17 KEY TRAITS OF
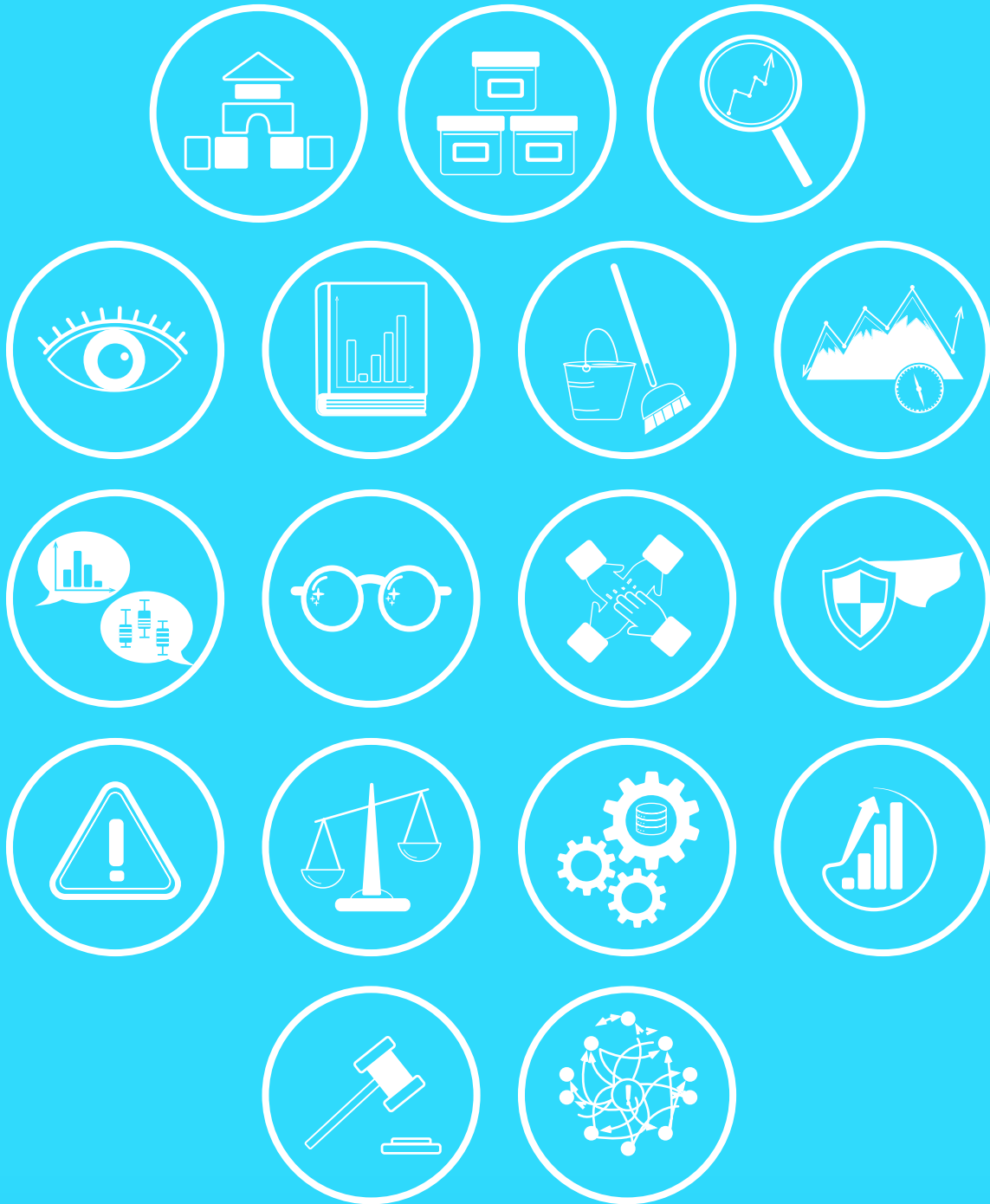
DATA LITERACY

DATALITERACY
LEARN THE LANGUAGE OF DATA

17 KEY TRAITS OF DATA LITERACY

Data literacy is

Data literacy is the ability to "read, understand, create and communicate data as information.[1]" It's quickly becoming a fundamental requirement for professionals in every discipline and industry. Much like word processing or internet navigation in previous decades, data literacy has shifted from a specialized skill to a commonly sought-after attribute, as companies both small and large seek to transition to a data-driven culture.

The current state of affairs, though, is that there's a major gap between the level of fluency in data disciplines that companies and organizations of all types require of their people, and the actual level of fluency that the people in those groups have.

In a 2018 Gartner report entitled "Fostering Data Literacy and Information as a Second Language", research director Valerie A. Logan found that 152 Chief Development Officers who responded to a survey ranked "poor data literacy" as the "second biggest internal roadblock to success[2]" out of 13 different factors.

If poor data literacy is such an incredibly large opportunity for the advancement of our corporate cultures and for society as a whole, and I believe that it is, then it behooves us to have a clear understanding of what it means to possess it.

I have collaborated with a number of industry thought-leaders to come up with a starting-point list of 17 characteristic traits that apply to individuals who can participate in and contribute to a data-driven cultural transition. People who possess and demonstrate the following knowledge, skills, attitudes and behaviors can be described as highly "data literate".

BEN JONES

Founder of Data Literacy, LLC
https://dataliteracy.com

1   https://en.wikipedia.org/wiki/Data_literacy
2   https://www.gartner.com/technology/research/data-literacy/

A Highly Data Literate Person:

HAS KNOWLEDGE OF:

PUTS TO USE THE FOLLOWING SKILLS:

EMBODIES THESE ATTITUDES:

PRACTICES THESE BEHAVIORS:

KNOWLEDGE

Our knowledge is the body of facts and information with which we are aware or familiar. It's the first category of data literacy traits enumerated because our development starts with the knowledge that we obtain either through academic study or through practical experience.

What does a data literate person know?
A data literate person knows...

01
BASIC ELEMENTS OF DATA

The data literate person knows how to distinguish between different types of data, such as categorical and numerical variables, discrete versus continuous values, and ratio or interval data fields. Beyond merely being able to identify data types, however, the data literate person also understands what can and can't be done with them in analysis and visualization.

Just as the poet studies vowels and consonants, verbs and nouns, highly data literate individuals embrace the fundamental building blocks of the language of data. This enables them to see data for what it is - information that can be grouped, aggregated, summarized and assembled into powerful insights and messages.

02
DATA STORAGE METHODS

The data literate person is familiar with ways that data is collected, structured and stored, and the attributes associated with each approach. Spreadsheets with their cells in rows and columns are seen as distinct from databases with their records arranged in relational tables or non-relational documents.

Similar to how farmers are knowledgeable about growing, harvesting and storing grain in silos, data literate people are familiar with various ways that data is collected, structured and archived. They're also aware of different ways data is imported into and exported out of various storage types, and basic methods to transfer data from one place to another.

03

DATA ANALYSIS PRINCIPLES

Those who are data literate understand that storing data is not an end in and of itself, but rather a means of extracting valuable insight about one's environment. The data literate person must therefore grasp the fundamental principles of analysis and statistics and when they apply.

Much like the way an investigator knows what types of deductive and inductive reasoning are useful when breaking down and combining facts and clues to solve a crime, a data literate person appreciates sound epistemology, the foundational concepts of statistical significance, and what types of comparisons, conclusions and projections are legitimate and reasonable based on data.

"Working with data requires a certain degree of numerical and graphical literacy, respectively called numeracy and graphicacy. Numeracy isn't just mathematics, statistics, or logic, but a sixth sense that is grounded on a grasp —even a tenuous one— of fundamental concepts of those areas. Graphicacy, on the other hand, consists of developing intuitions of what kinds of graphs, charts, or maps are more adequate to either explore our data or communicate the main insights we obtained from other people."

ALBERTO CAIRO
Knight Chair at the
University of Miami
www.thefunctionalart.com

Modern analytics tools allow for effective data visualization & dashboard design.
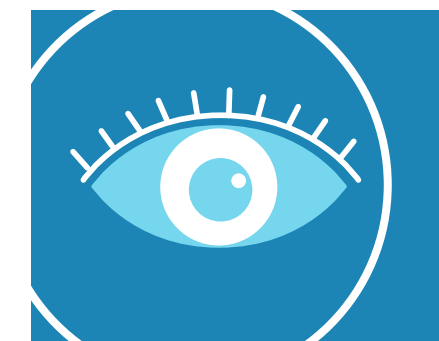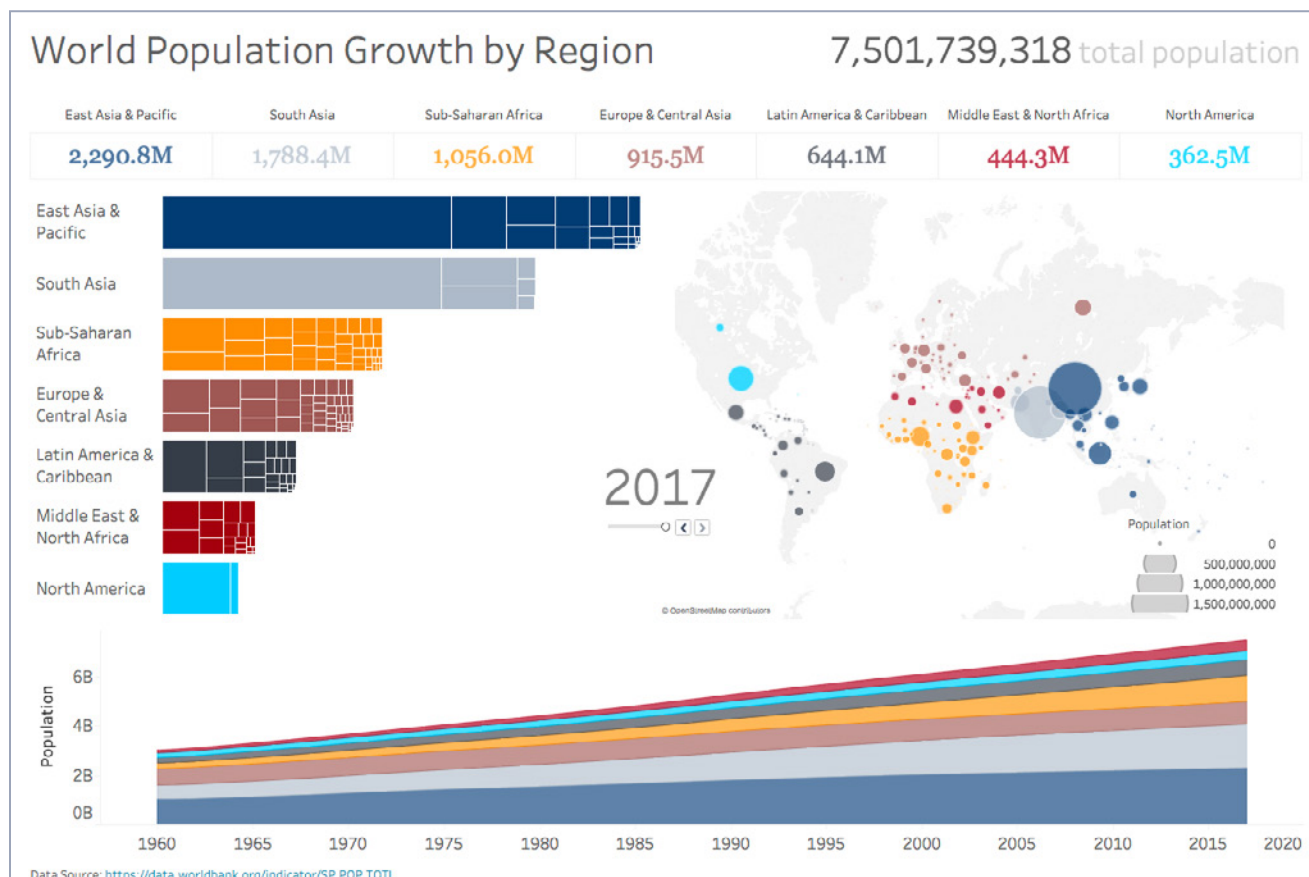
04

DATA VISUALIZATION RULES OF THUMB

Since the human visual system is a "very high bandwidth channel to the brain"[3], the data literate person understands various ways to visualize data and their respective pros and cons. The principles of cognition relating to how humans decode visual encodings such as position, length, area, and color, are well known to the data literati, as are the different chart types that make use of these encodings.

Like a doctor who knows how the body will react to prescribed medications and therapies, those who practice data literacy know how the mind of their patients – the audience members – will interpret various visual treatments of data that they take in through the eyes.

3   https://www.cs.ubc.ca/labs/imager/tr/2009/VisChapter/akp-vischapter.pdf

SKILLS

Simply defined, skills are the abilities we possess to do something well. Data literacy doesn't just involve knowledge about concepts and principles related to data, it also involves the ability to perform tasks and activities that uncover and convey meaning in data. It's the second group of data literacy traits because it naturally follows that when we know the elements of a language, we want to take action and put it to use.

What can a data literate person do?
A data literate person...

05
READS VISUAL DISPLAYS OF DATA

Organizations of every type are making use of tables, charts, graphs, maps, dashboards and scorecards to inform owners, employees, customers and other stakeholders on the status of the organization and its environment. Therefore, those who are data literate know how to read and understand visual displays of data created by others.

They're adept at viewing and interacting with such visual aides to answer questions, formulating new questions based on what they see, and identifying shortcomings with how the data has been presented. Whenever the language of data is shared with them, they're able to consume and comprehend the meaning being conveyed in the statements and visuals.

06
PREPARES DATA FOR ANALYSIS

The answers to our questions can rarely be answered by one single, clean data set. Data is most often 'dirty' – full of errors and formatting issues – and relevant information is often stored in multiple places. For this reason, people who are data literate know how to clean dirty data and combine multiple data sets together for analysis.

These data preparation activities, often called 'data wrangling' or 'data munging', are critical skills to learn, and can take up the largest amount of time in a given analysis. Data literate people know how to find and fix problems in data and blend, join or union disparate data sets together to set themselves up for successful analytics.

07
EXPLORES DATA

Like gold in a mine, insights do not reveal themselves without effort – they must be actively mined and extracted using helpful tools and effective techniques. For this reason, those who would be data literate need to know how to explore data sets and identify relevant facts, patterns and trends.
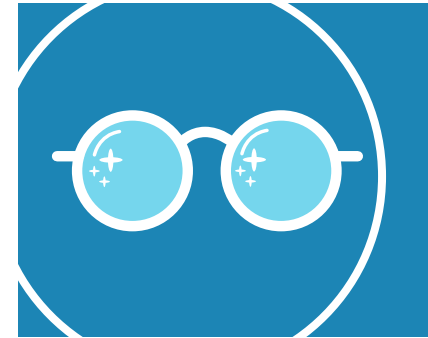
Fundamental exploration of data can involve making use of visual analytics, summary statistics, hypothesis testing, projection and forecasting, and regression analysis, among others. A higher level of fluency in the language of data involves more advanced analytics, data mining, and machine learning – skills that take the practitioner beyond basic data literacy.

08
CREATES CLEAR VISUALS

Building on their knowledge of principles of visual cognition, data literate individuals create clear visual displays of data to reveal insights to others. They design, craft and publish effective visuals that their audience members notice, clearly understand, and remember down the road.

Whether they're sharing explanatory visuals that articulate a key finding, or exploratory ones that allow their audience to interact in such a way as to glean important insights relevant to them, data literate people employ a task-oriented mindset to help people get a particular job done. This often involves appropriate chart type choices, good design and layout, and effective use of color and annotation.

> " Exploratory analysis expands your personal knowledge. Probing generates insights and produces visual artifacts that document what the data has to show. As you begin to understand the data, a new sense of what is emerges. You note that some views might also help others see what you have learned, and search for even better forms for conveying those insights. Your attention turns to focusing the story to the audience."

RJ ANDREWS
Author of Info We Trust
www.infowetrust.com

09
COMMUNICATES DATA EFFECTIVELY

Data literate people know that the true power of data is in shaping the minds and directing the decisions of their fellow human beings. For this reason, they know how to communicate effectively using data and information gleaned from it. Put another way, they speak data well.

They craft their message to their audience, and they adapt their approach depending on the circumstances, channel and method – whether they'll be presenting data in person to a live audience or publishing it to the web for others to read on their own. Furthermore, they augment the facts and figures with helpful annotations and images that drive the message home. More advanced levels of fluency in data communication involve animation, multimedia, and other storytelling techniques.

ATTITUDES

Attitudes are ways of thinking or feeling that often affect how we behave. Our attitudes stem from our knowledge and skills, and are also shaped by our interactions with others. It's possible to know a great deal about data and build many powerful skills, and yet to be held back by unhelpful and sometimes even harmful attitudes.

How does a data literate person think & feel?
A data literate person is...
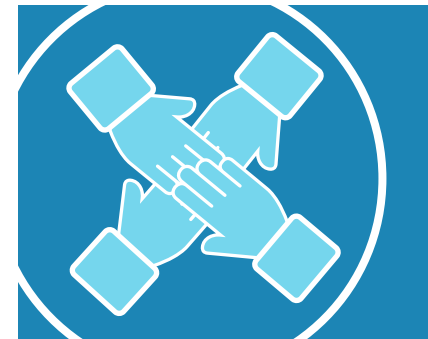
10 INCLUSIVE

Depending on the situation, data can either be an individual or a team sport. For instances when other people are involved, those who are data literate fundamentally believe that data is a language that anyone can learn to read and speak.

While they do appreciate that people have varying degrees of literacy and comfort in the different parts of the data working process at any given moment, they're not of the opinion that certain individuals are incapable of developing competency given enough time and instruction. Furthermore, they recognize their own opportunities for improvement and they're patient with the deficiencies of others.

11 CONFIDENT

While there's always more knowledge to acquire and skills to build, people who are data literate feel confident using data as a resource to ask and answer questions. They don't shy away from diving into a relevant data set, and they actively apply their skills or develop new ones as needed.

The data literate person sees data as one of many resources at their disposal to gain insight or inform a decision. When an important question arises, they quickly consider what sources of data could be brought to bear to help answer the question or shed light on the situation. Their willingness to be data-driven leads them to make use of their skills on a regular basis.

" We every day look at numbers, indicators, percentages and electoral maps thinking they are the final answers to our questions, but they rarely are. No data is perfect, nor objective. And if we recognize this, we can start seeing data as the beginning of the conversation, not the end. Data is already human, in a way, and if we recognize it's less perfect than we think, then we can finally feel authorized to consider data as the starting point, not the end of the conversation. It's its interpretation according to the context that matters. Data has an unique power to abstract the world, to help us understand it according to different - relevant - factors - every time. This is why we have to reclaim a personal approach to how data is captured, analyzed and displayed, proving that subjectivity and context play a big role in understanding even big events and social changes—especially when data is about people. To make data faithfully representative of our human nature, we need to start designing new ways to include empathy, imperfection and human qualities in how we collect - process - interpret and display it."

GIORGIA LUPI
Founder of Accurat & Co-Author of Dear Data
www.giorgialupi.com

12 ALERT

Since errors abound, the data literacy person is alert to common pitfalls into which people fall when working with data. Their education and experience have led them to appreciate that there are many common mistakes that we often make when working with data, from epistemic errors to mathematical miscues to graphical gaffes.

Data literate people don't let these common pitfalls deter them from forging ahead, but they are constantly on the lookout for warning signs. Over time they build a sense of familiarity with the territory that empowers them to avoid pitfalls themselves as well as to provide helpful guidance to others with whom they interact.

13 ETHICAL

Data can be used to help or to harm, and data literate people consider ethical use of data and the impact on society to be of utmost importance. Data literate people find ways to use data to help their organizations grow, but they only do so while respecting the rights and privacy of others and while seeking to improve the lives of those affected.

Data literate people value truth and transparency, and they actively seek to recognize and mitigate any biases within themselves and within the data they use. They are open to feedback about their work, and they invite dialogue about its effect on others, including any unintended negative consequences. Whenever possible, they use data to help solve real-world problems.

BEHAVIORS

Our behaviors are the ways in which we act or conduct ourselves in the world. This is the final category of data literacy traits because our actions are the outcome of our knowledge, skills and attitudes, and how we ultimately make a difference with data. The other three categories don't amount to anything if they don't drive behaviors that reflect our level of data literacy.

How does a data literate person act?
A data literate person...

14 UTILIZES DATA RESOURCEFULLY

A data literate person actively seeks out and creates data as a means of gathering information. If data exists that will help them make an important decision or come to a much-needed understanding about the current situation, they can be counted on to find it and make good use of it.

Not content with simply using the data that's readily available to them at the moment, they generate or compile new data when so doing will help them achieve their goals. They implement data collection processes and build repositories of data that relate to their most important questions and challenges.

15 CONTINUOUSLY IMPROVES DATA

Knowing that analyses and their underlying data are always imperfect and incomplete to some degree, data literate individuals identify areas of improvement in the data and associated analysis. Once identified, they proactively seek to implement improvements as time and resources permit.

They also sense, however, when the current state of data and analysis is sufficient for the task at hand, and they aren't paralyzed by an impractical need for perfection. They capture, convey and document any known issues or uncertainties and they move forward, committing to make incremental improvements to continually evolve their data capabilities.

16
EFFECTIVELY ADVOCATES FOR DATA

Data literate team members advocate for the effective use of data in communication and decision-making. When data is not being utilized in important discussions and decisions, they proactively suggest ways to add a data-driven perspective, and they offer their advice or assistance to make it happen.

When data is being utilized in a particular scenario, they act as a helpful advisor and humbly point out issues they see with the data or analysis, or opportunities to improve upon the approach and methods used. They find the right way to provide the feedback and go beyond critique to act as an advocate and resource.
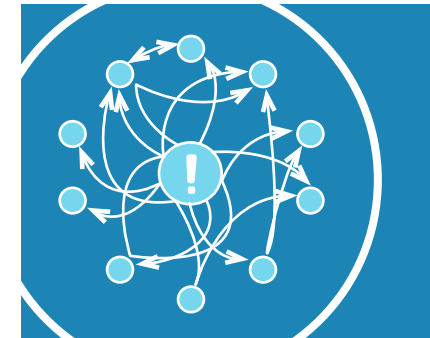
17
ENTHUSIASTICALLY SPREADS DATA LITERACY

Like any other language, the language of data thrives and spreads with effective usage and refinement. Data literate individuals spread data literacy through the active and competent use of the language.

Like articulate orators or writers, those who are data literate emulate effective use of the language for others to observe. Like teachers or speaking coaches, they provide instruction and feedback on how to speak the language of data well. Like evangelists, they encourage others to build their skills. Like change-agents, they help organizations incorporate data into their processes, their products and their culture.

> " Anyone who has worked with data knows that it doesn't all come in pristine form. For this reason, a data literate person needs to learn how to handle data that needs some work, or that doesn't even exist in a data form and needs to be gathered. This is often missed, but it's one of the key points in becoming data literate."

CHERYL PHILLIPS

Lorry I. Lokey Visiting Professor in Professional Journalism at Stanford University
https://comm.stanford.edu/faculty-phillips/

Conclusion

These are 17 key traits that characterize highly data literate individuals, separated into the knowledge they possess, the skills they acquire, the attitudes they convey, and the behaviors they demonstrate.

While individuals who index highly in each and every one of these are rare, they can be found in every organizational department and discipline and from every walk of life and background. They're incredibly valuable to the companies in which they work, the communities in which they interact, and the planet on which we all dwell.

Our belief is that together we can educate and encourage people in our world to learn to speak the language of data similar to how they learn to speak any foreign language – through exposure, study and practice. And like any skill, data literacy involves multiple levels of proficiency, and data literate individuals can go on to develop their data skills further to become more fluent with advanced tools and methods.

The ability to successfully attract, hire and retain such individuals will become a major competitive advantage for firms in the 21st century. Even more importantly, our ability to mobilize data literate individuals to solve our world's major challenges and problems will affect how well our species thrives in coming generations.

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https://dataliteracy.com
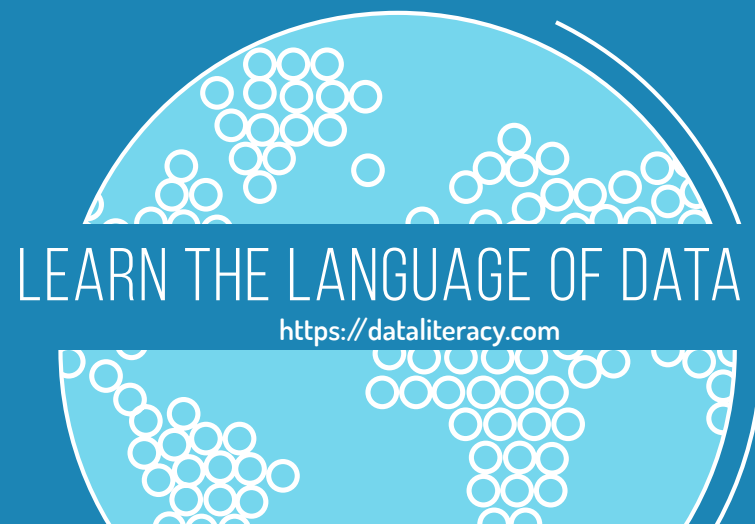
YOUR DATA LITERACY CHECKLIST ☑

Someone who is "data literate" possesses the following knowledge, skills, attitudes and behaviors. A data literate person:

KNOWLEDGE:

1. Knows how to distinguish between different elemental forms of data
2. Is familiar with ways that data is collected, structured and stored
3. Grasps fundamental principles of analysis and statistics and when they apply
4. Understands ways to visualize data and their respective benefits and drawbacks

SKILLS:

5. Reads and understands visual displays of data created by others
6. Cleans dirty data and combines multiple data sets together for analysis
7. Explores data sets and identifies relevant facts, patterns and trends
8. Creates clear visual displays of data to reveal insights to others
9. Communicates effectively using data and information gleaned from it

ATTITUDES:

10. Believes that data is a language that anyone can learn to read and speak
11. Feels confident using data as a resource to answer questions & identify new ones
12. Is alert to common pitfalls into which people fall when working with data
13. Considers ethical use of data and the impact on society to be of utmost importance

BEHAVIORS:

14. Seeks out and creates data as a means of gathering information
15. Identifies areas of improvement in the data and associated analysis
16. Advocates for the effective usage of data in communication and decision–making
17. Spreads data literacy through the active and competent use of the language