should we do with the words that appear more than once?

3. Show Word Cloud #2, **without repeating words**, but with grouping and size scaling.

Discuss the following:

- a. Do you think there's a difference between the words here? What is it?

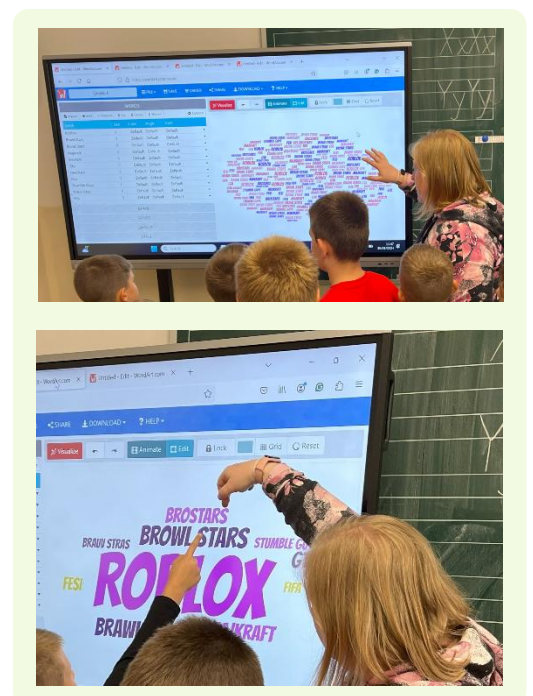
Answer: If a word is repeated more often, it appears larger.

- b. Can we now tell how many times a word was repeated?

Answer: No, we can't.

- c. Is it important for us to know how many times a word was repeated?

Answer: If we want to do a more detailed analysis, yes, it is important.



4. Begin introducing the concept of **data cleaning with the following question:**

a. Did you all write the name of the game in the same way?

Show some examples of differences.

5. Show Word Cloud #3, **after the data has been cleaned.**

Discuss the following:

a. Do you think it's important to write the same name for something (a game, app, or channel)?

b. What happens if you don't?

The data won't be accurate, we'll analyse it incorrectly, visualise it incorrectly, and end up drawing the wrong conclusions!

That's why it's important to clean data – and we'll talk more about that next time.

6. Begin introducing other ways to display and analyse data with these questions:

a. If you wanted to find out something about the data, would you rather look at the word cloud, the table we created in the corners, or the individual data cards?

Answer: It actually depends on what you want to do.

b. There are many other ways to show this data – do you know any already?

c. Next time, we'll learn how to present data in different ways.

6.6 Conclusion and Reflection



End the session with the following questions:

1. What did you learn today? What did you enjoy the most, and what you didn't like?

2. What would you tell your parents about what you did today?

3. What did we find out today?

Allow pupils to share their own conclusions. If needed, use follow-up questions like: Did you realise that you play the same games / use different chat apps?

4. Did we expect these results?

Let pupils respond with their own thoughts. If needed, ask: Why do you think there are differences?

5. The teacher can briefly summarise what they've learned today – were there any surprises?

6.7 Homework and Teaser for the 2nd Session



Explain to the pupils that during this session they provided us with a lot of data about their mobile phone use, their favourite games, etc. All of this data was based on their own estimates and perceptions. Next time, we will look at whether these estimates match the data collected from their devices.

PLEASE NOTE: The homework for the second session can be done in different ways, depending on the teacher's preference for whether pupils should use mobile phones and computers during the next session.

In all cases, you should give pupils clear instructions for the homework. These include an explanation of how to activate mobile phone usage tracking apps (on both *Android* and *iPhone*). Parents can help them activate these apps and check their mobile usage data. In the next session, we will use this data to compare the actual usage with the pupils' estimates written on their data cards.

Option 1 – without mobile phones in the classroom: Tell the pupils to check their mobile phone usage data following the instructions, and to write down their answers on the same sheet of paper. They should bring it with them to the next session.

Option 2 – without mobile phones in the classroom, online data entry: Tell the pupils to check their mobile phone usage data following the instructions, but to enter the data into an online survey (*prepared in advance – see our website for further instructions*). This allows the teacher to check which pupils have completed the survey and to remind those who haven't. While this option takes the least amount of classroom time, it may be better to enter the survey data together in the classroom, if possible.

Option 3 – bringing mobile phones to the classroom: Tell the pupils to check their mobile phone usage data following the instructions, so they learn where to find that information. For the second session, they should bring their mobile phones to the classroom and, with the teacher's help, find the data again. They will then fill in the survey in the classroom. This option is suitable if the teacher is confident with technology; it is also helpful to have a support person available.





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Engineering and
Computing

The **DIRECTORS (Digital data-dRiven EduCaTion for kidS)** project is carried out by partners from Delft University of Technology (The Netherlands) and the University of Zagreb (Croatia) as part of the Erasmus+ programme, co-funded by the European Commission.

Our goal is to **promote data literacy in primary education** through new teaching methods and materials. We aim to support the updating of existing curricula related to data education, with the goal of enhancing digital and data skills among **teachers and pupils**.

These open educational resources are the result of the DIRECTORS project's commitment to strengthening data literacy among young primary school pupils, offering **practical and age-appropriate** open content designed for both teachers and learners.

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