W02 – Spreadsheets / Tabular Data

CASE STUDY: A look at how data can be stored in a tabular format and an introductory look at how data is stored in a database table.

Last week you gathered and then stored your data. There were lots of different ways the data was recorded. Let's look at some past examples of how students turned in their data. Let's just look at the images data for now.

Some made types of grids.

My Camera Roll

	Selfie	Group/Others	Landscape/cityscape	Interior/Still-Life	Documentation	Screenshot
Home		xxx			xxx	
Work						
Social Setting						
Outdoors		x			x	x
School						
Car						
Other						xxxxxxxxxxx

	Home		Work		Social Setting		
Selfie		Selfie	2	Selfie			
Group		Group		Group			
Landscape/Cityscape		Landscape/Cityscape		Landscape/Cityscape			
Interior/Still-life		Interior/Still-life		Interior/Still-life			
Documentation	1	Documentation		Documentation			
Screenshot		Screenshot		Screenshot	1		
	Car		**Other**		**Outdoors**		**School**
Selfie	2	Selfie		Selfie	2	Selfie	2
Group		Group		Group	5	Group	
Landscape/Cityscape		Landscape/Cityscape		Landscape/Cityscape	1	Landscape/Cityscape	
Interior/Still-life	1	Interior/Still-life		Interior/Still-life		Interior/Still-life	
Documentation		Documentation		Documentation		Documentation	
Screenshot	2	Screenshot	1	Screenshot		Screenshot	

Some used a spreadsheet. Some put all their data on one spreadsheet, and some placed each page of data on a new sheet.

Some students stored each image as one row and each column represented related data about those images.

This student numbered each photo in addition to the two categories.

Photos	Location	Type
1	Other	Screenshot
2	Other	Screenshot
3	Other	Screenshot
4	Home	Documentation
5	Home	Documentation
6	Home	Documentation
7	Home	Documentation
8	Home	Still-life
9	Home	Selfie
10	Home	Selfie
11	Home	Selfie
12	Home	Selfie
13	Other	Screenshot
14	Outdoors	Landscape
15	Home	Selfie
16	Home	Drawing (still-life?)
17	Home	Drawing (still-life?)
18	Home	Still-life
19	Home	Still-life
20	Home	Still-life

This student only recorded the two categories.

Location	**Type of Photo**
Home	Others
Outdoors	Cityscape
Outdoors	Selfie
Outdoors	Others
Outdoors	Group
Outdoors	Group
Outdoors	Group
Outdoors	Group
Outdoors	Group
Outdoors	Group
Car	Group
Other	Screenshot
Home	Group
Outdoors	Others
Outdoors	Landscape
Outdoors	Group
Outdoors	Others
Home	Others
Other	Screenshot
Other	Screenshot

This student added many more columns. Notice how he has related who took the images and what activity it is related to. This was not necessary, neither was the color or pattern. But if we had combined the entire classes information together there would have been a column somewhere in the data letting us know which images belong to what student.

Activity	Color	Location	Symbol	Symbol_Var	Connected	Person
My Camera Roll	Red	Home	Lines	Documentation	Yes	Devin
My Camera Roll	Red	Home	Lines	Documentation	Yes	Devin
My Camera Roll	Brown	Other	Vertical Half	Screenshot	No	Devin
My Camera Roll	Red	Home	Double circle	Group/Others	No	Devin
My Camera Roll	Blue	School	Vertical Half	Screenshot	No	Devin
My Camera Roll	Red	Home	Lines	Documentation	No	Devin
My Camera Roll	Orange	Social setting	Vertical Half	Screenshot	No	Devin
My Camera Roll	Red	Home	Vertical Half	Screenshot	No	Devin
My Camera Roll	Red	Home	Vertical Half	Screenshot	No	Devin
My Camera Roll	Red	Home	Filled	Interior/Still-life	No	Devin
My Camera Roll	Red	Home	Vertical Half	Screenshot	Yes	Devin
My Camera Roll	Red	Home	Vertical Half	Screenshot	Yes	Devin
My Camera Roll	Red	Home	Vertical Half	Screenshot	Yes	Devin
My Camera Roll	Red	Home	Filled	Interior/Still-life	No	Devin
My Camera Roll	Red	Home	Filled	Interior/Still-life	No	Devin
My Camera Roll	Orange	Social setting	Lines	Documentation	No	Devin
My Camera Roll	Red	Home	Filled	Interior/Still-life	No	Devin
My Camera Roll	Brown	Other	Vertical Half	Screenshot	No	Devin
My Camera Roll	Brown	Other	Vertical Half	Screenshot	No	Devin
My Camera Roll	Brown	Other	Vertical Half	Screenshot	No	Devin

Structure of a database

In databases each group of data Is referred to as a table. One row of information as one entity (also called a record). Each column will represent one attribute (or field) of that entity. Sometimes you will see the first row as column headers that will represent what attribute is in that column.

So, in our images table we would have each image be one row. And each column would represent either the type of image it is or the location the image was taken. So, the entity is image and attributes are type and location.

We saw examples of how one person's data might look:

What if we were to combine the whole classes data? You can imagine that the image table especially would get very large—each student in the class with all their images. How do I keep track of what images belong to what student? Do I repeat their name again and again with each image or put their name as a subtitle before each set of 20?

	A	B	C
1	**lname**	**location**	**type**
2	Smith	Home	Group
3	Smith	Home	Selfie
4	Smith	Home	Selfie
5	Smith	School	Documentation
6	Smith	School	Landscape/Cityscape
7	Smith	School	Landscape/Cityscape
8	Smith	School	Landscape/Cityscape
9	Taylor	Social Setting	Group
10	Taylor	Social Setting	Selfie

Remember this because later when we talk about primary and foreign keys, this problem will be solved. It would basically be assigning a code or number to each student and then using that same code or number to associate each of the 20 images. So, if I was assigned the #1, I'd put the #1 next to each of my 20 images. More on primary and foreign keys in later weeks.

Data Redundancy

Let's look at Data Redundancy. If I had 20 images that I was recording for one person and I placed their name before each image I would be repeating their name again and again. What if the images for all the students got sorted (or ordered) by a different column like location, and now the same names weren't all in one place? If a person's name changed when they got married or we realized, we had it misspelled it when we put it in the database; we'd have to go into the data and find everywhere their name was referenced and make that change. This is not ideal and is definitely not efficient. This is what's referred to as Data Redundancy. We want to eliminate data redundancy in our databases. It would be easier to keep track of a number that referred to the student. Here the #1 refers to the student with the last name Smith and the #2 refers to the student with the last name of Taylor.

	A	B	C
1	**id**	**location**	**type**
2	1	Home	Group
3	1	Home	Selfie
4	1	Home	Selfie
5	1	School	Documentation
6	1	School	Landscape/Cityscape
7	1	School	Landscape/Cityscape
8	1	School	Landscape/Cityscape
9	2	Social Setting	Group
10	2	Social Setting	Selfie

Then that #1 would refer back to only one location where the name is stored and one place where their name would have to be edited.

	A	B	C	D	E
1	**id**	**lname**	**fname**	**gender**	**major**
2	1	Smith	Sue	F	Business Analytics
3	2	Taylor	Tom	M	Data Science

Data Integrity

Let's look at Data Integrity. In the images table, we could simply start typing in another image (see row 11) even if there was not a person it related to.

	A	B	C
1	**id**	**location**	**type**
2	1	Home	Group
3	1	Home	Selfie
4	1	Home	Selfie
5	1	School	Documentation
6	1	School	Landscape/Cityscape
7	1	School	Landscape/Cityscape
8	1	School	Landscape/Cityscape
9	2	Social Setting	Group
10	2	Social Setting	Selfie
11		Home	Group

This is possible in a spreadsheet program. But for clean, consistent data in a database, the data entry person should not just be able to add whatever data they want. It needs to make sense. In our case each image really should go with a person. This is Data Integrity. In a database you can't just add an image unless it was associated with a person.

Data Consistency

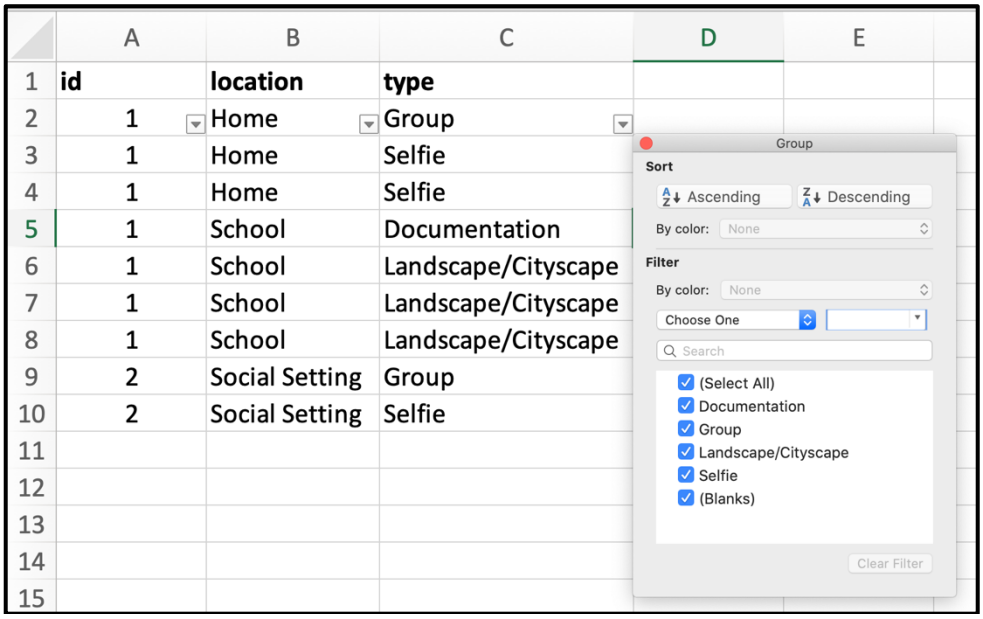
Let's look at Data Consistency. In the column where the last name is stored, I can actually go in there and add a totally different type of data like a date.

	A	B	C	D	E
1	**id**	**lname**	**fname**	**gender**	**major**
2	1	4/20/20	Sue	F	Business Analytics
3	2	Taylor	Tom	M	Data Science

This doesn't make a lot of sense since that is supposed to be a last name. But I can do it. In a database you would not be able to do this. You would be restricted to a certain type of data. If it was expecting a last name it would not let you put a number or a date. This keeps your data consistent, therefore databases enforce Data Consistency.

Let's cover two more vocabulary words that might make sense to you, especially if you are an Excel user. In Excel you can sort your data by columns. For example, say I want to list the people

alphabetically by last name. I can sort them that way. When we get to sorts on our database, we will use a keyword called ORDER BY and this will allow us to sort or order our data.



Another feature Excel users might be familiar with is the filter tool. What if I only want to see selfie images and no other image. I can filter my data to only include (or show) the images that are selfies and exclude (or hide) all the other types of images. This is filtering. When we get to filtering in our database, we will use a keyword called WHERE with a condition. Like, 'Show all the images WHERE the type of image is selfie'. Then it will filter it down to only those images. More on sorting and filtering in later weeks.