



Digital Data Literacy Roadmap for Schools.

Development of the Digital Data Literacy Strategic Plan for Schools

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1. Introduction

DataLiterate project has a mission to capacitate educators in Digital Data Literacy (DDL) through a hands-on, collaborative approach which will allow School Communities (including teachers, students, and school leaders) to increase their Digital Competences, particularly those related with Data Literacy for Education.

The project includes several Continuous Professional Development (CPD) initiatives to ensure the long-term viability of the project, as well as its dissemination and propagation to other schools after the end of the project.

The specific objectives are:

- To raise awareness of DDL relevance in an increasingly digital world.
- To build capacity on DDL applied to educational purposes.
- To create a CPD course under the DDL topic for educators.
- Build digital education readiness (through DDL) and thus mitigate the impact of COVID19 in education.
- Ensure that teachers know how to communicate, marshal resources, and tailor practice to student needs, especially in a digital context.
- Promote, support, and motivate quality, ongoing teachers' CPD that is based on DDL use to improve instruction.
- Contribute to a cultural change at the participating institutions regarding attitudes towards DDL and openness.
- Significantly increase teachers' and student's data competencies and thus increase their academic success and qualify them for a successful career by adapting to the growing needs for DDL competencies in the increasingly data-driven job markets.
- To strengthen the capacity of school leaders to deepen understanding of student and school data.

The objectives will be met thanks to the efforts of the project consortium and the beneficiary entities, which will work together in the elaboration of two main Intellectual Outputs:

IO1: Creation of a Capacity Building Programme for Data Literacy, including a MOOC for teachers and school leaders' CPD, supported by a piloting scheme which actively involves students.

IO2: Design of a DDL Roadmap for Schools; consisting of a Strategic Plan for schools, a Co-Design protocol and a co-designed, tailored institutional Strategic Plan for each school; as well as the Data Literate Handbook, a compendium of project resources, methodologies, materials, and training approaches.

1.1 How to use this document

This document aims at supporting the planning and implementation of the second task of the IO2, that is the development of the Digital Data Literacy Strategic Plan for Schools, consisting of a strategic methodological approach that provides a step-by-step process for schools to

become literate in digital data. In other words, the strategic plan aims to support school leaders and teachers to make data-driven school management decisions.

Accordingly, the main objective of the IO2, the strategic plan and the roadmap will be react to teachers' needs for Continuous Professional Development in Information and Communications Technology, specifically Digital Data Literacy. To achieve this, a firsthand approach that includes working in groups to design and develop the strategic plan for each school will be taken.

In this sense, the next few chapters of this document will briefly present the content that schools need to take in consideration when preparing their own strategic plan. In fact, this document is only a template where schools can provide information based on their experience and context in every chapter.

It is important to highlight that along the document, some examples from schools will be presented, just as an inspirational way to know how to implement and fulfill every aspect/chapter of the template. Also, in every chapter there is an italic quote, which is a simple explanation of what the schools responsible for the Strategic plan should insert in terms of content. Please consider that the information of the strategic plan should be based on the experience and background of your specific institution and not on the examples provided.

In general, the consortium of the project Data Literacy prepared this document with the intention to support schools to make data-driven decisions and to implement DDL culture in their institutions. The content provided is based on the Behavioural Change (BCM) Methodology (KPMG) and will prepare the schools to become Data Literate throughout an organizational methodology, reached from the preparation and implementation of their own Strategic Plan and Roadmaps.

1.2 Glossary

DATA

A sequence of one or more symbols given meaning by specific act(s) of interpretation. Data as a general concept refers to the fact that some existing information or knowledge is represented or coded in some form suitable for better usage or processing. Data is measured, collected and reported, and analyzed, whereupon it can be visualized using graphs, images or other analysis tools (Wikipedia).

DIGITAL COMMUNICATION

Communication using digital technology. Various modes of communication exist, e. g. synchronous communication (real time communication, e. g. using skype or video chat or Bluetooth) and asynchronous ones (not concurrent communication, e.g. email, sms) using for example, one-to-one, one-to-many, or many-to-many modes.

DIGITAL COMPETENCE

Digital competence can be broadly defined as the confident, critical and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society. Source: DigComp Framework <https://ec.europa.eu/jrc/digcomp>

DIGITAL ENVIRONMENT

A context, or a “place”, that is enabled by technology and digital devices, often transmitted over the internet, or other digital means, e.g. mobile phone network. Digital environments are usually used for interaction with other users and for accessing and publishing user-created content. Records and evidence of an individual’s interaction with a digital environment constitute their digital footprint.

DIGITAL TOOLS

Digital technologies used for a given purpose or for carrying out a particular function of e.g. information processing, communication, content creation, safety or problem solving.

EDUCATIONAL RESOURCES

Resources (digital or not) designed and intended to be used for educational purposes.

2. Target group

Define clearly the beneficiaries of this Strategic Plan (school leaders and teachers, etc....)

School leaders are members of school administration, such as headmaster (principal), deputies, career counselor(s), social counselors (social pedagogues), psychologists, who are gathering, analyzing, interpreting and making data-based decisions on a regular basis.

Teachers are school’s pedagogical staff, qualified in education of children of the certain age group. They teach using data-based educational methods, use data to evaluate students’ progress (using academic, social and emotional criteria) in class; and to demonstrate real-life data in their subject materials where it is useful to the topic.

Students are children who are learning in the school. They usually become aware of the utility of data when they are given data-related assignments in classes; however, they also read articles and watch videos when researching topics for class projects, etc. In these cases, young people tend to believe that anything they see or hear on the internet comes from a seemingly trustworthy source. Therefore, a better understanding of data would help develop critical thinking and help make better decisions in life. In addition, data-literate students may encourage data-based decisions in the school community where they see that some change is needed.

Parents of students are partners of the school in the education of their children. Usually, they are presented with school data or educational progress data that is not interpreted or too complex. Without sufficient data literacy parents are unable to make effective decisions about their child’s education or may struggle to help their child in the learning process and counsel them in their decisions.

3. Define Expectations and Goals of the Beneficiary

Elaborate a small introduction about the importance of the school leaders/teachers/staff to establish these aspects before starting the integrating DDL to the process.

- *What would you like to achieve after gaining a better understanding of DDL? Please state concrete result(s).*
- *Is there any specific aspect of your school you think can get improved with DDL? If so, which one?*
- *More details about what you would like to explore/know more about.*

In order to help you to fulfil this part of the Strategic Plan Template, we present examples of expectations and goals from some schools – you can use these examples as inspiration to define your own expectations and goals.

3.1. Example from the Schools

A) Example from the School: I.T.E.T. “G. CARUSO”

Schools play a strategic role in preparing the younger generation for the new digital and technological society, and a better understanding of DDL is strategic in the educational context. There are several main challenges to face, in order to spread relevant competencies among learners and teachers. In particular, the recent pandemic has intensified these challenges and forced us to employ probabilistic reasoning; the statistical illiteracy in schools is today the consequence of the widespread diffusion of incorrect information known by the term "fake news".

Society would improve if the fundamental ideas of probability theory and statistics were taught in schools because students would grow the capacity of reasoning; a strong means to evaluate and analyse the information surrounding them. Mastering DDL will help both teachers and students to spread digital pedagogical skills, make decisions based on data analysis and face the challenges in the use of new technologies.

Expectations and goals	Strategies	Success indicators
To increase digital data competencies of our teaching staff through a DDL approach	Designing workshops and making training courses on DDL contents available on S.O.F.I.A. ¹ , for high-quality teachers' continuous professional development.	The achievement of this goal will be assessed by taking into consideration the number of participants that will enrol in the workshops/training courses and complete them.
To widen our students' knowledge of Italian, Maths and English and improve their skills in tackling problems, as well, by using a DDL approach, in order to make students achieve a	Some DDL topics will be inserted in the curriculum of different areas of study.	The achievement of this expectation may be measured by taking account of students' improvement in the INVALSI performance

¹ S.O.F.I.A. is one of the Italian Ministry of Education platforms that offers teachers a wide-ranging selection of high-quality training courses to assure them a continuous professional development.

higher grade in the INVALSI ² standardized tests.		
To improve the annual learning plan of school subjects to better tailor it to students' interests and needs.	Designing and handing out a form through which quantitative and qualitative data about students (their interests, cognitive styles, information about strengths and weaknesses...) can be collected.	The figures for dropouts and course-transferring students, as well as for students getting better their performance, will give evidence and clarify at what level this goal will be accomplished.
To encourage families play a more active role in school life.	Designing a questionnaire that allows us to collect requests, opinions, suggestions, and requirements from student families, in order to improve our school organization and widen our curriculum.	The objective measurable criterion is the percentage of student parents who will take the questionnaire.

B) Example from the School: AESG

Between the values that we defend and that are included in the Educational Project, we highlight, among others in the pedagogical model, a constant search for improving the quality of educational action, through the adaptation of processes and procedures, flexibility and openness to innovation, adapting to the different contexts of the schools in the Group.

To improve the quality of teaching process, it is important raise teachers' and student's data competencies, through the definition of a set of strategies with a view to achieving expectations and goals.

Expectations and goals	Strategies	Success indicators
Increase the use of "Teams" and institutional email	Use of "Teams" and institutional email by teachers and students to carry out school activities	Number of teachers and students with activity in "Teams"
	Holding group, department and other intermediate educational structures meetings on the "Teams" platform	Number of group and department meetings held on the "Teams" platform
Promotion of students' digital competence	Creation of digital products (video, blog, presentation, poster...	Number of classes creating digital content
Involvement and continuous professional	Collection and "online" publication of digital products created respecting copyright and reflecting on internet safety rules	Number of published works

² INVALSI stands for National Institute for the Assessment of Education and Training System. It's an Italian public research institution aiming to measure students' learning outcomes in Italian, Maths and English, as well as their skills in reasoning and tackling problems through some written standardized tests. Every year students from grades 2, 5, 8, 10 and 13 take these tests.

development of teachers, through the sharing of best practices regarding the creation of digital content		
Promote technology-mediated assessment	Creation and sharing of digital assessment tools	Number of teachers who used digital instruments to monitor learning
Update the section of the internal regulation on safety and rules for the use of technological equipment	Definition of the Rules for pedagogical and safe use of technological means	Entry into force of the updated regulation
Integrate innovative initiatives and projects that promote digital training across the board and articulated	Participate in projects that promote digital empowerment	Number of activities performed Number of students and teachers involved
Promote through digital a culture of collaborative work and sharing of good pedagogical practices	Planning of activities involving teachers of various subjects	Number of activities performed
Promote the training and development of teaching staff	Holding a meeting/ workshop/ training within the scope of the Data Literate Project	Number of teachers who participate

4. Definition of Data Roles

Please define the different Data Roles and who from your Institution will be the representative(s) for each Role

School community includes different people with different backgrounds and operational roles than other institutions. Starting from the definition provided by KPMG methodology, Data roles can be defined as the different data personalities which exist within the institution with different data skills, capabilities and learning requirements. The core value of identifying staff members who can take over such roles lies in creating a school culture where data literacy is embraced with the ultimate aim of making data-driven decisions.

Before delving into the peculiarities of each role, it is pivotal to outline the profiles for data literate teacher, school leader and student. These can be seen as desirable achievements for every school member, regardless of who will take up a “data role” for the implementation of the Digital Data Literacy Strategic Plan.

Please note that there may be some degree of overlap; especially between the definition of Data Literate Teacher and School Leader. This speaks to the complexity of the domain and interrelatedness of the skills.

In the process of outlining the core skills of these three profiles, a central reference has been the competence framework developed by Ellen B. Mandinach and Edith S. Gummer in their paper “*What does it mean for teachers to be data literate: Laying out the skills, knowledge, and dispositions*” (2016, see references). Despite their focus is on teachers, it can be further developed and adapted to school leaders and students too.

Data literate teacher. Data literacy for teachers has a very defined meaning, that is the ability to find, evaluate, and use data **to inform instruction**. Therefore, it is key to underline the importance of combining a data-driven teaching approach with general pedagogical knowledge and knowledge of the educational contexts, the learners and their characteristics.

Such a teaching approach should entail the following **competences**:

- **Articulate a problem of practice** about a student, group of students, a topical area, the curriculum, or an aspect of instruction and **identify possible sources of data to address the problem**. Teachers must be able to evaluate the right data for the particular problem of interest, data that are aligned at the problem of practice and actionable.
- **Use multiple measures/sources of data**. This is a foundational concept in data-driven decision making and educational measurement. It is important not to rely on just one measure but to triangulate among multiple sources of data to obtain a better and more accurate depiction of the situation. Moreover, it is capital to use different types of data, as combining the use of qualitative and quantitative data. Data is much more than numbers that can be quantified (e.g. grades). It is important to recognize that qualitative methods may provide valuable and informative data, complementary to the quantitative one.
- **Evaluate data quality**. Data quality includes many aspects such as validity, timeliness, and consistency of the data. Foundational to data use is knowing that the data being used is “clean”, timely in terms of from data collection to use, and valid for the purposes of use and interpretation. Data must not be misleading or out of range.
- **Show and explain how to analyze data**. It is important to drill down into data to really understand misconceptions and understandings. Total test scores do not tell the complete story. Thus, knowing how to break down data into subgroups and examining them enables teachers to identify differences across group performances. On the other hand, there are times when looking at whole

group of data (namely, aggregate data) is key to gain meaningful insights. This skill also entails organizing data into a meaningful and manageable representation of the information.

- **Monitor student performance and their needs.** Based on the evidence that teachers have acquired, they must use those data to plan and determine what are the next logical steps to take. That is to monitor student performance over time to determine if differences have occurred or changed behavior. Monitoring performances over time will enable teachers to determine students' learning strengths and weaknesses, in order to make instructional adjustments.

Data literate school leader: Data literacy from a school leader's perspective is the ability to find, evaluate, and use data **to improve the school organization and effectiveness on different levels: from the operational to the well-being of the whole school community.**

In this regard, a data literate school leader should have the following competencies:

- **Understanding how to access data.** They must know how data is stored and made available by the other school's members. Increasingly, educational data is stored in electronic formats for easy and safe access and analysis. School leaders should promote an alignment of the data systems used to manage data across the different school departments (e.g. involving admin or IT staff).
- **Ability to use data securely and responsibly,** ensuring there is an ethical use of data, including the protection of privacy and confidentiality of data. Knowing about how to protect student data in terms of privacy and confidentiality is of the utmost importance for any organisation. This skill is increasingly important now that technological applications are making data use more efficient but also somewhat riskier in terms of data security.
- **Prioritize and manage data.** It is important to arrange the data according to the utility of the issue being addressed and knowing that data must be handled with accuracy, coded, stored, and arranged in a coherent manner for latter access and examination. Also, it is essential to organize data into a meaningful and manageable representation of the information.
- **Make instructional adjustments based on data.** This means knowing what instructional actions are appropriate given the information gained from examining data.
- **Evaluate the context for the decision.** School leaders must understand the setting into which their decision is being fit. In this regard, it is key to underline the role played by the so-called "thick" data, which is qualitative information (such as observations, feelings, and reactions) that offers insight and contextual information about a phenomenon that often quantitative data cannot describe.
- **Compare results of pre- and post-decision and monitor changes in school practices.** Part of the inquiry process is checking to see if there has been a change from before a decision was made and action taken afterwards. This is

to determine the impact of that decision making process.

Data literate student: When it comes to students, it is pivotal to underline that being data literate should be perceived as a set of skills that will enable them not only to enhance their school performances (especially not only related to scientific subjects), but also to become more aware and active citizens (e.g. being able to read news and information). A data literate student should acquire the following competences:

- **Understand what data is and its difference with opinions.** The importance of fact checking and data verification in order to critically assess data and to develop the ability to interpret insights from data.
- **Know where to find data** (resources available and techniques to create a dataset) **and how to judge the relevance of the source and its content**, thus being able to select reliable sources of information.
- **Clean and analyze data.** Understanding the importance of data cleaning and how it affects the analysis results. How to plot and calculate basic statistics to derive insights from data.
- **Visualize and communicate data.** Being confident with basic concepts of data visualization, knowing how to choose a chart based on the type of data and the communication goal. Moreover, knowing what misleading graphs are and how to avoid them.
- **Prioritise methodology over single tool solutions.** It is important to be aware that working with data is much more about a methodology rather than the single tool. Keeping this in mind, it is important to have an overall knowledge of different tools and digital resources available to work efficiently with data.

A reference framework outlining the characteristics of each data role is provided below. Nevertheless, it is important to note that in the implementation phase, the following framework should be tailored to the particular characteristics of each school.

- **Data Believer:** People with limited to no analytical knowledge but with significant need to understand and engage with data in order to make decisions. These can be people that have extensive knowledge of the school environment, but they have not grasped the potential of a data-driven approach in their professional activity and might also be skeptical about it. The mindset of a data believer needs to change from making decisions based on gut feeling to making decisions based on data analysis. To achieve this, it is vital to gain some data literacy skills, thus acquiring a methodology on how to work with data.
- **Data User:** People who have understood the potential of incorporating data and analyses in their daily work. Generally, the analytical capabilities are very basic and need to be developed to a proper level. These people need to be able to understand and engage with data, in order to derive meaningful insights. Although the data user doesn't need to be as technical as a data scientist,

understanding analyses and more complex methodologies is important.

- **Data Scientist:** These are typically the people who have profound analytical and technical skills, very likely because of their academic background. Generally, no further development is required in the area of analytical and statistical methodologies. The focus areas for a data scientist would be to improve on communicating, explaining and reasoning with data. This is especially because they can be the ones who support other members of the school community in their learning process towards data literacy.
- **Data Leader:** People who have a good understanding of the data, can interpret results or analyses and have a good level of understanding of analytical methodologies. Data leaders are the front runners of data literacy within your organization. They see the added value of using analytics in day-to-day activities and understand the impact of an analysis. A data leader doesn't need to have the same level of analytical skills as a data scientist, but is required to be able to apply some analytical methodologies on his own. Furthermore, the data leader needs to be able to communicate, discuss and reason with the data. Data leaders promote digital data literacy within the institution and supervise the implementation of the plan.

4.1. Example of Division and organization of Data Roles in Schools: ITET Girolamo Caruso

The members of ITET Girolamo Caruso staff who will assume the Data Roles are the following:

Data Believers are all students and teachers who haven't developed any competencies in DDL yet.

Data Users:

- the students who have been involved in the IO1 piloting phase, have improved their data competencies, and raised awareness of the DDL importance in their academic success;
- the teachers who will take part in DDL workshops or complete training courses on DDL topics in the S.O.F.I.A. platform;
- the school secretary's staff.

Data Scientists are our Computer Science teachers.

Data Leaders:

- the school leader;
- the teachers who have already carried out the IO1-phase tasks;

the teachers who will attend some workshops or enrol in and complete some training courses on DDL topics in the S.O.F.I.A. platform.

5. Line of action

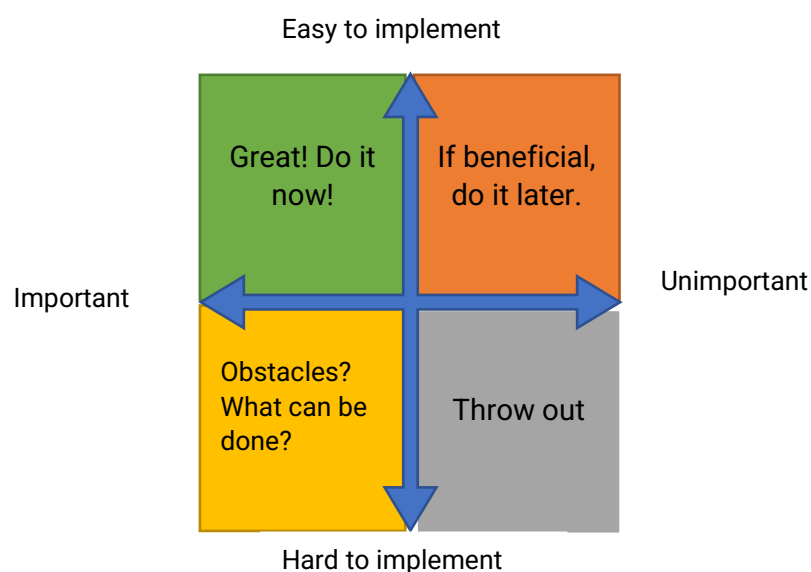
In this part it should be defined a line of action for school leaders, teachers and another for students which suggests activities and ways in which they can implement data literacy in the school settings.

Digital Data Literacy is a vast and complex skillset. Your school is definitely using data and may already be doing something to develop DDL skills of school leaders, teachers and students. Do you know what specific steps are made regularly or sporadically in the school to develop DDL? Firstly, start by making an inventory of actions and efforts being made. Who is doing what and when? You will need to define to everyone what you are looking for and ask to provide short notes on what is being done. Also, what frustrates your community about data being used in the school? What is missing? What is too much? It is best to make both written and face-to-face inquiries to cover as many people as possible.

When you know where you stand with DDL and the question of DDL was publicly raised in the community, gather a team of 4-8 people from every group of beneficiaries to brainstorm/strategize on the questions below. When discussing, try to hear-out every group and always take notes. If there are many ideas, prioritize and select 1 or 2 to begin with. The selected ideas should be relevant and achievable in the chosen timeframe. You can use the idea sorting tool below to put each idea in the respective zone. We recommend that you discuss these questions:

- What would you like to achieve after gaining a better understanding of DDL? Please state concrete result(s).
- Is there any specific aspect of your school you think can get improved with DDL? If so, which one/s?
- More ideas about what you would like to explore/know more about.

Figure 1. The idea sorting example based on Eisenhower Matrix



6. Capacity Building Roadmap for Schools

(Informative chapter, that will support you on preparing your own Roadmap)

One of the main missions of the project Data Literate is to boost educators' capacities on Digital Data Literacy, through continuous professional development initiatives and hands-on collaborative approach which will allow not just teachers, but also school leaders and students to increase their Digital Competences, in particular those related with digital data literacy for education.

Following this perspective, the main purpose of the development and implementation of the 'Capacity Building Roadmap for schools' is to provide guidelines for the institutions to build their own plan and/or strategy to become data driven. To do that, this chapter will introduce some theoretical information about the 5 principles of Behavioural Change Methodology (BCM), implemented by KPMG, adapted to the educational field.

It is important to underline that the information and the roadmap template available in the document should be used as an example and inspiration for all the participating teachers in the development of the next stage of the project, Task 2.3 - "Co-designing of schools institutional strategic plans".

6.1. Behavioural Change Methodology (BCM)

The goal of turning educational institutions into data literate schools demands a planification and a change of behaviour in the organization. To ensure that the entire staff and students will be aware and part of the change, and above all, that the change will be maintained over the years, it is important to apply a Behaviour Change Methodology (BCM).

In general, BCM is used to support a change of behaviour in people, processes, or systems, with the aim to achieve specific business outcomes. However, in the case of the project Data Literate, this methodology has been adapted to the whole school body. From this perspective, Goedhart et al.(n.d.), state that becoming data literate is an organizational exercise, featured by technical competencies.

It is very important to highlight that change of mindset and behaviour is a complex and challenging process that demands a few steps to be successful, and that is exactly what this roadmap is about: providing step-by-step guidance to become data literate based on the BCM principles. Additionally, the BCM group (2020), mentions that to make a change it is important to deeply understand the existing problems that needs to be solved, the specific audience, and the existing barriers to change as a way to develop solutions to a positive behaviour change.

In practical terms, the participating schools consider the main problem to be the lack of knowledge regarding working with data and data analysis. Next, the audience can be considered the students in general, teachers, and school leaders. Other existing barriers can be understood by the pilot report, where all the feedback provided by teachers, school leaders, and students was deeply analysed and showcased in an easily understandable format.

In the next pages, the 5 steps to tackling culture of the BCM from KPMG will be presented, as a guide to the preparation and implementation of the roadmap for schools, and, at the end of the document (6.7) there is an example that can be used as basis for schools to develop their own Capacity Building Roadmaps.

Figure 2: KPMG’s global Behavioural Change Management (BCM) methodology



Source: <https://www.compact.nl/en/articles/how-to-become-data-literate-and-support-a-data-driven-culture/>

6.2. Make it Clear

The first step to begin a change of behaviour and to start the path of transforming your school in data literate is to define goals and objectives (Goedhart et al., n.d.). In practical terms, this step is very important, because if you do not know what culture are you aiming for, how can you be successful in shaping it”? (KPMG, 2016, p. 4).

In this case, based on the “KPMG’s BCM methodology, it is important to define a few aspects before starting the processes, and we will adapt each step to the Data Literacy project:

1. Why do the schools want to become data literate?
2. Are the schools’ leaders, teachers, IT staff and students aligned and committed to be part of the change?
3. What will be the strategy and what are the aiming results?
4. What will be the mission, the vision, strategic plan and the decision-making process?
5. Are the expectations, aligned with the vision and strategic defined?

To sum up, the “Make it clear” stage is where the representatives from each school will design and **define their goals, the results** they intend to achieve and **how they intend to do it**.

6.3. Make it known

The “Make it known” moment is the second phase of the BCM, which sets the timing when school staff should be communicated about the new vision and strategy to be applied in the future, and the new moulds that the school will apply to become data literate. In fact, communicating the change to the people involved is a crucial moment because it will help to **identify some possible front runners** in the defined strategy plan and will ensure that **everybody will be actively engaged** (Goedhart et al., n.d.)

Furthermore, it is also a key moment for **understanding your starting point**, and how it is compared to what you intend to achieve in your institution. To be successful in the “Make it known” matter, it is important to:

1. Identify gaps between current and desired status.
2. Establish a realistic strategic plan.
3. Define a communication plan to inform the school body.
4. Equip the leaders with the required knowledge and tools to become data literacy experts.
5. Gather the different teams and guide them through the process of change.

Those steps must be based on a **good leadership and guidance**, because “culture is not evolved with one conversion. It is built by leading, by modelling and by integrating” (KPMG, 2016, p. 6). In this sense, the “Make it known” phase is **understanding the current point of the schools regarding data literacy, identify the gaps** (for instance: the main difficulties faced during the piloting), **mobilize the necessary leadership, organize and define roles and tasks within the teams**.

6.4. Make it real

Changing the culture of an institution can be daunting. After the last two stages, it is finally the moment to “Make it real”, which means **defining a roadmap** for achieving the results planned in the “Make it Clear” step by considering the gaps and difficulties found on the “Make it known” phase. This process will be the foundation of the path to expertise in Data Literacy.

Accordingly, the KPMG manual mentions that in this stage, a few aspects should be considered, like:

- Which are the areas that require immediate attention?
- Are there any existing good practices for embedding and uphold the desired goals?
- How will the success be measured?

Basically, **changes should be translated into reality to the institution and explain what it will mean in practical terms**. In order to achieve that, a few actions can be implemented:

- **Roadmap:** to define an approach to manage the desired goal to become data literate.
- **Workshops:** to equip, interact, and receive feedback from the participants.
- **Data roles:** to set responsible of the change within the institution.

These actions are crucial to communicate the expected level of proficiency expected from each data role, and the practical results that will be obtained. Furthermore, at this moment **people should develop the technical skills based on the role they will take part in the roadmap throughout the workshops**.

6.5. Make it happen

The “Make it happen” step is **when the roadmap will be implemented** (KPMG, 2016). At this period, the change will be facilitated and move the schools to the desired “(...) end state of data literacy proficiency levels by implementing practical changes” (Goedhart et al., n.d.), with the support of workshops, plans and meetings.

According to Goedhart et al., the main purpose of this stage is that people with a medium/high level of data literacy proficiency comprehend how useful data literacy is in professional and personal terms, so that they naturally adapt data support in their daily activities.

Following this perspective, what can also help at this moment is to **prepare a program (or a Gantt chart), where all the workshops and interventions will occur** and how and who they will count with.

6.6. Make it stick

The final step is to ensure that data literacy will be a sustainable reality in the institution. This can only happen if the main responsible for the initiatives keep managing, communicating and monitoring the changes (Goedhart et al., n.d.).

At this point, the organizations must carefully assess their progress and the difficulties that they managed to overcome along the way. Thus, the best way to see the evolution of the teachers, school leaders and students is the comparison between the beginning status and the results obtained at end of the process.

After the “end” of the process, it would be a good idea to keep the data roles previously defined to ensure the sustainability of the data literacy proficiency in the institution. Another good practice is to maintain the internal communication plan, as a way to always communicate existing difficulties and/or needs that may occur with the time.

6.7. Capacity building Roadmap – EXAMPLE

Plases fulfil the boxes in the roadmap based on your own goals, background and context

1) Align leaders around the strategic aims, ambition and scale of change (Make it clear)

“To sum up, the “Make it clear” stage is where the representatives from each school will design and define their goals, the results they intend to achieve and how they intend to do it.”

Objectives of the schools:

- *Implementation of digital data use in all subjects’ curricula*
- *Software literacy: use of software A, B and C*

Expected results:

- o *Social Science - Usage of data analytics to project future trends: demography, vote trends, companies value.*
- o *Mathematics – Sampling, detection of manipulated data, data treatment.*
- o *Language – Syntax and relationship with coding.*
- o *Math computing with MATLAB, 3D-model render.*
- o *Office suite - How to operate with Excel files and extrapolate graphs to other softwares*
- o *Wordpress – creation of a blog and elaboration of SEO good practices from analyzing its reach and impact Strategy to achieve the goals*

2. Communicate the change vision and case for change and begin to establish ownership of the solution (Make It Known)

“Understanding the current point of the schools regarding data literacy, identify the gaps (for instance: the main difficulties faced during the piloting), mobilize the necessary leadership, organize and define roles and tasks within the teams.”

Existing gaps between current and desired status

- *58,14% of the students met for the first time the data literacy content during the pilot.*
- *Some teachers mentioned that they had difficulties related to the educational content (e.g. no familiarity with spreadsheet, difficulty in finding the right dataset).*

Establish a realistic strategic plan.

- *New subject curricula including theoretical lessons that will put in practice in the final project to be evaluated.*

- *Staff training to ensure teachers have the competences to deliver the lessons.*
- *Preparation of Best practices on how to apply GDPR to schools (big collective with minors and adults without legal link with them).*
- *...*

Main steps/tasks to be performed to achieve the objectives and produce the proposed outputs:

- *New subject curricula including theoretical lessons that will put in practice in the final project to be evaluated.*
 - *Incorporation of one lesson on data collection, data cleaning and data treatment and analysis.*
 - *Enforcement of the data lesson with practical examples and real case studies to create interest in the student.*
 - *Design of requirements for the final project, integrating knowledge from all the lessons and requiring the usage of data for back up the sustained affirmations/hypothesis.*

1. Translate the change vision into reality for people in the organization and define what it means for them (Make It Real)

*“These actions are crucial to communicate the expected level of proficiency expected from each data role, and the practical results that will be obtained. Furthermore, at this moment **people should develop the technical skills based on the role they will take part in the roadmap throughout the workshops.**”*

Participants from the school in this stage

In this stage, we have to:

- **Define data roles:** *to set responsible of the change within the institution.*

It is very important to define and decide which people from the school staff are going to be responsible for each stage of the implementation of the DDL initiative in the schools. Here partners can help establishing a few examples, maybe with the support of one of the schools from the consortium.

1. *For example:*
2. *School leader will be responsible for...*
3. *Portuguese teacher will be the leader of... (something like that)*

Development of technical skills

Activity	Description	Date
1. Inception Working groups	at least 2 more teacher/school will be called to take the MOOC and elaborate their implementation plan on digital data literacy for at least 1 class.	October
2. Ignition working groups	Collaborative workshops with school community teachers; ICT staff, school leaders and students for setting the school scene in terms of digital data literacy.	November
3. Acceleration working groups	The participants will write the school-specific strategic plan elaboration based on all information and outcomes of the previous working groups.	January

- Workshops: to equip, interact, and receive feedback from the participants.

2. Move the organization towards the end state and equip people to work in new ways (Make It Happen)

“The “Make it happen” step is when the **roadmap will be implemented** (KPMG, 2016) (...) Following this perspective, what can also help at this moment is to **prepare a program (or a Gantt chart), where all the workshops and interventions will occur**“. In other words, prepare a small summary of everything that was defined in the point 1 and 2.

Main milestones associated to the workplan:

What? (Milestone)	When?	Who?
<i>Incorporation of one lesson on data collection, data cleaning and data treatment and analysis.</i>	<i>M0 of school year</i>	<i>Teacher responsible of the subject and school board</i>
<i>Design of requirements for the final project, integrating knowledge from all the lessons and requiring the usage of data for back up the sustained affirmations/hypothesis.</i>	<i>M1</i>	<i>Teacher responsible of the subject and school board</i>
<i>Enforcement of the data lesson with practical examples and real case studies to create interest in the student.</i>	<i>M5 of the school year</i>	<i>Teacher responsible of the subject</i>
<i>Guidance for students and teachers on the project</i>	<i>M7-9 of school year</i>	<i>Teacher responsible of the subject Tutor / IT staff or Technology teacher</i>

		<i>School Leaders/Teachers who participated in the first stage of the project</i>
<i>Showcase of final projects</i>	<i>M9</i>	<i>Students</i>
<i>Elaboration of report with projects, outcomes and possible future researchers associated to the results</i>	<i>M9</i>	<i>Students with guidance of teacher</i>

3. Be certain about the existing capability in the organization to sustain the change (Make It Stick)

“We hereby commit to perform all necessary efforts towards the achievement of the activities, results and objectives described above. Which measures are you going to take to ensure the sustainability of the project. “

Participants from the school in this stage
<ul style="list-style-type: none"> • <i>Dissemination (post the initiatives on the website of the school)</i> • <i>Present the example to other school leaders by e-mail, newsletters...</i> • <i>Schedule workshops with actual and future teachers of the school with DDL contents.</i> • <i>Etc...</i>
Evaluation/Quality aspects activities:
<p><i>In this aspect, we should present a strategy on how to evaluate the school community digital data literacy competences and how to evaluate the evolution of the schools in the process to become DDL. For example:</i></p> <ul style="list-style-type: none"> • <i>Share evaluation surveys to school staff and students and analyze the feedback</i> • <i>Prepare meetings with teachers</i> • <i>Stablish an agenda of goals and plans</i> • <i>Gantt of activities...</i>

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