

# LESSON PLANS REPOSITORIES AS TOOLS TO MAP DIGITAL COMPETENCES IN SCHOOLS WITH THE EUROPEAN DIGCOMP FRAMEWORKS

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## Abstract

The article describes the model developed under the "Digital School Liguria" project to provide evidence of digital skills practiced in Ligurian schools by analysing data stored in the "Observatory" lesson plan repository. The Observatory is a digital platform available to Ligurian teachers to document and share their experiences in innovative digital teaching. The model involves associating the descriptive elements of the platform's classification system with the competencies described in the DigComp frameworks (DigComp 2.2, DigCompEDU, DigCompOrg) to provide - thanks to the database processing functions - an automatic representation of digital competencies related to the teaching activities documented by teachers in the digital platform. Critical issues and solutions are discussed on the basis of what emerged during the project phase. The new function when it will be implemented will enable to obtain useful information for both users (teachers) and institutional stakeholders, primarily the Region of Liguria, which funded the initiative, are discussed.

Keywords: Lesson plans repositories, Digital competences, DigCompEdu, DigComp 2.2, DigCompOrg.

## 1 INTRODUCTION

Thanks to the archiving and sharing potential offered by digital tools, there are numerous initiatives in the educational sector aimed at building repositories of digital educational resources: using school cloud archives, databases created as part of research projects, personal blogs, teachers create libraries of resources useful for peer-to-peer training while also providing evidence of their professionalism. But the mere repository function - while valuable for sharing among teachers - can be a weakness: being "only" a repository of teaching resources has in fact proved insufficient to ensure the sustainability of platforms of this kind both at the national and international level: we can, for example, cite important experiences now concluded such as INDIRE's GOLD project in Italy [1].

In our opinion the added value not only for sustainability over time, but to increase the concrete perception of usefulness of a repository of digital educational resources for its users, is the creation of tools that allow to make usable for different purposes the data that emerge from the resource archived.

The challenge of our working group is to make the digital platform "Observatory" - a repository of digital educational resources developed as part of the Italy Liguria Region's strategic project called Liguria Digital School Project [2] - a useful tool for its users with various features for analyzing and visualizing the collected data.

Specifically, in this paper we describe a proposal to use the data collected with the platform "Observatory" to create a qualitative visualization of digital competencies practiced 1) by teachers according to the DigCompEdu [3] framework, 2) by students according to the DigComp 2.2 framework [4], and 3) expressed at the school level according to the DigCompOrg framework [5].

## 2 THE LIGURIA DIGITAL SCHOOL PROJECT: GOALS AND TOOLS

*Liguria Digital School Project* is a systemic project that started in 2016 with the operational management of Liguria Digitale S.p.A [6], an in-house company of Regione Liguria and its Member Entities that implements the region's entire digital strategy.

The project, financed by the European Social Fund, is now the reference point for the implementation of the digital school on the territory: the goal is to facilitate the integrated system of education and training in Liguria to the adoption of digital technologies for teaching, creating a quality school, an open and innovative space to train young people in the new skills required by the world of work and to prepare them for digital citizenship.

The target audience of the project activities is teachers and trainers of schools of all levels and Vocational Education and Training (IeFP) institutions in Liguria. The main benefits are in favor of the students: thanks to the training they receive from trained teachers, will become conscious citizens tomorrow and, having developed targeted skills, will be facilitated in entering the world of work.

The Liguria Digital School Project makes use of tools that ensure continuity in the territory's school innovation and are also the main indicators for assessing its progress:

- The Observatory, a digital platform that collects the digital innovative activities of Ligurian schools and its public result represented on a public georeferenced Map. Approximately 4450 innovative projects implemented in the region's schools and VET (Vocational Education and Training) schools are shared in the Observatory;
- The Community, an online and in-presence community involving teachers and trainers from across the region with activities related to digital school hot topics, such as the "STEAM-UP to Girls" action. The Community has nearly 6,000 teachers and trainers-more than 1 in 4 throughout the region-and has been involved in more than 115 workshops;
- The Digital Team, a group of ICT experts who support teachers and trainers free of charge with customized services accessible through a dedicated web-app. The Digital Team has already carried out 1400 interventions in the territory.

All the project activities bring in themselves a strong element of innovation in the support that the public administration provides to the regional education system: thanks to the results obtained to the monitoring system that has already started and is being consolidated, this element of innovation will be increasingly shared with the national and international community that at the political/administrative and scientific level is in charge of defining best practices to spread and support digital innovation in the educational sector.

### 3 THE OBSERVATORY OF INNOVATIVE PROJECTS AND DIGCOMP FRAMEWORKS

The Observatory is a digital platform at the heart of the activities of the *Liguria Digital School Project*: teachers, by filling in fields in the system, are guided to describe the digital innovative activities carried out in their schools and can enter additional digital evidence to document what has been achieved.

The classification system underlying the Observatory was developed taking into account the international frameworks for metadata of educational resources [7] and it is continuously updated thanks to the indications and feedbacks of its users.

The fields of which the Classification System is composed guide teachers to describe two macro-types of innovative activities: teaching activities carried out in classrooms and digital innovation activities carried out for the benefit of the entire school institution.

To describe the teaching activities carried out in classrooms, the observatory system articulates 46 categories with a total of 475 descriptors (Table 1).

*Table 1. Number of Categories and descriptors for the teaching innovation projects in the classroom.*

<i>Area</i>	<i>Description</i>	<i>n. Categories</i>	<i>N. Total Descriptors (multiple choice)</i>	<i>N. Total Descriptors (open text)</i>
Master Data	Title, abstract, timing, ...	18	56	10
Disciplines	--	1	192	
Activities	Setting (settings, digital platform devices, inclusion, external partners)	8	67	
	Innovative teaching methodologies	9	36	
	Digital resources used by teachers and produced by students	3	43	
	Learning activities for digital skills	7	70	
Documentation and evaluation		2	11	
<b>TOTAL</b>		<b>46</b>	<b>475</b>	<b>10</b>

To describe the digital innovation activities carried out for the benefit of the entire institution, the observatory system provides a 28 category breakdown with a total of 121 descriptors (Table 2).

Table 2. Number of Categories and Descriptors for the School Innovation Projects.

Area	n. Categories	N. Total Descriptors (multiple choice)	N. Total Descriptors (open text)
Master Data	15	31	8
Infrastructure and Information Systems	5	45	
External partners	1	7	
Training	2	19	
Innovative digital practices	3	19	
Documentation and evaluation	2	11	
TOTAL	28	121	8

### 3.1 I framework DigComp 2.2

In 2013 the European Commission through the Joint Research Center in Seville, published the first version of the DigComp framework to describe the digital skills required of citizens today. This framework (which saw its version 2.2. in 2022) was followed by two other frameworks specifically developed to deal with the topic of digital competencies in education: the DigCompEdu framework released in 2017 and the DigCompOrg framework, released in 2018: the former describes the competencies required of teachers who use digital for their profession, the latter describes the positive actions of digitally-competent educational organization. Below are three tables summarizing the three frameworks (Table 3).

Table 3. Framework DigComp 2.2

Area	Competences
1 - Information and data literacy	1.1 Browsing, searching and filtering data, information and digital content
2 - Communication and collaboration	1.2 Evaluating data, information, and digital content
3 - Digital Content creation	1.3 Managing data, information, and digital content
4 -Safety	2.1 Interacting through digital technologies
5 - Problem Solving	2.2 Sharing information through digital technologies
	2.3 Engaging in citizenship through digital technologies
	2.4 Collaborating through digital technologies
	2.5 Netiqueutte
	2.6 Managing digital identity
	3.1 Developing digital content
	3.2 Integrating and re-eaborating digital content
	3.3 Copyright and licensing
	3.4 Programming
	4.1 Protecting devices
	4.2 Protecting personal data and privacy
	4.3 Protecting health and well-being
	4.4 Protecting the environment
	5.1 Solving technical problems
	5.2 Identifying needs and technological responses
	5.3 Creatively using digital technologies
	5.4 Identifying digital competences gaps

Table 4. Framework DigComp Edu

<b>Area</b>	<b>Competences</b>
1- Professional engagement	1.1 Organizational Communication
2 - Digital resources	1.2 Professional Collaboration
3 - Teaching and learning	1.3 Reflective Practices
4 - Evaluation of learning	1.4 Digital Continuous Professional Development
5 - Enhancement of students' potential	2.1 Selecting digital resources
6 - Promote students' digital skills	2.2. Create new/edit existing digital resources
	2.3 Managing, protecting, and sharing digital resources
	3.1 Innovative instructional design
	3.2 Guiding learning through communication
	3.3 Drive to Collaborative Learning
	3.4 Guiding to Self-Regulated Learning
	4.1 Assessment strategies
	4.2 Analysis of evidence
	4.3 Feedback and planning
	5.1 Accessibility and Inclusion
	5.2 Individualization and Personalization
	5.3 Active involvement of students
	6.1 Information and Media Literacy
	6.2 Communicating and collaborating digitally
	6.3 Producing digital resources
	6.4 Respectful use
	6.5 Finding solutions

Table 5. Framework DigComp Org

<b>Area</b>	<b>Competences</b>
1 - Leadership and organization management	1. The potential of educational technologies is clearly recognized
2 - Teaching and learning practices	2. The benefits associated with the use of educational technologies in learning are highlighted and clearly expressed
3 - Professional development	3. The concept of learning in the digital age figures in the planning of the educational organization's activities
4 - Assessment practices	4. Open education is an integral part of the strategy to engage the local area.
5 - Content and curriculum	5. The operational plan enhances potentially propulsive aspects and identifies major obstacles
6 - Collaboration and networking interactions	6. Staff enjoys a degree of autonomy
7 - Infrastructure	7. The operational plan identifies opportunities, incentives and recognition for staff
	8. Learning in the digital age is related to overall priorities
	9. Modernization of educational services offered goes hand in hand with the proposal of new educational opportunities.
	10. The operational plan is clear to all and enjoys general consensus
	11. Organizational and management responsibilities are well defined and clearly assigned
	12. The necessary economic and human resources are taken into account
	13. There is provision for ongoing monitoring and evaluation of both the results achieved and the quality of processes
	14. Specific initiatives and pilot actions are always subject to evaluation
	15. In assessing the level of implementation of the operational plan, reference is made to recognized standards
	16. Administrative managers intervene in defining the general line to be followed
	17. Staff and students boast adequate digital skills
	18. Safety issues and risks inherent in the use of online environments are highlighted, along with standards for proper online behavior

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19. Recognized standards are referenced when measuring the development of staff and students' digital skills
  20. Digital competence is among the elements for staff evaluation
  21. Staff are active players in the innovation process
  22. The innovation process includes new roles for staff
  23. The innovation process provides new roles for students
  24. Pedagogical approaches are expanded
  25. There is room for personalized learning
  26. Pedagogical approaches are expanded
  27. Collaboration and group work is provided
  28. The social/affective dimension is developed
  29. It is evident that professional development is a priority
  30. Professional development concerns staff at all levels and grades
  31. Professional development takes into account the needs of both the individual and the organization in which he or she works
  32. A wide range of approaches to professional development is envisioned
  33. Accreditation and certification of professional development interventions is a priority
  34. Space devoted to formative evaluation is expanded
  35. Summative training is diversified
  36. Self and peer evaluation are emphasized
  37. The assessment outcome is to be meaningful and personalized
  38. Forms of prior and experiential learning and open learning are recognized and accredited
  39. Data generated from the use of digital learning environments are considered of strategic importance
  40. There is a code of conduct regarding the management of data generated by the use of digital learning environments
  41. Data generated from the use of digital learning environments is a resource for teaching
  42. Data generated from the use of digital learning environments are used for quality management and curricular planning
  43. Content is created by both teachers and students
  44. The use of digital content collections is a common and widespread practice
  45. Copyright and intellectual property rights are respected
  46. Digital content and tools are used in compliance with user licenses
  47. The use of open educational resources is encouraged
  48. Disciplinary teaching is revised in favor of more integrated approaches
  49. Conditions that constrain time and space for learning are overcome
  50. Networked learning is a concrete reality
  51. Learning in authentic contexts is encouraged
  52. Learning with digital tools is a reality in all subjects
  53. Students' digital skills are developed in all subjects
  54. Use of online environments for knowledge and content exchange is an established practice among staff
  55. Individual commitment and contribution to knowledge sharing is recognized
  56. In online interactions and collaborations, students act effectively
  57. Participation in activities and events aimed at knowledge exchange is encouraged
  58. Internal collaboration and knowledge exchange are expected behaviors
  59. A strategy for communication has been developed and activated
  60. Networking activities and presence are dynamic
  61. Knowledge exchange through external collaborations is clearly encouraged
  62. Active participation in external collaborations is incentivized for both staff and students
  63. Physical learning environments are optimized to reflect the characteristics of learning in the digital age
  64. Virtual learning environments (VLS) are optimized
  65. A policy for the proper use of the computer system is in place
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- 66. Both pedagogical and technical needs are taken into account when purchasing educational technology
  - 67. A range of different educational technologies is available to enable learning without limitations of space and time
  - 68. Bring Your Own Device (BYOD)-based approaches are permitted
  - 69. Needs related to digital inequality and inclusion are considered
  - 70. Appropriate technical support is available
  - 71. Assistive technologies are available for users with special needs
  - 72. There are established measures related to privacy and network security
  - 73. Purchases of educational technologies are designed effectively
  - 74. There is an operational plan for managing the operation of the computer system
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## 4 OBJECTIVE

Picking up on what was stated in the introduction, the goal of *Liguria Digital School Project* is to make the Observatory a useful platform for its users and for digital school stakeholders: both, based on the evidence provided by the processing and graphical representation of the data, thanks to the functions of the platform can have a concise view of the digital school they are implementing (the former) and of the overall characteristics of the digital school in Liguria (the latter).

Since the descriptive elements of the Observatory platform are aimed at describing innovative digital activities implemented in Schools, it was felt that it would be possible to map between the descriptors of the Observatory platform and the skill areas and individual competencies of the three DigComp frameworks:

- The mapping on the digcomp 2.2 framework would make it possible to detect the digital skills that teachers "train" in their students by proposing teaching activities with digital;
- Mapping on the digcompedu framework would enable the detection of digital skills exercised by teachers implementing teaching activities with digital;
- Mapping on the digcomporg framework would make it possible to detect the degree of adequacy of Schools in supporting innovative teaching with digital.

The goal is to provide individual teachers, schools and interested stakeholders with an overview, a graphical representation of the types of skills more or less practiced in schools in the Liguria region that document in the observatory platform: knowing is the first step in being able to decide on strategies for improvement.

## 5 METHODOLOGY

An initial mapping of each category and descriptor of the Observatory platform to the areas (and related competencies) of the different frameworks was created by the authors (Figure 1).

A	B	C	D	E	F	
Type of activity	Category (Observatory)	Descriptor (Observatory)	Framework	Area Framework	Competence	
CURR = class based INN = School Innovation			Framework 1 = DigComp 2.2 2 = DigComp Edu 3 = DigCompOrg			
CURR / INN	[Strumenti di comunicazione e collaborazione] Le attività di comunicazione e collaborazione del progetto si svolgono prevalentemente per mezzo di (descrivere nel campo descrizione)	Videoconferenza / Audioconferenza		1	2	1
CURR	[Materiali didattici realizzati] Durante le lezioni sono stati utilizzati i seguenti materiali/strumenti didattici realizzati dal docente/studenti	Dispense formato testo redatte dal docente		2	2	2
CURR	[Digitale, Imprenditorialità, Lavoro] Il progetto promuove/realizza	Attività PCTO in collaborazione con imprese ICT		3	6	8

Figure 1. Example of the mapping between descriptors of the Observatory and Areas/Competences of the three frameworks

The second step - not yet implemented - involves integrating the mapping into the current data model of the Observatory platform: an appropriate system of tables and relationships will ensure that the relationship between the descriptive elements of the system and the competencies of the DigComp frameworks are represented in the database.

It will then be possible to carry out statistical processing to detect the overall frequencies of the Observatory platform data (only the descriptors of the classification system and not the categories) grouped according to different areas of competence of the considered frameworks.

## 6 RESULTS

Initial processing has currently revealed two critical issues that presuppose a second phase of work to implement the mapping system.

FIRST - The comprehensive mapping of the Observatory system descriptors on the competencies of the three DigComp frameworks highlights that the classification system of the Observatory platform consists of many fields that are mappable on some competencies and less mappable on others competences.

Below the three tables show the number of descriptors mapped onto the different skill areas of the frameworks considered (Table 6)

*Table 6. Number of descriptors mapped to the DigComp 2.2 framework.*

<i>Area DigComp 2.2</i>	<i>Number of Descriptors</i>	<i>Area DigComp Edu</i>	<i>Number of Descriptors</i>	<i>Areas DigCompOrg</i>	<i>Number of Descriptors</i>
1 - Information and data literacy	25	1- Professional engagement	92	1 - Leadership and organization management	8
2 - Communication and collaboration	45	2 - Digital resources	39	2 - Teaching and learning practices	30
3 - Digital Content creation	78	3 - Teaching and learning	12	3 - Professional development	10
4 -Safety	18	4 - Evaluation of learning	23	4 - Assessment practices	8
5 - Problem Solving	12	5 - Enhancement of students' potential	43	5 - Content and curriculum	14
		6 - Promote students' digital skills	75	6 - Collaboration and networking interactions	29
				7 - Infrastructure	37

The result is that users of the Observatory turn out to have many opportunities (many descriptors) to highlight the exercise of some competencies and fewer opportunities (fewer descriptors) to highlight the exercise of other competencies.

For example, in the case of mapping the descriptors of the DigComp 2.2 Competency Areas Observatory, it turns out that if a teacher fills in all the fields in the database, he or she will always turn out to have exercised competencies related to safety and problem solving to a lesser extent (figure 2).

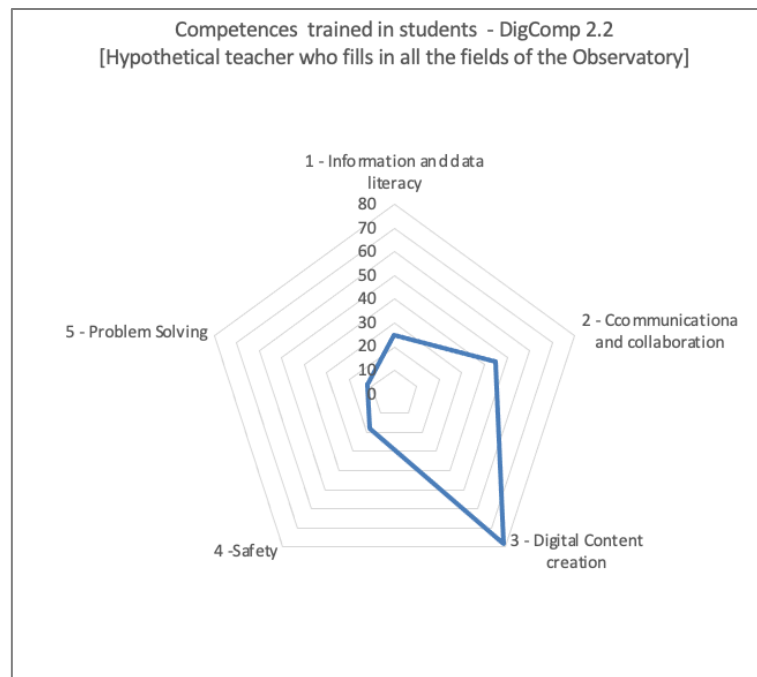


Figure 2. Representation of the number of descriptors in the Observatory mapped to the DigCom 2.2 framework

SECOND - When will the previous criticality be resolved, since all the competency areas of the frameworks are represented in the Observatory classification system, it may turn out that all of the competencies of the DigComp frameworks are essentially equally represented, and this is likely to provide little meaningful information to detect areas of strength and areas of weakness.

This may occur even though for each category in the Observatory system there is a descriptor "I have not practiced this activity," and therefore even though potentially all DigComp areas are represented in the database, some teachers will state that they have not practiced some of them.

## 7 CONCLUSIONS

The results obtained suggest the need to carry out the following additional activities in order to arrive at a tool that allows for rendering a survey and visualization of digital skills related to the activities carried out by teachers in schools and then documented in the Observatory platform.

### 1 Review of the mapping between Observatory descriptors and DigComp framework areas:

- Re-visit of the overall mapping through the involvement of other experts in the field (experts on digcomp frameworks and faculty from the schools) to detect the possibility of a greater balance in the relationship between descriptors and areas of the frameworks;
- Eliminate in the mapping of descriptors so as to achieve a uniform number of descriptors for each framework area;
- Consider some competencies as transversal to others (e.g., the case of Safety and Problem-solving competencies for the digcomp 2.2 framework) and then create combined charts to represent in a combined way items assessed on different scales.

### 2 Greater evidence of specific elements

To overcome the criticality of low significant representations (since teachers are guided to describe their projects using all the elements of the frameworks), it will be useful to perform another analysis using another element detectable thanks to the structure of the system of classification of the Observatory.

In fact, each descriptor was ranked in the database by assigning it a value from 1 to 3: the value from 1 to 3 was assigned based on two criteria identified by analyzing different sources of literature on this topic [7]: 1) the simplicity/diffusion of the digital tool used and 2) the complexity/articulation of the teaching activities related to the use of that digital tool.



The graph that will represent the digital competencies practiced in schools according to the DigComp frameworks can be enriched with a dimension to display not only the frequency of presence of a competency but also the degree of innovation obtained by averaging the values from 1 to 3 assigned to each descriptor of the classification system.

With the changes that will be implemented to the model presented in this article, the Observatory platform, in addition to being a tool that allows teachers to document and share the activities carried out with digital in the Schools, will also become a tool that will make it possible to visualize on graphs the areas of digital competence most and least practiced by teachers and in schools, and can thus provide evidence of the innovation results achieved by Ligurian schools and the areas that need development.

The platform itself will become a tool for innovation in that it will then be possible to find within it resources that can be used to fill the detected competence gaps.

The Observatory platform - ready for reuse for other Italian public administrations - can constitute an important support tool for the development of digital culture thanks to the teachers' self-monitoring functions and an important policy making tool thanks to the actions that interested parties can decide based on the data returned by the dashboards.

## ACKNOWLEDGEMENTS

Thanks are due to the professionals from the Digital Team of the Liguria Digital School Project and the Software Factory of Liguria Digitale S.p.A [4] for their support in the creation of the mapping files and the initial implementation tests in the observatory database.

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