

Interactive Classroom Working Group

School strategies for fostering students' digital competences

Practical guidelines for school leaders



Case Study

Mattarella Secondary School, Modena · Italy



Case Study: Scuola secondaria di I grado P. Mattarella (IC3 Modena), Italy

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Introduction

School digital strategies refer to the plans and frameworks developed by educational institutions to effectively integrate digital tools, technologies, and practices into the learning environment. Sustainable and inclusive digital education strategies require a balanced approach that considers diverse learner needs and promotes equitable access to technology. Rather than simply integrating new technologies in school practices, effective digital education strategies require a well-considered idea of how technology can improve educational outcomes, address inequalities, and support the wider educational mission of the school. It is a continuous process of identifying key priorities, allocating resources for targeted initiatives, monitoring progress, and achieving the different objectives.

This case study is one of 15 developed from interviews with members of school leadership teams who have contributed to the development of effective, sustainable, and inclusive school strategies to foster students' digital competence. The case studies focus on strategies that have successfully improved digitalisation of school and teaching practices and supported the development of digital competences in their students, in a sustainable and inclusive way. The schools are located in eight countries i.e. Czech Republic, Ireland, Italy, Luxembourg, Portugal, Serbia, Slovenia, and Switzerland. The interviews were part of research carried out by European Schoolnet's Interactive Classroom Working Group on the schools' experiences, the lessons they have learnt and the good practice they have developed. This research has informed the development of the publication 'School strategies for fostering students' digital competences. Guidelines for school leaders'. Find the publication and other case studies here: <https://fcl.eun.org/icwg>

Introduction to Italian Context

The national context is shaped by two multi-year intervention plans: the [Piano Nazionale Scuola Digitale \(PNSD - national digital school plan\)](#) and the [Piano Nazionale di Ripresa e Resilienza \(PNRR - national recovery and resilience plan\)](#).

The PNSD encompasses multiple actions across various areas of intervention.

1. **Connectivity:** ensuring that all educational institutions have access to the Internet.
2. **Environments and tools:** providing educational institutions with innovative learning environments utilising digital technologies.
3. **Skills and content:** promoting and enhancing students' digital skills and fostering the development of high-quality digital content.
4. **Training and support:** supporting educational and digital innovation through training programmes for school staff.

To improve digital infrastructure, measures have been implemented to enhance connectivity, procure equipment for digital teaching, develop students' digital skills and train teachers in digital teaching methodologies.

Through the PNSD, a network has been established that includes:

- ▣ 8,200 digital activity coordinators ('digital animators'),
- ▣ 24,000 innovative teachers,
- ▣ 200 digital teaching experts.

Additionally, Future Labs provide training for school personnel in all Italian regions. Future Labs represent a network of innovative learning spaces developed by a number of schools selected through a tender by the Italian Ministry of Education and linked or integrated in the school building. The Future Labs initiative financed 28 school hubs in Italy to promote in-service professional development for teachers on digital education.

The PNSD is currently pursuing a comprehensive strategy to integrate digital curricula in all schools, in alignment with European digital skills frameworks, such as the Digital Competence Framework for Citizens (DigComp)¹ and Digital Competence Framework for Educators (DigCompEdu)², along with innovative teaching methodologies, and to provide state-of-the-art learning environments.

In general, schools have administrative and management autonomy. Within the general framework on school autonomy set at national level (DPR 275/1999), schools define the curricula, widen the educational offerings and organise teaching (school time, groups of pupils, etc.).

Piano Nazionale di Ripresa e Resilienza (the national recovery and resilience plan) and Scuola 4.0 (School 4.0)

The area dedicated to education and training includes five lines of action with direct and indirect impacts on school digitisation processes. Specifically, the Integrated Digital Teaching and Training on the Digital Transition of School Personnel initiative aims to implement a continuous education system for teachers and school staff, offering more than 20,000 courses to 650,000 school leaders, teachers and staff. This initiative also includes adopting a national framework for integrated digital teaching to promote curricula on digital skills.

The New Skills and New Languages programme focuses on developing the e-skills needed by the school system to actively participate in the transition to future job markets and on creating educational pathways and orientation towards science (STEM) disciplines.

The School 4.0 – Innovative Schools, New Classrooms, and Laboratories action plan aims to transform 100,000 classrooms into innovative learning environments and to create laboratories for the digital professions of the future.

1 https://joint-research-centre.ec.europa.eu/scientific-activities-z/education-and-training/digital-transformation-education/digital-competence-framework-citizens-digcomp_en

2 https://joint-research-centre.ec.europa.eu/digcompedu_en

School building measures target over 200 innovative school buildings, promoting the gradual replacement of obsolete structures to create effective teaching and learning environments.

Training in digital education for teachers is a key measure for effectively utilising innovative learning environments. These training sessions are based on the European framework for teachers' digital

competences, DigCompEdu, which includes six competence areas (professional engagement, digital resources, teaching and learning practices, assessment of learning, enhancing students' potential, developing students' digital competences) and required six digital proficiency levels (novice, explorer, experimenter, expert, leader, pioneer) as suggested by the DigCompEdu framework.

Introduction to the school



The school, located south of Modena's historic centre, is part of Istituto Comprensivo 3 of Modena, which includes a preschool, two elementary schools and a secondary school. Mattarella Secondary School hosts about 285 pupils across 12 classes with an average of 40 teachers.

Attention to accessibility has optimised building access for pedestrians, cyclists, cars and public transportation.

The institute has two floors. It features an outdoor square that opens out to the neighbourhood and an indoor plaza, the agora, which symbolises the school and serves as a primary reception area. The agora is designed to host a variety of educational activities as well as extracurricular initiatives, conventions, parties, meetings and other events.

The structure is integrated into the local community, with complementary spaces such as the gymnasium, motor room and educational laboratories, which positions the school as a civic centre that enhances social, educational and cultural engagement at

the local level. The building's design allows for maximum flexibility of use, with highly integrated but operationally autonomous environments, each having independent entrances for different activities.

The original design includes 12 teaching classrooms, 4 specialised classrooms (music, science, computer science, art), a multipurpose common room with a library, atrium, offices, gymnasium, service areas and green spaces.

The agora is used not only for plenary events but also for multidisciplinary clubs, tutoring sessions and work groups during morning disciplinary activities.

It serves as a space for daily educational activities embedded in the curriculum, not just for occasional events. The multifunctional exploratory space includes mobile and modular platforms dedicated to various fields of experimentation (robotics, audio-video production, agri-food).

The library is more than just a place for books; it also serves as a reading laboratory that each class uses at least once a week as part of the curriculum. It hosts specific multidisciplinary clubs throughout the school year. The makerspace, science lab, art lab and music lab, each with a specific disciplinary



This setup allows for the dynamic reconfiguration of the space which features a large stage, LED wall and digital gallery.

focus, complete the large integrated exploratory environment of the building.



Why this school as a case study?

The Mattarella Secondary School building was constructed in 2016, with the physical environment, the teaching methods and the school schedule specially designed, and classrooms adapted to the subjects being taught. The flexible internal structure allows for various uses, while openness to the outdoors is ensured by accessible green areas adjacent to the school.

This approach combines an innovative organisation of learning environments with the adoption of a structured and pervasive digital curriculum, which is divided into multidisciplinary modules and involves the use of one-to-one digital devices. The digital curriculum includes progressively advanced multidisciplinary modules focused on artificial intelligence for each academic year.

The exploration space extends beyond dedicated multidisciplinary (makerspace) or a single discipline (art lab, science lab) environments to encompass the entire school. This includes group spaces (classrooms-laboratories), a flexible agora and multifunctional laboratories that support both curricular and extracurricular activities.

The building is a dynamic and integrated environment for exploration, a living and evolving educational laboratory. The exploration space consists of multipurpose laboratories, disciplinary laboratories, the agora, classrooms-laboratories and the library. These exploration spaces form

School leadership team

The functionigram (organisation of the teaching team structured by different functions) has been updated post-Covid-19 to include a tripartite structure with specific functions for the preschool, primary and secondary levels. For instance, at the secondary level, there are specialised teams such as a language team and a technology team.

The vice-principal, alongside the school principal, manages relations with families and students. Throughout the year, time is allocated to discipline coordination groups, where teachers from specific subject departments meet to plan. These departments also collaborate with mentors and experts from multidisciplinary clubs. There is a digital team that deals with all aspects related to

the spatial axis for disciplinary activities, tutoring sessions and curricular clubs that engage students in group activities. This is made possible by a teaching organisation that compacts, breaks down and reconfigures class groups and teachers' schedules to ensure the smooth conduct of various activities and forms of active teaching.



Curricular and extracurricular activities, social interactions and structured learning paths unfold within the school's integrated exploratory environment.

digital innovation such as networks, classroom hardware and software, labs, etc.



It proposes purchases and manages inventories, and keeps in contact with the secretary for equipment maintenance. Furthermore, it surveys training needs and prepares training activities, and manages the school's online platforms.

At the beginning of the year, the school principle issues a call to fill various school functions, and teachers can apply. These roles are demanding, so traditionally, all applicants succeed in securing their desired positions. Teachers receive continuous training and have opportunities to train others. The school serves as a training hub for many nationally promoted initiatives (e.g. PNSD, PNRR).

There are formal and informal levels through which decisions are communicated within the school organisation. The formal level involves circulars issued by management and published on the website, while the informal level uses more agile

tools, such as instant messaging. Formal and informal communications are coordinated and contextual. All decisions align with the [three-year planning document for educational offerings](#), which is updated annually.

Generally, there are no formalised commissions or committees, but rather, referrals and working groups. Instead of a committee making decisions for everyone, the school prefers an open discourse involving all stakeholders, likened to the metaphor of a village.

The digital team comprises of several teachers from preschool through primary level, who share focus areas. In secondary school, the team includes four teachers: an Italian teacher, a technology teacher (primarily involved in coding), a math teacher and a second math teacher (focused on robotics).

Vision-values of the school digital education strategy

The vision for the school originated from a need to reorganise space. Observing the shortcomings of the previous school building, it was clear that the old environment left children bored and failed to create engaging experiences.

In the first year of the new school's existence, teachers noticed that children were carrying textbooks from classroom to classroom. With lab spaces and immersive environments available, textbooks were no longer as effective. Both teachers and students began using tablets, which proved to be much more functional for the school's evolving curriculum. The digital curriculum emerged not to promote technology per se, but from recognising a more motivating way to develop learning, and aligning with students' everyday experiences outside of school.

Eventually, the transition moved from tablets, used only at certain times, to Chromebooks as personal, everyday tools for each student. Every student now has their own Chromebook. Students are responsible for managing their tools, including storage, maintenance and recharging. This responsibility, while seemingly trivial, teaches essential aspects of civic education. The digital team is in charge of the overall school digital infrastructure and technical support, but all students

are responsible for the digital related aspects that involve their school life at various levels.

Over time, the school has developed a digital curriculum called Digimeter. For each grade level, specific themes and learning objectives are identified. For example, different themes and objectives are outlined for robotics or coding, depending on the grade level. Within the digital curriculum, there is a specific focus on artificial intelligence, encapsulated in the 'Lucy club'.

Lesson plans are collected annually and compiled into a continuously updated repository (Thecae), accessible to the entire school. These lesson plans are organised according to the digital curriculum structure.

A designated teacher oversees the digital curriculum programme across all sections of the school. In the primary school, one teacher manages the digital curriculum for all classes. In the secondary school, the digital curriculum is led by the technology teacher along with external experts, particularly for the artificial intelligence components.

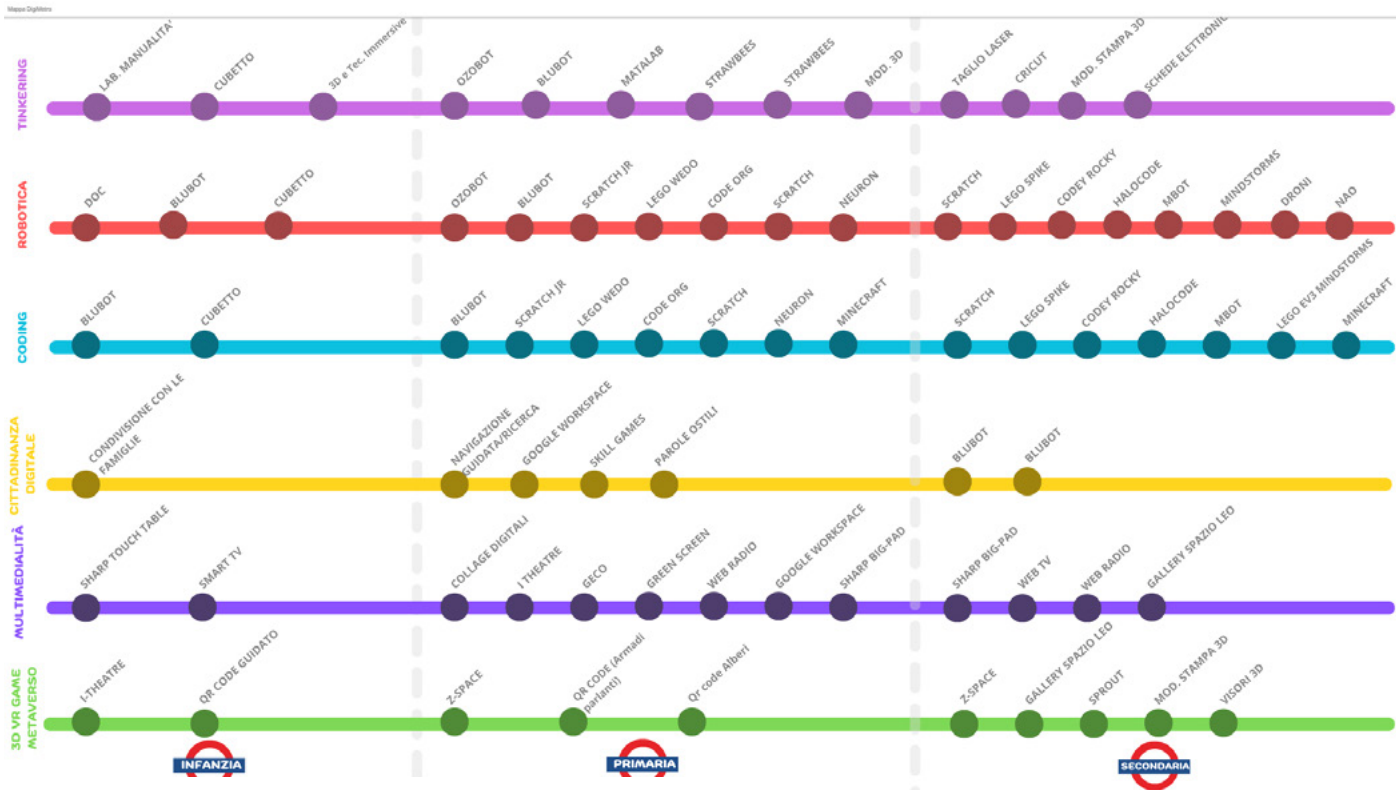


Figure 1 - Image of the school's digital curriculum (Digimetrò)

Focus and aims

At the beginning of the new school life, the priority was adapting the learning space by utilising flexible areas for open school planning, and integrating technology and personal devices. The teachers designed these spaces with the intent of moving away from traditional classroom use. This process involved, and still involves, observation, preparation and continuous feedback reworking. The design and adaptation of learning spaces have gradually led to new thinking about the technical infrastructure and the use of digital content and devices which ultimately means the development of an appropriate digital curriculum.

The National Digital School Plan (PNSD) requires each school to define a digital plan and a digital curriculum. The digital plan aligns with each school's three-year educational offerings plan and must be integrated into it. It outlines the goals, strategies and medium-term investments, identifying investment priorities for technology and connectivity over

Infrastructure and funding

The structuring of spaces is closely linked to the technological infrastructure. The school features a multipurpose space equipped with three mobile lab platforms, a digital pad wall of screens and a digital gallery that facilitates digital use across all

three years. The digital curriculum aims to make the teaching of digital technology topics pervasive and structural in all classrooms, not just those of a few pioneering teachers. The curriculum is structured according to the DigComp and STEM guidelines (<https://www.miur.gov.it/-/emanate-le-linee-guida-per-le-discipline-stem>). Each lesson plan targets the goals and competences defined by DigComp.

For the implementation of the digital curriculum, the school collaborated with both private and public partners. Notably, Ammagamma (<https://ammagamma.com>), a company with a strong investment in the educational sector, supported the school in developing the artificial intelligence component of the digital curriculum. These partnerships aid the school in both curriculum development and student activities, as well as in staff training. Resources from PNSD and PNRR significantly assist the school in fostering partnerships and creating synergies.

subject areas. Additionally, there are specialised environments for web TV, web radio, a press room and a creative digital atelier. Twice a week in the afternoon, each class is divided into two subgroups for tutoring activities or multidisciplinary modules,

utilising every space in the school. The agora, gymnasium, multipurpose space and classrooms are fully occupied by groups of students working with teachers or outside experts.

Widespread connectivity, individual one-to-one devices and a robust technology infrastructure are essential in creating an integrated and flexible learning environment throughout the school. Both students and faculty must have constant access to the different platforms to use and share various materials.

Every classroom is equipped with interactive whiteboards. In the fourth and fifth grades of elementary school, students begin to use personal technology devices more frequently, utilising carts and personal computers for different disciplines based on a Bring Your Own Device (BYOD) approach. In the three years of secondary school, each student has a Chromebook for the entire cycle.

The school has retained paper textbooks only for specific subject areas. In many areas, digital resources (both purchased and free) are used, with Chromebooks being adopted in secondary school. This approach keeps the final expense for each family below the ministerial ceilings.

As a 'Google School', the institution uses Chromebooks and Google for Educational platforms and tools for online communication. A digital team consisting of several teachers manages various aspects of the digital curriculum, digital plan and equipment. The teachers of the team are involved in continuous professional development initiatives. Technical support is provided by external companies: support services are part of the IT package sold to the schools and are provided together with the technological products.

Funding comes from the ministry (e.g. PNSD), European funds (e.g. PON, PNRR) and various projects and calls in which the school participates.

Role of AI and other emerging technologies

While the digital curriculum was introduced nine years ago, AI modules have been added more recently and are taught by outside experts selected through tenders rather than in-school teachers. The Covid-19 pandemic, with its heavy reliance on online learning, sparked a reflection that led to

the decision to integrate digital education into the regular curriculum, treating it as a core subject. This integration means including digital education in the standard school schedule and subjecting it to formal evaluation at the end of the school year.

Table - Structure of the artificial intelligence pathway in the 3 years

Class	Educational phase (hours)	Educational aims	Involved disciplines
1°	Preparation (14)	<ul style="list-style-type: none"> ▣ Recognising AI technologies in everyday life. ▣ Understand the historical dimension of the evolution of AI. ▣ Reflect on the impact of AI in real life through the exercise of imagination. 	Italian, History, English, Art, Technology.
2°	Participation (14)	<ul style="list-style-type: none"> ▣ Understand the technical fundamentals underlying AI, with a specific focus on machine learning. ▣ Create algorithms using block programming that implement AI functions to achieve specific goals. ▣ Develop STEM skills. 	Technology, Mathematics, Science, Physical Education.

Class	Educational phase (hours)	Educational aims	Involved disciplines
3°	Elaboration (14)	<ul style="list-style-type: none"> ▣ Develop a complex project that utilises AI to solve a real-world problem. ▣ Apply creativity, problem solving, and teamwork to integrate humanistic and scientific sensitivities and achieve a concrete objective. 	Technology, Italian, English, Mathematics, Religion, Art.

Thus, the idea of curricular multidisciplinary pathways was born. These are compulsory modules for all students, who must complete two each quarter, each with its own formal assessment. Lucy is one such multidisciplinary pathway focused on introducing students to AI. Developed in collaboration with Ammagamma, a company specialising in AI and education, the introduction began as a pilot programme in the first grade of secondary school. After a three-year trial, the school developed the first version of a three-year AI pathway. This pathway includes elements of logic (understanding algorithms), mathematics (numbers), technology (coding, robotics), language development (adapted for different ages), Italian (storytelling of the activities) and foreign languages (terminology management).

The philosophy of the Lucy pathway is not to merely teach students how to use AI tools, but to involve

Added value and impact

Lucy is one of the multidisciplinary pathways offered by the school. These pathways align with early childhood experiences and serve as 'containers' for various skills required in compulsory education, with a strong emphasis on science, technology, engineering, arts and mathematics (STEAM). There are five specific pathways.

- ▣ MARY (named after Maria Montessori) focuses on social and emotional intelligence, cross-curricular learning, motivation, empowerment, and remediation.
- ▣ MAIA emphasises natural intelligence, teaching science through digital education and augmented reality.

them as active participants in deconstructing and understanding AI mechanisms. For example, at the first level, students might learn about search algorithms (e.g. how a search engine algorithm works). At the second level, they could explore facial recognition (e.g. how a facial recognition app works). At the third level, they could delve into creating simplified versions of chat mechanisms similar to a Generative Pre-trained Transformer (GPT). Experts guide students to deconstruct these tools, understand their workings and reconstruct simplified versions.

At the end of each quarter, students are assessed just like in any traditional subject. The Lucy educational pathway follows a teaching methodology based on three stages: preparation, participation and elaboration.

- ▣ FRIDA centres on creative and artistic intelligence, creating musical and visual artifacts with digital technologies, digital art and creativity.
- ▣ MARGHE encompasses humanistic and cosmopolitan intelligence, integrating cross-curricular languages, vehicular languages, history, geography and dynamic humanistic thinking.
- ▣ LUCY is dedicated to artificial intelligence.

The school leads a network of 40 schools that share the approach and content of the artificial intelligence pathways. This collaboration allows the knowledge and experience developed over the years to be shared with other schools.

The school does not issue individual negative evaluations for students. Instead, based on mastery learning, any cases of learning difficulties are addressed with specially designed improvement and support pathways. Previously, there were some dropouts during the school cycle, but with this approach, there are no longer any school dropouts. At the end of each school year, the school conducts a review of its educational offerings, involving faculty, students, technical staff and families. Questionnaires are used to gather feedback from all representatives of the school community and teachers take this input into consideration once they reflect on the development of the curriculum and

Challenges

One of the main challenges in developing the school's digital strategy is securing financial resources to support the implementation of the digital curriculum. Additionally, special attention must be given to the resistance from some families towards adopting such innovative paths. Finally, the difficulty some teachers face in accepting an innovative model and engaging with contexts outside the traditional scope of teaching must be addressed.

In all fundraising efforts, a portion of the funds is always allocated to implementing the digital curriculum, tools and activities. The school participates in numerous calls for proposals and aims to maximise resources from European and ministerial funds.

Family resistance is overcome through ongoing dialogue and cooperation. The school's model is discussed and shared in various contexts: during

Sustainability and improvement of strategy

The priority is to achieve an increasingly widespread and stable consolidation of this model. It is important to revise disciplinary teaching modules, especially concerning traditional testing methods (oral questioning and written tests), which alone are no longer adequate for the school model we are pursuing. Finally, it is essential to integrate what is currently considered extracurricular into the core curriculum. When we fail to formally incorporate these learning activities into a multidisciplinary module, they are often perceived as additional and

update the three-year educational offerings plan. A forthcoming project aims to track the evolution of the learning outcomes of students who have completed the third grade of secondary school as they transition to high school. The school results of the students that have completed the three years of lower secondary level will be tracked once they have left the school and are attending the higher school levels. This will provide insights into how well the knowledge and skills acquired in the earlier years enable them to meet the challenges of high school successfully.

open days when families decide whether to enrol their children, through letters and communications to families and the local community, in discussions with class representatives and at various community-sharing events.

Not all teachers consciously choose this school initially, resulting in a kind of 'natural selection' over time. It is now well-known that this school adopts an innovative model and attracts new teachers who are ready to get involved while those who do not accept the change gradually leave.

One additional aspect that requires more attention is assessment. In this school, assessment is based on self-evaluation, formative assessment and detailed summative assessment. It is not always easy to align these methods with the standardised, periodic and synthesised guidelines promoted at the national level.

non-essential, leading to the mistaken belief that they are superfluous because they are not subject to assessment.

Sustainability also depends on the school system's ability to adapt and thrive as new staff join in a constantly changing environment. Teachers who choose to come to this school are usually already aware of its innovative practices and share its values. Initially, they listen and observe. The school provides extensive support, which is often lacking in other schools, to help teachers integrate smoothly.

New teachers find a structured curriculum that is not only digital but also thematic and which covers a range of macro themes over the three years. The school leader has facilitated distributed leadership, and the school is very active in taking advantage of the various funding opportunities offered by national and European public and private funding. Teachers receive ongoing guidance in their daily decisions, and a wealth of teaching materials is shared among staff, fostering continuous mutual support.

In the long run, a key goal is to involve more people and institutions and grow the community. This includes not only teachers but also parents who increasingly trust the school. The system works best when it is not dependent on any single individual. Unfortunately, this is often not the case today. If the school leader leaves or funding is lost, the model and its offerings risk failing.

The case study complements the European Schoolnet's publication 'School strategies for fostering students' digital competences. Guidelines for school leaders'.

Find the publication and other case studies at fcl.eun.org/icwg



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