Learning from the Extremes:

A Rural Schools Innovation Roadmap

Deliverable 8.2

Rural Schools Innovation Roadmap

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Title	Rural Schools Innovation Roadmap
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Abstract	The Learning from the Extremes Schools Innovation Roadmap aspires to act as incubator for rural school development projects. The aim of Rural Schools Innovation Roadmap is to give a concrete overview of what is known about the implementation of school innovation in general and to incorporate these insights into the proposed transformation journey. It includes all the key features that act as the reference point while describing the activities that support the experimentation and development of the digital learning solutions to bridge the digital divide and to increase the access to digital content and tools. A framework is proposed that provides a useful reference for all relevant stakeholders reaching out to the educational communities to articulate learning outcomes as they develop their tools. This process will inform future decisions on investments related with access and connectivity in rural areas. The Rural Schools Innovation Roadmap highlights the added value of the Learning from the Extremes support scheme for the schools that embark to the digital transformation journey. This parameter must be also taken into account in any future plan and investment. The innovation process has been informed from the pilots in the selected rural schools while at the same time pedagogical and technical guidance and support was provided to the schools either through the community or from the consortium team.
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Executive summary

The "Rural Schools Innovation Roadmap" represents a strategic endeavour spearheaded by the European Commission to address the digital gap prevalent in rural educational settings across Europe. This comprehensive guide is designed to catalyse digital transformation and foster innovation within these schools, ultimately aiming to empower students and educators with enhanced digital access, connectivity, and educational resources.

At its core, this initiative acknowledges the critical importance of inclusivity and collaboration among diverse stakeholders. It recognizes that successful digital transformation in rural schools necessitates the active involvement and engagement of students, teachers, parents, and community members alike. By fostering a collaborative approach, the Roadmap aims to ensure that the resulting innovations are not only relevant but also sustainable within the unique contexts of rural communities.

The Roadmap itself serves as a structured framework, providing rural schools with a clear path towards digital transformation. It offers guidance on developing tailored action plans that address the specific needs and challenges faced by each school. Emphasizing both pedagogical and technical aspects, the roadmap encourages schools to consider how digital tools and resources can best support their educational objectives while also addressing infrastructural and connectivity barriers.

Moreover, the Roadmap underscores the importance of sustainability in driving continuous innovation and development. By encouraging schools to incorporate sustainability plans into their action strategies, the initiative aims to ensure that digital transformation efforts yield long-term benefits for rural communities. This forward-looking approach emphasizes the need for ongoing evaluation, adaptation, and evolution to meet evolving educational needs and technological advancements.

The Rural Schools Innovation Roadmap represents a collaborative and forward-thinking initiative. By empowering rural schools to embrace digital transformation and innovation, it seeks to bridge the digital divide and unlock new opportunities for educational advancement and community development across Europe's rural landscapes.

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Introduction

In the wake of the COVID-19 pandemic, the global education landscape underwent a seismic shift, unveiling profound challenges and inequalities within European educational systems. Notably, the transition to distance and online learning laid bare the stark reality of the digital divide, particularly affecting rural communities. Schools grappled with limited digital readiness, exacerbating disparities in access to quality education. The pandemic underlined the pressing need to address the technical obstacles faced by schools, especially those situated in rural areas. The digital chasm widened as many learners lacked essential devices and connectivity, hindering their participation in remote learning initiatives. Alarmingly, a great number of students unable to access online education resided in rural regions, amplifying the educational inequities.

Moreover, the readiness of schools to embrace technology varied significantly, contingent upon their resources and capacity to integrate digital tools into pedagogical practices. While some institutions thrived due to ample resources and a culture of innovation, others languished, struggling to adapt amidst the crisis. Several critical points emerged from this crisis. Firstly, the pandemic underscored the imperative of bolstering rural schools' absorptive capacity, emphasizing the role of leadership and innovative teaching practices in navigating educational transitions. Secondly, it shed light on the disparities between rural and urban schools, highlighting the urgent need for targeted support and investment in rural education infrastructure. Addressing these challenges necessitates a multifaceted approach. Investment in resources, teacher support, and a culture of innovation are paramount for building resilience in rural education communities. Recognizing this urgency, European policies have shifted focus towards fostering a high-performing digital education ecosystem.

The European Union (EU) has embarked on a mission to cultivate digital competences and skills, vital for navigating the evolving educational landscape. With nearly two in five Europeans lacking essential digital skills, ensuring equality during the digital transition is imperative. The EU's proposed Council Recommendation on blended learning seeks to bridge educational gaps exacerbated by the pandemic, promoting inclusivity and flexibility in learning environments. Additionally, the EU has outlined strategic initiatives to enhance digital education, including the Digital Education Action Plan (2021-2027). By leveraging tools like SELFIE and fostering collaboration with the European Investment Bank, the EU aims to bolster digital infrastructure and skill development across Member States.

Rural schools confront unique challenges stemming from geographic isolation and limited resources. Despite resource constraints, rural educators exhibit commendable dedication, fostering strong community connections and personalized learning experiences. However, turnover rates among young teachers and disparities in digital access remain persistent hurdles. Amidst these challenges lie opportunities for innovation and collaboration. By harnessing community support and leveraging existing strengths, rural schools can emerge as hubs of inclusive education, empowered by digital tools and strategic partnerships.

The Learning from the Extremes project emerged as a beacon of hope amidst the challenges faced by rural and remote schools across Europe. Recognizing the pressing need to bridge the digital divide and promote inclusivity in education, this initiative aimed to address the glaring inequalities in access to digital education tools and resources. By focusing on enhancing inclusion and reducing the digital gap in school communities situated in remote areas with limited connectivity and access to devices, the project sought to pave the way for a more equitable educational landscape.

At its core, Learning from the Extremes envisioned a future where rural schools would not only overcome their technological limitations but also emerge as vibrant centres of learning and innovation. To achieve this vision, the project set out to provide a comprehensive Rural School Innovation Roadmap, offering a detailed guide on how schools could transform and innovate to become hubs of learning not only for students but also for their local communities.

Central to the success of the project was the involvement of various stakeholders, each playing a crucial role in shaping the educational landscape. Students, the primary beneficiaries of education, were at the

forefront, representing the driving force behind the learning process. Parents, as key influencers in their children's educational journey, were instrumental in ensuring alignment between educational values and aspirations. Teachers, the linchpins of the educational system, played a pivotal role in guiding learning within the classroom and adapting to technological advancements. However, challenges persisted, particularly in rural areas, where access to technology and professional development opportunities remained limited. School administrators and principals bore the responsibility of ensuring smooth operations and fostering a positive school culture, facing unique challenges in rural settings such as isolation and resource scarcity. Community members, including local businesses and government officials, provided crucial support, recognizing the importance of education in driving societal progress and economic development.

Through rigorous needs analysis research conducted across ten European countries, the project gained valuable insights into the specific challenges and requirements of rural education. Findings highlighted the critical importance of addressing organizational, technical, and pedagogical needs to facilitate effective technology integration in rural schools. Organizational requirements underscored the need for strong leadership, adequate funding, and collaboration among schools and stakeholders. Technical requirements emphasized the necessity of reliable infrastructure, high-speed internet access, and technical support to enable online learning and communication. Pedagogical requirements focused on the professional development of teachers, curriculum development, and ongoing assessment to meet evolving teaching and learning needs.

The actions outlined by the Learning from the Extremes project are instrumental in fostering innovation and driving sustainable change in European schools, particularly in rural settings.

1. Rural Education in Europe

During the Covid pandemic schools faced severe challenges with the switch to distance and online learning, due to their limited digital readiness. The pandemic made it very clear that schools were lacking the resources and infrastructures to switch to new ways of teaching and learning, many teachers lack relevant digital competences or teaching materials for remote teaching, students often lack connectivity or access to digital devices, tools, and content at the place where they learn. The consequent loss of learning opportunities impacted especially those living in rural areas.
The pandemic underlined the critical importance of addressing the technical challenges faced by schools, particularly those in rural areas. The following are some key points:

Digital Divide Exacerbation: The pandemic highlighted the digital divide, with many learners lacking the devices or connectivity needed for remote learning. School closures disproportionately affected students in rural areas, with 70% of those unable to access remote learning residing in rural regions.

Resource Dependency for Technology Adoption: The readiness of schools to adopt technology depends on their resources and ability to integrate it into daily practices. Schools with sufficient resources and a culture of innovation are better equipped to adapt to new modes of education.

Adaptive Capacity: The pandemic emphasized the value of schools' adaptive capacity for rapidly adjusting to new educational modes. Strong leadership and confident, innovative teachers are essential for successful innovation in response to urgent changes.

Disparities Between Rural and Urban Schools: Rural schools often have fewer financial and human resources compared to urban counterparts, leading to a lag in technology-related innovation. Addressing this gap requires targeted support and investment in rural education.

Factors Affecting Absorptive Capacity: Four conditions determine a school's absorptive capacity: prior knowledge, staff skills acquired through experience and professional development, engagement with innovative projects, and exposure to external knowledge. These factors overlap with technology self-efficacy and attitudes towards technology integration.

Addressing the digital divide and building absorptive capacity in rural schools are crucial steps in ensuring equitable access to quality education, particularly in times of crisis like the COVID-19 pandemic. This requires investment in resources, support for teachers, and fostering a culture of innovation within rural education communities.

1.1 European Policies and Digital Education

The European Union (EU) in its policies aims to promote the development of a high-performing European digital education ecosystem and seeks to enhance citizens' competences and skills for the digital transition. Digital competences and skills are essential to give every individual an equal chance to thrive in life, find employment and to be an engaged citizen. Having digital competences and skills and ensuring the availability of digital infrastructure and equipment have become more relevant since the outbreak of the COVID-19 pandemic.

Virtually all future learning and jobs will require some level of digital competences and skills. Constant technological change requires the lifelong development of competences and skills by all learners for Europe to remain economically competitive and to participate in social life. However, on average, two in five Europeans aged 16-74 still lack these skills (Digital Economy and Society Index). Ensuring equality during the digital transition of education and society is vital.

The European Commission (EC) published a proposal for a Council Recommendation on blended learning to support high quality and inclusive primary and secondary education. 'Blended learning' in formal

education and training is the term used to describe when a school, educator or student uses more than one approach to the learning process. The European Commission (EC) proposes shorter-term measures to address the most pressing gaps exacerbated by the COVID-19 pandemic, as well as a way forward for blending learning environments and tools in primary and secondary education and training, that can help build more resilient education and training systems. Blended learning can help to improve the inclusiveness of education, particularly due to its flexibility. It can mean better education provision in remote and rural areas, and for those who are part of traveller communities, or residing in hospitals and care centres, and those engaged in high-performance training. All environments and tools should be equally accessible to minority groups, children with disabilities or from socio-economically disadvantaged backgrounds and should not lead to discrimination or segregation.

Specifically, the European Commission's proposal for this Council Recommendation includes that Member States should:

- Provide additional learning opportunities and targeted support to learners facing learning difficulties, with special educational needs, from disadvantaged groups or having been otherwise adversely affected by school disruption. This could include, for example, enhanced individualised support, mentoring systems, additional learning time during the school year and/or holiday period, access to additional learning environments, such as public libraries and community spaces, and to after-school services with pedagogical support. In that context, the Commission recommends mobilising or recruiting additional staff to allow more time for individual support at school and in after-school activities.

- Prioritise the physical and mental wellbeing of learners and their families, as well as teachers and trainers. This could include developing guidance for mental health and including student and teacher wellbeing and anti-bullying policies in school.

- Boost the development of digital competences of learners, of their families and of teachers and trainers, and encouraging investment at school and community level in available devices and connectivity.

- Support effective partnerships for infrastructure and resources between different education providers, including business, arts, cultural heritage, sport, nature, higher education, and research institutes, the educational resources industry (including technology, publishing, and other curriculum equipment) and educational research.

- Make full use of EU funds and expertise for reforms and investment in infrastructure, tools and pedagogy to increase resilience and preparedness for future-ready schools, in particular Erasmus+, the Recovery and Resilience Facility, European Social Fund Plus, European Regional Development Fund, Digital Europe Program, Horizon Europe and the Technical Support Instrument.

The European Commission (EC) stands ready to support the implementation of the Recommendation by facilitating mutual learning and exchanges among Member States and all relevant stakeholders within the dialogue forums set up under the European Education Area and the Digital Education Action Plan and on its online platforms and communities for education and training: School Education Gateway and eTwinning. A focus on the development of a blended learning approach in primary and secondary school education will be included in the regular progress reports of the European Education Area and the Digital Education Action Plan 2021-2027.

The European Commission is addressing these issues through the follow actions:

The Digital Education Action Plan (2021-2027).

The SELFIE tool (Self-reflection on Effective Learning by Fostering the Use of Innovative Educational Technologies).

SELFIE for TEACHERS to support teachers' digital competence and to enhance learning in the digital age.

Collaboration with the European Investment Bank (EIB), for example through the Invest EU program, to enable Member States access to funding for digital and physical infrastructure and to support the development of skills and innovative pedagogies.

The 2021-2027 Erasmus+ and European Solidarity Corps programs have been made greener and more digital.

The Recovery and Resilience Facility supports Member States in addressing their needs in digital education, following the COVID-19 pandemic.

The European Social Fund promotes the development of digital skills as a vehicle to ensure better and fairer job opportunities for European citizens.

The new Digital Europe Program (DIGITAL) focuses specifically on boosting advanced digital skills.

The Council of the EU has set the following EU-level targets for digital education as part of the European Education Area strategic framework for the period 2021-2030, that by 2030 less than 15% of eighth graders across the EU should be low-achievers in computer and information literacy. A European Education Area Strategic Framework Working Group – Digital Education: Learning, training and assessment (DELTA) – has also been established to encourage mutual learning and the exchange of information and best practices between Member States. Working groups promote voluntary European cooperation in education and training. They offer a forum to exchange experiences and practices on addressing common challenges while respecting the principle of subsidiarity and the diversity of EU Member States. Experts work together to share information about reforms of national education and training systems policies to inspire positive change throughout the EU.

Working groups contribute to the implementation of European Education Area (EEA) actions and reinforce synergies with other EU policies initiatives, including the Digital Education Action Plan (2021-2027), the European Skills Agenda, and the Green Deal. Their outputs will inspire inclusive, holistic and lifelong learning perspectives, and forge closer links between policy and funding and current mandate runs until December 2025. Members of working groups are government officials appointed by EU countries and other participating countries, representatives from EU-level stakeholder organisations, social partners and international organisations, EU bodies, offices, and agencies.

The working groups explore themes on: a) Early childhood education and care, b) Schools, including sub-groups on Pathways to School Success and Learning for Sustainability, c) Higher education, d) Vocational education and training and the green transition, e) Adult learning: opening up opportunities for all, f) Digital education: learning, training and assessment and, g) Equality and values in education and training.

As part of the Next Generation EU strategy, the updated Digital Education Action Plan is an important part of the recovery from the COVID-19 shock. It will provide a coherent and integrated framework for addressing the gradual transition of education and training to the digital age by addressing challenges in education and training arising from the COVID-19 crisis and the overarching digital transformation. The Action Plan will help steer specific interventions through Commission programs such as Erasmus, Digital Europe, Horizon Europe or the Structural Funds by informing specific program priorities. It will present a long-term vision for its actions. It intends to include a coordination and implementation modality. The Action Plan should offer a coordinated policy response at EU level that adds value to actions at Member State level. It should involve stakeholders at various levels (EU, national, regional, local) and involve more closely citizens in its future implementation.

The EU guidelines according to the Digital Education Action Plan 2021-2027 aim to strengthen digital education in the Member States through specific action plans over a decade and beyond, targeting and investing in the new digital age and equality between Member States. It enables Member States

themselves to use and adapt according to their geographical, social, political, and educational needs, capacities, future goals and plans a variety of actions through a wide range of digital programmes, tools and partnerships.

Digital education can be an important lever for the EU internationally through sharing of principles, tools, and content. With its focus on people, in particular teachers and learners, the EU should lead by example with digital education that is rooted firmly on its values while embracing the opportunities of the digital age.

1.2 Challenges and Opportunities for Rural Schools in Europe

Rural schools often face challenges due to their location in areas with lower socio-economic status and isolation. This results in less resources, including staff expertise, equipment, connectivity, and learning materials. Funding issues, higher costs, or lack of appropriate offers contribute to resource limitations. High turnover rates among young teachers are common due to remoteness, isolation, and limited career opportunities, leading to fewer networking and professional development opportunities. Students in rural areas tend to have lower socio-economic status, higher truancy rates, lower academic achievement, and decreased likelihood of accessing higher education.

Despite challenges, teachers in rural areas are often more enthusiastic and satisfied with their jobs and financial conditions. While young teachers may leave more frequently, older teachers tend to stay longer, bringing valuable experience. Teachers demonstrate higher commitment and involvement with parents and community stakeholders and students typically exhibit better school discipline and higher overall life satisfaction. Smaller class sizes in rural schools offer opportunities for more personalized learning experiences. Surprisingly, rural schools may have more computers per student, although usage and access to digital resources and suitable connectivity may vary. Rural schools benefit from stronger connections with the local community, receiving support from parents, stakeholders, and businesses.

1.3 Needs Analysis

In rural areas of Europe, the teaching landscape is undergoing a shift driven by the integration of technology into education. As technology becomes increasingly accessible, educators are required to adapt their teaching methodologies, incorporating a diverse array of resources aligned with the curriculum and assessment criteria. This shift necessitates more active engagement with both students and parents, a transformation that has been accelerated by the COVID-19 pandemic.

Despite these advancements, numerous challenges persist for rural teachers. Issues such as limited access to appropriate technology and essential infrastructure continue to hinder progress. Additionally, there exists a spectrum of attitudes among educators regarding the efficacy of technology and their own capabilities to effectively integrate it into enhancing student outcomes. These disparities in technology adoption and support contribute to inequalities in the quality of education across rural areas.

While some rural educators benefit from adequate and sustainable professional development opportunities, many are excluded from decision-making processes related to technology integration in education. Government initiatives aimed at developing competency frameworks and supporting tools for teacher professional growth often struggle to effectively reach rural educators.

To successfully improve technology integration in rural education, collaboration with various educational stakeholders, particularly those operating in rural contexts, is imperative. Involving rural teachers in the early stages of policy formulation is essential, as their insights and experiences are invaluable for crafting policies that are both well-received and effective. Bridging the digital gap and promoting technology adoption necessitates ongoing, school-based professional development programs tailored to rural educators. These initiatives should provide hands-on learning experiences and facilitate opportunities for educators to share their insights and best practices with their peers. By empowering rural teachers

through robust professional development initiatives, we can foster a more inclusive and technologically enriched educational environment for rural students throughout Europe.

From the conducted research it emerged that relatively to organizational requirements effective communication channels are vital for rural schools, facilitating not only dialogue with education authorities but also fostering connections with training institutions, research bodies, and other schools. This exchange of experiences and resources is particularly crucial in rural settings where isolation can impede development and innovation. Adequate funding and resources are essential for rural schools to ensure equitable access to necessary tools and educational materials. Facilitating collaboration among rural schools, governmental bodies, and other stakeholders is imperative to ensure the efficient and effective distribution and utilization of resources and strong leadership and governance are necessary to provide rural schools with the support required to implement changes effectively.

In relation to technical requirements, it was found that ICT is increasingly prevalent in all schools, rural and urban alike. However, rural schools face unique challenges due to their geographical isolation and limited service provisions compared to urban areas. High-speed internet access and reliable technology infrastructure, encompassing hardware and software, are crucial for rural schools to enable online learning, access educational resources, enhance teaching methodologies, facilitate remote communication, and prepare students for the future. Additionally, educators require such access for communication with authorities, training institutions, and other schools, as well as for online professional development. Technical support and maintenance are essential to ensure that equipment remains up-to-date and functional. In rural areas, this may pose challenges due to a shortage of expertise, potentially leading to disruptions in the learning process. Robust security measures are necessary to safeguard sensitive information and data against cyber threats, ensuring the protection of privacy and preventing data breaches. Reliable power sources are essential to ensure consistent technology usage. Some schools have implemented solutions such as solar power or offline modes for digital platforms to mitigate interruptions caused by power outages or extreme weather conditions.

Regarding the pedagogical requirements in rural areas, teachers often fall into two categories: long-standing community members who have remained to teach, and young novice teachers, sometimes incentivized or assigned to rural schools where staffing is scarce. Increased opportunities and support for professional development are crucial for rural teachers to maintain and enhance their teaching skills, particularly in utilizing educational tools effectively and continuously innovating. Curriculum development and alignment are essential to integrate educational tools and content into classroom instruction effectively, ensuring they meet evolving teaching and learning requirements. Ongoing assessment and evaluation are necessary to gauge the effectiveness of teachers' skills, educational tools, and content in meeting student needs and community learning objectives.

In conclusion, the needs analysis that was made in the frame of Learning from the Extremes showed that addressing the access to educational tools and content in rural schools requires a comprehensive approach that considers all three aspects of requirements namely organizational, technical, and pedagogical, affirming what is already known about the needs that rural and remote schools have and the challenges they face. A realistic and detailed picture is given, highlighting the unique circumstances and priorities of rural schools in different European contexts.

1.4 Stakeholders Involved

Students represent the primary focus of education, being central to the learning process. Education equips individuals of all ages with the necessary knowledge and skills for success in various aspects of life. However, if educators fail in their responsibilities, students may face limitations in accessing educational, cultural, and social opportunities as adults. Parents hold significant responsibility for their children's

upbringing and education, aiming to ensure that educational values align with their aspirations. Additionally, parents financially support their child's education, influencing the educational content and approach and they often provide crucial support to their children, assisting with homework, technological issues, and other tasks, although discrepancies in technical proficiency may exist based on urban or rural settings.

Teachers play a pivotal role in educating students, bearing the responsibility for guiding learning within the classroom environment. This responsibility becomes particularly crucial in remote areas where educational options are limited, as parental choice is constrained by geographical factors. Teachers are expected to possess the expertise necessary to deliver effective instruction and often engage closely with parents and the community to meet expectations. Technology serves as a valuable tool in enhancing training opportunities for teachers, overcoming barriers of location and time. Distance learning models, including MOOCs and webinars, bolster teachers' self-efficacy, especially in remote areas with limited training resources nearby. School size directly impacts teaching strategies, with rural schools often adopting multi-grade classrooms to optimize staff and instructional time. While challenges may arise in such settings, evidence suggests that effective peer-learning activities can positively influence learning outcomes, emphasizing the importance of class dynamics over age grouping.

School administrators and principals bear the responsibility of ensuring smooth school operations and fostering a positive school culture. However, staffing limitations in rural areas may result in regular teachers assuming administrative roles without adequate training, highlighting the need for competent leadership within schools. Additionally, administrators must consider input from various stakeholders, including the community and government, when making strategic decisions. Additionally, elected community members forming school boards are entrusted with ensuring the quality of education within their jurisdiction and managing financial resources effectively. As parents themselves, school board members often feel a personal obligation to uphold the effectiveness of schools.

Local communities play a vital role in education, benefiting from the development of educated citizens who contribute to societal progress. Education fosters social cohesion, reduces disparities, and promotes civic engagement. Communities can also support rural schools by providing technical and infrastructural resources, such as affordable internet access, through local initiatives. While education typically offers numerous benefits, certain factors such as "brain drain" and limited educational opportunities in rural areas may lead to adverse effects. These challenges can exacerbate inequalities, hinder local development, and contribute to depopulation. Government officials and policymakers are tasked with setting the strategic direction of education systems, enacting relevant laws and regulations, and overseeing budget allocation. Despite the multifaceted nature of education, policymakers must navigate complexities to ensure equitable access to education, particularly in underserved areas like rural regions. Meeting the universal service obligation amid budget constraints and demographic shifts poses significant challenges. Additionally, supranational institutions and advancements in digital technologies influence educational trends and migration patterns, impacting rural populations. Businesses have a vested interest in education as it shapes the future workforce. They may provide resources and learning opportunities to schools, aiming to ensure that students acquire relevant skills for the evolving job market. Improved connectivity in rural areas can stimulate economic growth, attracting new businesses and skilled professionals. Furthermore, higher education institutions and research organizations play a crucial role in fostering the development of rural areas by investing in human capital and facilitating access to knowledge and innovation. Outreach programs, vocational training, and partnerships with local schools contribute to enhancing educational opportunities and supporting community development.

1.5 General Requirements for Rural Education

Research findings regarding the general requirements for rural education showed that three groups of requirements are distinguished: organizational, technical or infrastructural, and pedagogical requirements. While these requirements are applicable to all schools, they are often more critical in rural areas. These are the following:

Organizational Requirements:

Schools need adequate funding and resources to ensure access to necessary tools and content. Rural schools face challenges in this aspect, particularly in providing learning resources and developing teachers' competencies for digital learning. Communication, exchange, and collaboration among rural schools and with urban schools are effective for enhancing educational quality and efficiency. Strong leadership and governance are vital, especially in rural areas, where leaders face challenges such as isolation, teacher recruitment, poverty among students, and resource scarcity as well as collaboration among stakeholders to address the unique demands of rural schools.

Technical Requirements:

The COVID-19 pandemic highlighted the importance of addressing technical challenges, especially in rural schools. Remote learning was hindered for many rural students due to lack of devices and connectivity. Schools' readiness to adopt technology depends on their resources and ability to integrate it into daily practices. Successful innovation requires strong leadership and confident teachers. Rural schools often lack financial and human resources and lag behind in technology-related innovation. Absorptive capacity, determined by prior knowledge, staff skills, engagement with innovative projects, and exposure to external knowledge, influences schools' ability to innovate.

Pedagogical Requirements:

Improving access to educational tools and content in rural schools necessitates a comprehensive approach addressing organizational, technical, and pedagogical needs. Teacher professional development is crucial for effective use of educational tools and content. Curriculum development and alignment ensure meaningful integration of technology into instruction. Ongoing assessment and evaluation are essential to ensure effectiveness and meet student needs, involving data collection on student performance and feedback from teachers and students.

The COVID-19 crisis underscored both challenges and opportunities for schools to innovate using digital technologies, particularly in rural areas. Recognizing the need for a holistic, long-term approach to digital education, the European Union revamped its Digital Education Action Plan for 2021-2027. Member states are tasked with implementing national policies and legal frameworks to leverage digital technologies for education, particularly in remote and rural areas.

To address the challenges that rural communities across Europe still struggle with, despite clear strategic priorities outlined in European Union’s action plans, it was crucial to strengthen relationships between rural schools and local communities, transforming schools into educational hubs accessible to all residents. The Learning from the Extremes project aimed to address these challenges by supporting 123 rural schools in 10 European countries. The Learning from the Extremes project adopted a multidimensional approach to digital education in rural schools, involving all stakeholders. It aimed to analyze the needs of rural communities, provide funding for infrastructure, offer consultation and training services, and analyze pilot data to inform future actions. The project focused on developing Rural Schools Innovation Strategies to support schools in their digital transformation journey. Through funding, consultation services, and technical support, it seeked to equip these schools with the necessary digital infrastructure and facilitate

their digital transformation journey. The ultimate goal was to transform them into multi-purpose learning centers that enhance local employment, civic services, and sustainable development. The Learning from the Extremes project aimed to help schools to install proper infrastructure and be able to utilize digital technologies in an efficient and innovative way, while simultaneously teacher professional development and training are considered very crucial for effective implementation of digital technologies in teaching and learning practices.

The Learning from the Extremes intervention aimed to demonstrate ways on how the digital gap suffered by school communities from remote areas can be reduced by:

- Connecting students: Students will have modern, connected, and constructive learning spaces equipped to support engaged, personalised learning.
- Developing teachers: Teachers will have the development, support, and resources they need to integrate digital tools within the learning environment.
- Saving time: Support staff will benefit from school management tools that minimise manual tasks and maximise time to focus on teaching and learning.
- Access to digital tools: School communities will have access to digital tools and connectivity for effective communication and collaboration.
- More quality teaching: All staff will be able to partner with our country schools to help close the gap in access to high-quality teaching.
- Professional support: All schools will be able to share teaching excellence with professional support in the classroom, the school, and the region.

2 The Learning from the Extremes approach

2.1 Supporting Rural Schools to become Sustainable Innovation Ecosystems

According to HORIZON 2015 K-12 Report (NMC, 2015[1]) report, any effort to scale innovation should be focused on supporting advocacy and organizing communities around existing models, creating a united voice that is heard through social platforms and other outlets. But how this united voice can be created? There are many parameters and conditions for the realization of the **innovation chain reaction**. In the following (Table 1 and Figure 1) we are describing the most crucial conditions to support the transformation process in school settings. The process starts with the mobilization of the **critical mass** of innovators in the school setting. The involvement of external stakeholders (e.g. innovative colleagues from more advanced schools acting as mentors) and the formation of strong communities of practice can **increase the density** of innovators and make their united voice to be heard. The process can be supported with the appropriate ICT tools and applications along with the necessary infrastructure by providing exemplary cases and working examples on how to "walk the walk". There are experiments in other settings that have similar needs and visions. In this way, **the temperature of the innovation system is increasing significantly**. The more opportunities teachers have to interact, the more likely these innovative ideas are to flourish. Authoring tools, advanced search mechanisms, community building services can have a significant role in the process. Finally, an **effective, systematic and well-documented self-reflection mechanism** has to be in place. It will set the milestones in the innovation journey. Self-reflection will highlight the success and the failures in the previous period and will define the targets of the next.

Table 1: Conditions for the Diffusion of School Innovation

Increase Mass	For schools to embark on their transformation journey towards digital change and innovation, they need a clear **vision and leadership**. More specifically, school leaders need to create a shared vision for how digital innovation can better meet the needs of all learners and to develop a plan that translates the vision into action. These vision and planning processes should be based on a holistic view of the current innovation status of the school. The vision of change begins with a discussion and a reflection exercise on how and why a school community wants to transform learning and introduce digital innovation. The moment these goals are clear, research findings and good practices can be used to open new possibilities for accomplishing the vision that would otherwise be out of reach. **Innovative projects can accelerate, amplify, and expand the impact** of effective teaching practices only if they are carefully designed and thoughtfully applied. However, to be transformative, teachers need to have the **knowledge and skills** to take full advantage of the process and the outcomes of these project-based activities. Besides, the roles of teachers, trainers, and learners all will need to shift as digital school innovation enables new types of learning experiences. Successful digital change and transformation is based on **teacher and leader capacity**. A successful change strategy requires professional development, feedback and support for teachers along with a well-developed monitoring and evaluation system. **Organizational capacity**, **strategic planning** and **quality assurance** are crucial parameters during the transformation journey. It is at this stage that the adoption of a **mentoring mentality** is of primary importance for the teachers and schools that are willing to open new horizons.
Increase Density	An extended **community of practice** can provide a structure for fostering digital change, sharing experiences and best practices and enhancing learning goals. The introduction of innovative approaches requires fundamental changes in the school culture, rather than simply introducing or changing isolated practices. To successfully drive change, school innovations must be flexible, responsive to the specific school needs, embedded in the school contexts and open to their environments. At this stage, **school heads** become a dynamic and influential force in the school community that can guide schools in creating a culture that initiates and supports innovation. Good leadership can ensure a supportive environment

[1] Johnson, L., Adams Becker, S., Estrada, V., and Freeman, A. (2015). NMC Horizon Report: 2015 K-12 Edition. Austin, Texas: The New Media Consortium.

	for teachers; **promote collaborative practices** such as mentoring, formative feedback, reflective and inquiry-based practices; and provide relevant opportunities for networking and professional development.
Increase Temperature	The preparedness, commitment, and capacity of teachers are critical factors in the wider adoption of **school innovation** for **digital change and transformation** in schools. Teacher professional development, training, collaboration and learning opportunities are important elements in supporting the implementation of such innovative practices. The key at this stage is the development of **innovative mindsets** among teachers. From **whole-of-school transformation** to innovative learning solutions, open and creative environments can cultivate effective and engaging learning. The more opportunities you have for teachers to interact, the more likely these **innovative ideas** are to flourish. To do so, learning communities, cooperation initiatives and shared projects are ways to support the development of teacher competencies and to foster the innovation process. For digital change to take place we need to support learning and teaching by communicating evidence of learning progress and providing insights to teachers; school heads, policymakers; parents; and, most importantly, the learners themselves.
Increase Reflectivity	To support schools to become **hubs of innovation** we need to provide reflective practices that can help collect ideas that would otherwise float away. Through **self-reflection** and mentoring, innovators influence themselves and others around them by directing their discoveries back into the system for deeper investigation. A powerful way to improve curriculum and assessment outcomes for students, teaching practices and for the school as organisation is the responsive and **creative use of the outcomes** of the projects which will be developed in the framework of the process. We need to keep in mind that innovation is the capacity of schools to embed and sustain innovation in teaching and organisational practices. The development of this capacity can often require **fundamental changes in the school culture**. For schools to act as hubs of innovation they need to be supported on different levels: leadership and vision, digital culture and curricula, teachers' professional development and resources and infrastructure. To make the desired digital change viable, schools need constant reflection through continuous support of digital innovation and transformation.

Learning from the Extremes aimed to develop a schools' support mechanism that facilitates the process described above. It defines the path and the specific elements to depict innovation in schools, as well as the relevant indicators. Considering that the fulfilment of the necessary conditions one can define the transformation journey incorporating the processes described above. It described the full cycle of the school digital change and transformation (see Figure 1). Before schools can embark on change, they need a clear vision and leadership. More specifically school leaders need to create a shared vision for how digital education best can meet the needs of all learners, develop a plan that translates the vision into action and collaborate adopting a mentoring mentality. This vision and planning processes should be based on holistic view of the current digital innovation status of the school. The school environment is becoming an aligned and synergistic system of systems that:

- Creates learning practices, human support and physical environments that will support the teaching and learning of 21st century skill outcomes
- Supports professional learning communities that enable educators to collaborate, share best practices, and integrate 21st century skills into classroom practice
- Enables students to learn in relevant, real world 21st century contexts
- Allows equitable access to quality learning tools, technologies, and resources
- Supports expanded community involvement in learning, both face-to-face and online

In the following we are describing the expected contributions of the *Learning from the Extremes* support and training scheme to the schools' transformation journey:

Increase Mass: This process is focusing on the analysis of the school needs and has the aim to identify areas (using self-reflection tools like SELFIE) in which the school can best demonstrate innovative approaches and projects. The development of a critical mass of **Change Agents**, innovative teachers who will share the vision of the school leader to take the school to the next level, is of major importance at this process. At this level, initial innovative scenarios are being implemented to pioneer future-oriented

practices and to experiment with digital resources and technology-enhanced learning applications. At this phase, *Learning from the Extremes* will offer a rich database of creative initiatives with access to numerous resources, guidelines and support (also online through webinars and hangouts) as well as examples for the coordination of action plans offering funding opportunities (e.g. through ERASMUS + mobility grands or cooperation projects) for the realization of the school action plans focusing on teachers professional development (PD) and the adoption of a European Development Plan.

Increase Density and Temperature: These processes aim to diffuse innovative practices in numerous areas (curriculum, parental engagement, interactions with actors outside of the school) of the school operation. It aims to encourage the uptake of resource-based learning practices and to engage a wider school community (by involving more teachers in the projects and initiatives, technical staff, parents) in implementing resource-based educational scenarios in various curriculum areas, as well as to reflect on the use of tools, resources and practices that the extended use of the service will offer. These processes aim to create a steady and supportive development of new learning techniques and methodologies, leading to sustained improvement. The development of **strong communities of practice around the implementation scenarios** is regarded a crucial element in the success of proposed interventions. To support the realization of these processes, the project offers numerous tools for the school communities. Apart from **community building and support tools** (to support the Increase of the Density process) numerous **content creation and content delivery tools** (to Increase the Temperature) will be available for teachers and school heads, through the ***Learning from the Extremes*** **Platform**. The aim is to help teachers to become **creators of educational activities** which will reflect on the real educational needs of their rural classrooms. They will be able to adopt existing content, enrich it with numerous resources and tools and deliver the outcomes as an integrated lesson to their students. **Integrated students' assessment mechanisms** will allow teachers to assess the impact of their practices in real settings. Its focus is not only on the integration of digital resources into syllabi, but also on subsequent adoption of the modernization of the school organization, teachers' professional development. Localized assessment approaches will estimate the impact on both, individuals and schools as an organization, as well as on the development of effective cooperation with organizations like universities and research centres, informal learning settings, enterprises, industries and the local communities.

Increase Reflectivity: The aim of this process is to accelerate the educational changes regarded as effective and to expand them to significant parts of the school, always keeping in mind the school's main needs (as defined in phase one). Attention is given to exploiting knowledge management techniques (sharing what is known within the participating school communities); synthesizing evaluation and accelerating diffusion within national agencies (to reach more users). Insights from the use of the **consultation and support services**, data from the school communities, the development of the teachers' competence profiles, the content that was created and delivered locally, the interaction of the communities and their members will create a unique data base for future recommendations and for the identification of best practices. The *Learning from the Extremes* services will help the selected schools to proceed more and develop their innovative ideas to new services that could provide new solutions for classroom practice, for bringing the gap between formal and informal learning settings and creating new opportunities for personalisation at different levels (student, teacher, school). At this level, innovation has to **be the norm in the rural school operation** that will act as **an Innovation Hub, a Digital Learning Common**, an environment that shares a culture that imports external ideas that challenge internal views and beliefs and, in turn, exports its students – and their assets – to the community it serves.

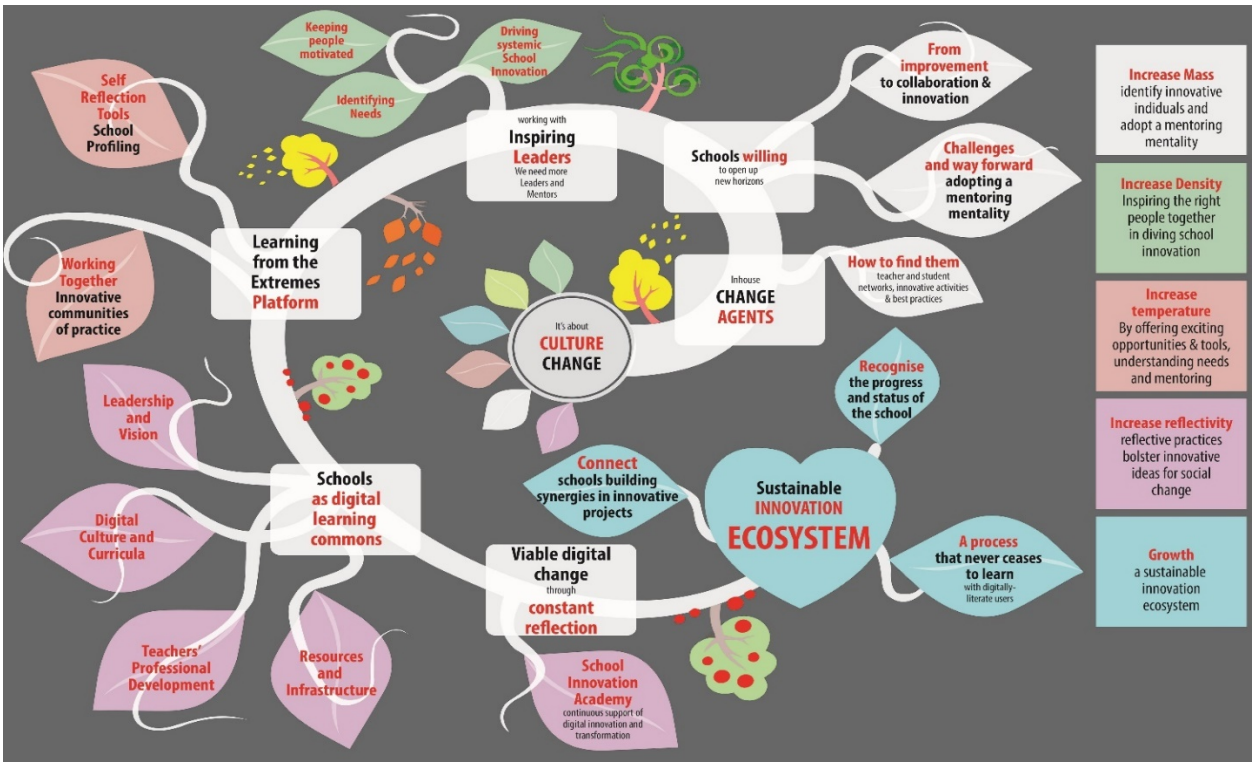

Figure 1: The full cycle of the school transformation with the support of the Learning from the Extremes services.

In Figure 1 the full cycle of the school transformation with the support of the Learning from the Extremes services is shown. The process starts with the Change Agents who are becoming Inspiring Leaders of the school community. Learning from the Extremes offers open, interoperable and personalised solutions meeting the local needs, supports school heads capture innovation, to decide on the appropriate strategy to diffuse innovation to the school and through constant reflection guides them towards the transformation of the school to innovation hubs and digital learning commons and finally to sustainable innovation ecosystems.

The **journey towards digital change and innovation** that a school is embarking through *Learning from the Extremes* leads to the transformation of the school into an efficient player of a **Sustainable Innovation Ecosystem**. Recognizing and supporting the progress and the status of the schools that have successfully scaled school innovation is of primary importance. The *Learning from the Extremes* support mechanism will continue to offer opportunities for schools to connect and build synergies in new innovative projects. After all, a **Sustainable Innovation Ecosystem** is an on-going process that never ceases to learn with digitally literate users.

2.2 Effective Use of ERASMUS+ Opportunities for the Schools Transformation Journey

As part of the *Learning from the Extremes* consultation and support scheme guidance and support was offered to the schools to develop common projects that could be realized and funded at the European level. Numerous challenges are emerging from the involvement of the schools in international activities (e.g. eTwinning projects, ERASMUS + KA1 and KA2 activities) and such a mentoring scheme can help the school heads to develop **European Development Plans that are harmonized with their school transformation journeys**, to involve their teachers in international professional development activities and to extend learning and teaching beyond their local school environment, establishing innovative cooperation projects that could safeguard at the same time significant resources for the school community.

Figure 2: ERASMUS+KA1 and KA2 require the development of a whole-school approach for the effective integration of the projects to the school community. Schools can use these opportunities to get support for their innovation plans.

Learning from the Extremes partners have established mechanisms to support schools to get involved in such projects and initiatives, e.g. the European School Innovation Academy (ESIA) (http://esia.ea.gr/about-esia/) is coordinated by EA (in cooperation with an international consortium) offers teachers and school heads the opportunity to participate in international PD courses with colleagues from numerous countries in Europe, USA, and Japan. There is a variety of courses offered every year in different locations across Europe. School heads and teachers from the same school can participate in the courses taking place at the same time while they are attending different programmes harmonized with their needs. A specific session is each course is devoted to clustering and planning of common projects. Participants have the chance to set up the project work and to get prepared for its submission to the ERASMUS+ National Agencies. ESIA is offering continuous support and guidance during the preparation process making sure that the proposal aims are in line with the school development plans.

2.3 A cloud-based infrastructure for Community Building and Schools Support

Learning from the Extremes offers a cloud-based infrastructure (based on the existing Open Schools for Open Societies (OSOS) Social Platform (http://portal.opendiscoveryspace.eu/osos)) to support the schools support scheme of the project. In this section we are presenting these tools and their foreseen role in the integrated support scheme that the project will offer to the selected projects:

- **Self-Reflection Tools:** A school that has embarked on a course of change needs to be fully aware of its needs and strengths. *Learning from the Extremes* is fully committed in the facilitation of this enlightening exercise. To achieve this, the project relied on two established self-evaluation methodologies:
  - **SELFIE (Self-reflection on Effective Learning by Fostering the use of Innovative Educational Technologies** - https://ec.europa.eu/education/schools-go-digital/about-selfie_en) which is a tool designed to help schools embed digital technologies into teaching, learning, and student assessment. It can highlight what's working well, where improvement is needed and what the priorities should be. The tool is currently available in the 24 official languages of the European Union.
  - **The Open Schools for Open Societies Self-Reflection Tool** (https://portal.opendiscoveryspace.eu/osos/srt) which is a tool that monitors the progress of the school towards openness at three different levels, the Management Level, the Process Level, and the Teachers' Professional Development Level. It is available in 10 official languages of the European Union.

    The Learning from the Extremes project has provided an updated self-reflection tool (https://learningfromtheextremes.eu/lfe-self-reflection/) that offers a clear understanding of the progress of the school towards digital innovation and openness.
- **Rural School Innovation Strategies:** It provides recommendations to school heads for strategic holistic school improvement and the implementation of the foreseen whole-school approach. These recommendations were produced by utilizing rule-based inter-relations of the school innovation profile elements and are aligned with the typical elements of the schools' European Development Plan to support school leaders' innovation planning. More specifically, examples of recommendations to be provided can include: a) **Reflecting on the use of ICT in the teaching practice** (i.e., educational designs), b) **Recommendations of specific educational designs**, namely suggestions of educational designs employed in other schools to the teaching staff of the school, based on the similarity of school innovation profile so that the teaching staff can select educational designs successfully employed in

schools with similar innovation profile to their own, c) **Recommendations of professional development courses** to meet the specific competence needs of the teaching staff, by matching the competence profiles of teaching staff and the descriptions of professional development courses in terms of competences they cultivate, and d) **Recommendations of potential partner schools** with similar (or complementary) innovation profiles to support collaborations, mentoring and mutual improvement, such as ERASMUS+ staff mobility, eTwinning and ERASMUS+ strategic partnerships. The recommendations will be provided to the interested school heads in the form of school innovation actions.

- ***Learning from the Extremes*** **Community Platform:** It offers a) **community-building tools**, b) **advanced search mechanisms** to provide access to numerous **digital content repositories and archives**, c) **authoring** and **classroom delivery tools** with integrated **student assessment functionalities** and d) an **interactive map of Europe (The Rural School Innovation Interactive Map)** that depicts the activities and the development of the schools that are part of the network to facilitate effective collaboration and international projects development on common issues. Additionally, training and support is offered to the user communities through targeted training programmes: a) The **School Heads Training Programme** provides on-line support (as well as physical support in the framework of workshops) to the implementation of the Rural School Innovation Strategies and the use of the platform services and tools, b) the **Teachers Training Programme** that offers guidelines and support to teachers who need to prepare their contents/lessons for educational use and c) the **School Technical Staff Training Programme** that offers the necessary guidance to the technical staff of the school to support the usage of the school infrastructure and the project tools and services.

2.4 The Learning from the Extremes Approach Impact

During the project, data from the Self-reflection tool was collected from all 123 schools that participated in the Learning from the Extremes project activities. All the school have filled in the 1st and the 2nd Self-Reflection Tool (SRT) and have identified their pre and post status.

The school environments were evaluated from January 2023 (pre) until November 2023 (post) during the implementation period of the project by completing two measurements, one before their involvement and one after their engagement in the transformation journey. Participating schools achieved an average increase of 24.54% in their openness level, innovation status and e-maturity levels. The majority of the initial lowest performers, based on the first measurement achieved a 35–55%. The higher scorers from the first measurement still reached a small but significant increase in the recorded openness, innovation and e-maturity levels.

Figure 5 illustrates the frequencies of the final scores of the sample (n = 123) with an indication of a normal distribution demonstrating the results pre and post measurement (1st and 2nd Measurement). We observe a significant increase of 24.54% of the mean openness/innovation/e-maturity value between the pre- and post-measurement, after the period of implementation of the Learning from the Extremes approach in the school settings. The increase of 24.54% in the openness/innovation/e-maturity level that we observe indicates that schools integrated many of the aspects of the Learning from the Extremes proposed approach in their day-to-day activities as well as into the Development Plans by reaching almost 67% openness/innovation/e-maturity value.

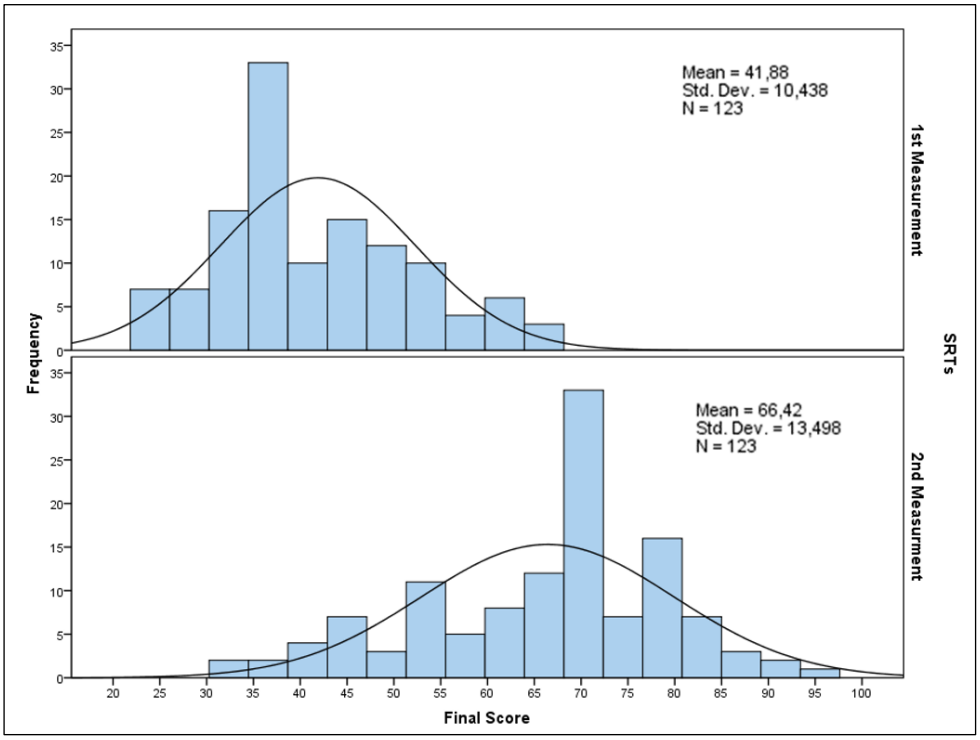

Figure 3: Frequencies of the measurements (1st and 2nd – or pre and post) of the school sample.

This very significant improvement of the schools' statuses could act as a reference point for educational policy actions to support school development through cooperation and continuous interaction with external stakeholders.

Furthermore, these significant results led to the development of the Rural Schools Innovation Roadmap which aims to outline all the necessary actions that school needs to take to develop the school environment and therefore evolve towards innovation and digital transformation, reduce the disparities between rural and urban areas, and establish inclusive learning for all students and continuous professional development for all teachers.

3. Rural Schools Innovation Roadmap

Rural Schools Innovation Journey begins with the preparation of the school's path, involving a careful exercise of self-reflection and participatory actions with relevant stakeholders to craft a strong development plan. National coordinators and consortium members supported this process through continuous consultation, ensuring alignment with the overall objectives of Learning from the Extremes: to demonstrate how – through the effective use of the technology and the necessary guidance and support – we can:

- Improve schools through better facilities, teachers, and leadership.
- Supplement schools by working with families and communities.
- Reinvent schools to create an education hub that support their communities.
- Transform learning by making it available in radically new ways.

These strategies are at the heart of the Learning from the Extremes Participatory Action. Communities were formed around the Innovation and Transformation Plans, with support provided for their materialization through Continuous Professional Development (CPD) opportunities. These communities and CPD initiatives centered around the selected Digital Tools chosen by participating schools. These powerful narratives of transformation and innovation were visible on the community platform and social media channels of the project. The stories were shared in multiple languages and across various Innovative Learning Hubs and Learning from the Extremes project mentors served as beacons for innovation and transformation in their communities, guiding and inspiring others to embark on similar journeys of educational innovation. Through these efforts, the impact of Learning from the Extremes project extended far beyond individual schools, creating a network of empowered educators driving positive change in education.

Attempting to reflect what is needed to diffuse innovation by following specific actions that the Learning from the Extremes project highlighted through the pilots' implementation, a series of actions are described in the following Figure 2:

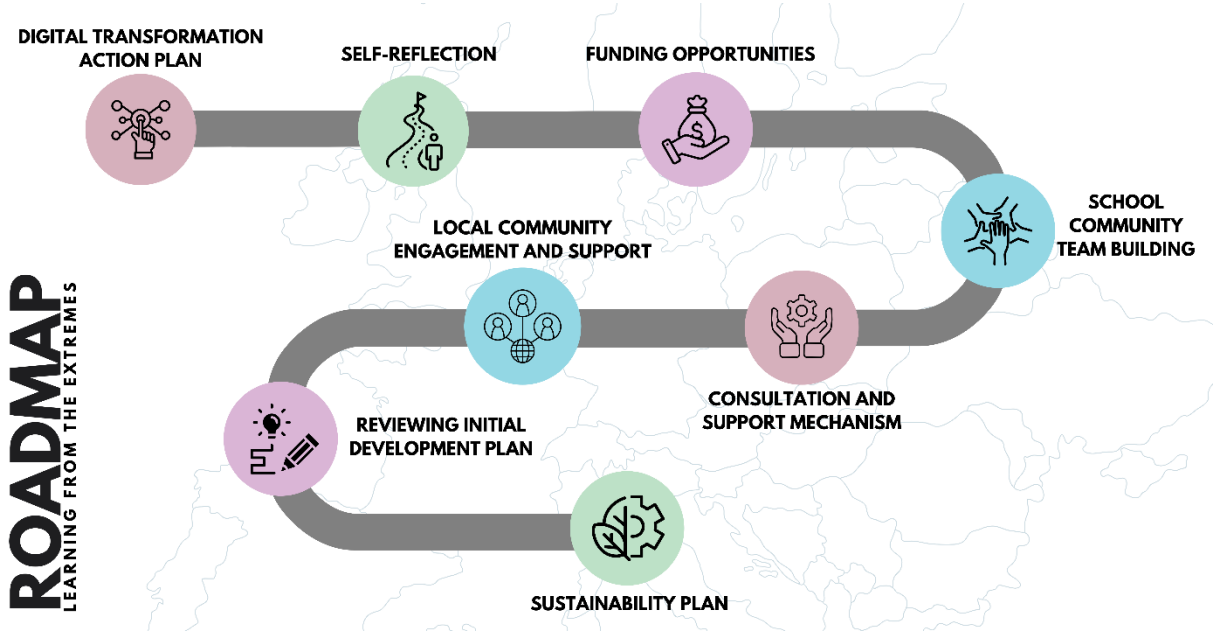

Figure 4: Learning from the Extremes Roadmap

These actions reflect on the following key steps that schools need to take all the way to innovation.

3.1 Form a Digital Transformation Action Plan according to the School Needs

Initially, the school attempts to reflect on its profile regarding its characteristics e.g. its geographical area, number of teachers and students, whether it's already part of a school cluster or network or it's supported by a teacher training college, or a (regional) education center for in-service teacher training or continuous professional development, and its needs. According to the schools' needs, a plan of development is made. The questions that the school must answer to reflect on its needs relate to:

- the pedagogical and technical challenges that are evident in the school community
- the pedagogically innovative aspects of the proposed project that are supported by the technological solutions,
- the number of teachers and their professional background that participate,
- the intended outcomes, the key performance indicators (e.g. number of teachers that participate in CPD activities, number of digital devices per student, expected increase in e-maturity level of the school in one school year, etc.) and success criteria (quantitative and qualitative) of the proposed project,
- the risks and/or barriers to the proposed project and the planned actions to overcome them,
- the plans and approaches of the involvement of the local community in the development plan,
- the expected impact of the proposed project on teachers,
- the expected impact of the proposed project on students focusing on the expected educational added value of it,
- the plan of continuation and/or scaling up of the project after the funding period.

The development plan describes how the needs of the school meet the characteristics of the HECC (Highly Equipped and Connected Classroom) Three Level Model and how it can impact the everyday activities of the school. The HECC model describes four dimensions of needs:

- **Digital technology equipment**: This includes technologies utilized in educational settings for teaching and learning, encompassing both hardware and educational software and services.
- **Network requirements**: Refers to the bandwidth and latency of the network essential for successful implementation of educational technology.
- **Professional development of teachers**: Emphasizes the continuing professional development (CPD) of teachers, focusing on enhancing their capacity to effectively utilize digital technologies in teaching, learning, and assessment practices through methods such as rapid learning cycles, fast feedback, continual reflection, and collaborative coaching.
- **Access to digital content**: Encompasses meeting curricular requirements to ensure greater incorporation of digital content in classrooms and its utilization by teachers and students, considering factors like complexity, accuracy, authenticity, and inter-disciplinarity.

Furthermore, it is imperative for schools to have a clearly articulated vision and competent leadership in order to kickstart their journey towards digital transformation and innovation. Specifically, school leaders need to nurture a collective understanding of how digital innovations can enrich the learning journey for every student. Subsequently, they should formulate a robust strategy to translate this vision into tangible actions and initiatives. This initial phase entails conducting a comprehensive needs analysis, engaging a diverse range of stakeholders including school administrators, parent and community groups, educators, Special Education Needs Coordinators, educational societies, and ideally, student representatives.

As technology becomes increasingly accessible, educators are required to adapt their teaching methodologies, incorporating a diverse array of resources aligned with the curriculum and assessment criteria. Utilize the needs analysis to strategically plan the digital transformation, taking into account insights from other schools' experiences and alignment with national policies. Recognize that digital

transformation plans are iterative and ongoing processes. As such, a combination of short-term and long-term objectives can be formulated to attain "quick wins" while also progressing towards overarching, longer-term goals. This approach ensures adaptability and sustainability in the journey of digital innovation within the educational setting.

For schools to embark on their journey of transformation towards digital advancement and innovation, they require a clearly defined vision and effective leadership. Specifically, school leaders must cultivate a shared vision detailing how digital innovation can enhance learning experiences for all students and devise a strategic plan to actualize this vision. These processes of envisioning and planning should be informed by a comprehensive assessment of the school's current innovation landscape. The journey towards change commences with engaging in discussions and reflective exercises to understand the reasons and methods for transforming learning and integrating digital innovations within the school community. Once these objectives are articulated, leveraging research insights and best practices can unlock new roads for realizing the vision that may otherwise remain unexplored. The vision and planning processes are grounded in a comprehensive understanding of the current digital innovation landscape within the school. The school environment evolves into a cohesive and interconnected system of systems that:

- Cultivates learning practices, human support, and physical environments conducive to teaching and acquiring 21st-century skill outcomes.
- Fosters professional learning communities that empower educators to collaborate, exchange best practices, and seamlessly integrate 21st-century skills into classroom instruction.
- Provides opportunities for students to engage in meaningful learning experiences within relevant, real-world 21st-century contexts.
- Ensures equitable access to high-quality learning tools, technologies, and resources for all students.
- Promotes increased community engagement in learning, both through face-to-face interactions and online platforms.

3.2 Self-reflection

A school's assessment of its current status in areas like connectivity and digital capacity and identifying areas for improvement can be facilitated through self-reflection tools (SRT). Utilizing these tools can serve as a catalyst for change by pinpointing goals, outlining actions, and ultimately enhancing learning outcomes. The aim of these tools is to capture the perspectives, needs, contributions, and relationships of various stakeholders within the school ecosystem, paving the way for sustainable and innovative learning environments.

One such self-reflection tool is the R4C SRT, which evaluates organizational change within a school concerning innovation across three levels: Management, Process, and Teachers' Professional Development. Drawing inspiration from tools like Selfie and OSOS-SRT, R4C SRT consists of eight items at each level, with the school representative selecting from four statements that best align with their current situation. These statements range from enabled to advanced, providing insights into the school's level of e-maturity and openness. The primary focus of this tool is to measure the impact of innovation at the school unit level, serving as both a pre- and post-implementation assessment. The proposed tool (https://learningfromtheextremes.eu/lfe-self-reflection/) provides a validated and robust pre and post measure of a pilot school's 'distance travelled' in their digital transformation journey. The use of the tool as an instrument covers a number of indicators. The tool is targeted at a school representative who is in the best position to answer the items related to the status of the school across the 24 areas at the three levels of the instrument.

The school representative will have to fill in each one of the 3 levels and to choose between the statements that correspond to the school's status. After the completion of each one of the required sections of the self-reflection tool, the School Head (the school) will get a report that will include the answers in each one of the sections as well as the results of the reflection. The report will present their answers as a table for each one of the sections as well as will inform about the status in relation to its innovation. The Self-Reflection Tool should be realized from each school at the beginning of its journey and then at the its end.

3.3 Funding opportunities

Effectively leveraging ERASMUS+ opportunities can significantly contribute to schools' transformation journeys. Engaging in international activities such as eTwinning projects and ERASMUS+ KA1 and KA2 activities can assist school leaders in crafting European Development Plans aligned with their transformation goals. These initiatives not only facilitate the participation of teachers in international professional development activities but also extend learning and teaching beyond the confines of the local school environment. By establishing innovative cooperation projects, schools can not only enrich educational experiences but also access valuable resources for their communities.

Partnerships like the European School Innovation Academy (ESIA), coordinated by EA in collaboration with an international consortium, provide teachers and school leaders with the opportunity to take part in international professional development courses alongside colleagues from diverse European or across the world backgrounds. These courses, held in various locations across Europe, allow school heads and teachers from the same school to attend programs tailored to their specific needs. A dedicated session within each course focuses on collaborative project planning, empowering participants to initiate projects and prepare them for submission to ERASMUS+ National Agencies.

This gradual approach also applies to integrating technology into school environments. Rather than overwhelming teachers with too much too soon, schools should implement technology incrementally, considering available time and training resources to avoid resistance. Establishing a progressive plan ensures sustained and effective utilization of technology over time, aligning with long-term educational objectives.

3.4 School Community Team Building

Establishing an extended community of practice serves as a structured framework for nurturing digital transformation, facilitating the sharing of experiences and best practices, and advancing learning objectives. Introducing innovative approaches necessitates fundamental shifts in school culture, going beyond mere changes in isolated practices. Successful change initiatives require flexibility and responsiveness to the specific needs of the school, embedding innovations within the school context and remaining open to external influences.

During this transformative process, school leadership plays a pivotal role in sustaining the digital transformation journey of an entire school, ensuring the effective utilization of digital technologies, and promoting equity in education by offering meaningful opportunities for all students to engage with new technologies. Achieving successful digital change in rural schools necessitates a clear vision and shared leadership to strategically integrate digital technologies into teaching practices. School leaders are instrumental in cultivating an environment conducive to innovation and providing support to teachers in effectively incorporating technology into their pedagogy. Various models of school leadership, including instructional, transformative, distributed leadership, and leadership for learning, offer diverse approaches to drive change and foster innovation within schools.

A designated stakeholder or group, such as teachers, principals, or administrative staff, should take on the responsibility of being cultural champions to spearhead the implementation, training, and support for new

technologies. This individual or team should organize training sessions and act as the main point of contact to provide assistance, encouragement, and motivation to other teachers. As teachers become more involved in the digital transformation process, they often become champions themselves, creating a ripple effect of adoption throughout the school community.

To become centers of innovation, it is crucial for schools to implement reflective practices that capture and harness innovative ideas. Through self-reflection and mentoring, innovators not only influence themselves but also inspire others by channeling their discoveries back into the system for further exploration. Leveraging the outcomes of projects developed within this framework can significantly enhance curriculum and assessment outcomes, teaching practices, and overall organizational effectiveness.

It's important to recognize that innovation entails the capacity of schools to embed and sustain innovative teaching and organizational practices, often requiring fundamental changes in school culture. Continuous reflection and ongoing support for digital innovation and transformation are essential for schools to realize meaningful and sustainable change. Furthermore, digital technologies have the potential to promote inclusion and remove barriers to learning, supporting differentiated and personalized learning for all students, and creating a supportive environment where all students can thrive and develop essential digital skills for success in the digital era.

For digital transformation to be truly transformative, teachers must possess the knowledge and skills necessary to fully leverage project-based activities. Additionally, as digital school innovation introduces new learning experiences, the roles of teachers, trainers, and learners will inevitably evolve. The success of digital change hinges on the capacity of both teachers and leaders. A robust change strategy requires ongoing professional development, feedback, and support for teachers, complemented by a well-established monitoring and evaluation system. Organizational capacity, strategic planning, and quality assurance play pivotal roles throughout the transformation journey. Embracing a mentoring mindset becomes paramount for teachers and schools seeking to explore new horizons.

The readiness, dedication, and proficiency of teachers are crucial determinants in the widespread adoption of digital change and transformation in schools. Offering teacher professional development, training, collaboration opportunities, and learning experiences are essential components in facilitating the implementation of innovative practices. At this juncture, nurturing innovative mindsets among teachers becomes imperative. Whether it's facilitating whole-school transformation or cultivating innovative learning solutions, fostering open and creative environments can foster effective and engaging learning experiences. Maximizing opportunities for teacher interaction can nurture innovative ideas. To achieve this, fostering learning communities, fostering cooperative initiatives, and engaging in shared projects are effective means to enhance teacher competencies and foster the innovation process. To facilitate digital change, it's imperative to support learning and teaching by communicating evidence of learning progress and providing insights to teachers, school leaders, policymakers, parents, and, most importantly, learners themselves.

3.5 Consultation and Support Mechanism

The main goal of Learning from the Extremes was to pave the way for innovation in rural schools by strengthening their organization and promoting inclusion, diversity, accessibility, and equity within the community they serve. It also aimed to embed innovation as a primary driver to transform schools into important learning hubs for their communities. This transformation journey required the active participation of the entire school community, as it cannot be achieved solely by individual change makers. Therefore, a key aspect of the Learning from the Extremes project was the creation of a robust network of users at both national and international levels. This network was supported and maintained by the

community-building team in collaboration with national coordinators and consortium members. The vision of this support mechanism was to establish a strong collaborative network for the Learning from the Extremes project schools, providing necessary guidance, consultation, and support. It also served as a platform for exchanging good practices, initiating joint projects, and fostering a sense of belonging among participants.

The Support Mechanism aimed to assist them in implementing their projects and realizing their vision. This support was facilitated through various tools to help headmasters, educators, and stakeholders reflect on their needs, design a strategy, and become part of a strong network of rural schools, ultimately becoming reference learning hubs for their local communities. Several techniques, tools, and resources were made available to participating schools at both national and international levels. A "Travel Companion for Learning from the Extremes Innovation Journey" served as a guide, offering tips and tricks for utilizing services, tools, content development, resource repositories, and digital tools and resources for an inclusive and diverse transformation journey. The services provided encompassed community-building tools, authoring environments, networking opportunities, and mentoring opportunities.

It was a comprehensive network of cross-created techniques, tools, and resources designed to aggregate support for the successful creation of school projects and activities. It aimed to help headmasters and educators materialize the school's development plan coherently, ensuring that the design aligns with desired outcomes. Tools were available to construct necessary steps toward improving the competence profile of educators and learners, engaging communities as a whole, and tracking school transformation. The creation of national and international user communities was supported by carefully designed networking opportunities, facilitated events, and tools such as the Learning from the Extremes platform. This platform served as a central hub for various services, offering forums, authoring tools, digital resources, and guidance to enhance learning.

The Support Mechanism of Learning from the Extremes was essential for ensuring a user-friendly and seamless implementation of each school's journey towards innovation. The overall workflow followed a structured path, starting with the school's reflection and leading to the development of a transformational development plan. Key aspects of the support mechanism included a strong participatory model and consultation and mentoring, ensuring that stakeholders are actively involved in decision-making and planning. The success of the projects is not the fulfilment of the proposed strategic plan, it is the innovation taking place, the community emerging from the plan and continuous transformation of the school vision.

The Learning from the Extremes Community Portal was developed to facilitate the pilots and a series of best practices of the project, to support the smooth implementation of the open calls, to facilitate the involved authors and provide to them a centralized environment to collaborate and generate new ideas and most importantly to raise awareness and make a part of EU's rural schools visible to the world and to each other. The Learning from the Extremes Community Portal is available on the site: https://www.schoolofthefuture.eu/en/lfe.

Users' engagement with the Community Platform allowed all the actors to identify common collaboration opportunities and actions and directly connect to others with similar needs that are facing similar challenges. Thus, apart from the teachers at the participating rural schools, all users were able to access Platform's content and expand their network through connecting with other schools' stakeholders. This framework of collaboration leveraged new synergies and aimed to maximize the impact generated from the Open Calls of the project. A plethora of tools and functionalities were available to both teachers and National Coordinators to support the schools in this challenging effort.

User engagement with the Community Platform enables all actors to identify common collaboration opportunities and actions and connect directly with others with similar needs facing similar challenges.

Thus, except for teachers at rural schools, all users will be able to access the content of the Platform and expand their network by connecting with other school stakeholders. This collaborative framework exploits new synergies and aims to maximize the impact generated by the project's open calls. A wealth of tools and functionalities are available to both teachers and national coordinators to support schools in this challenging endeavour.

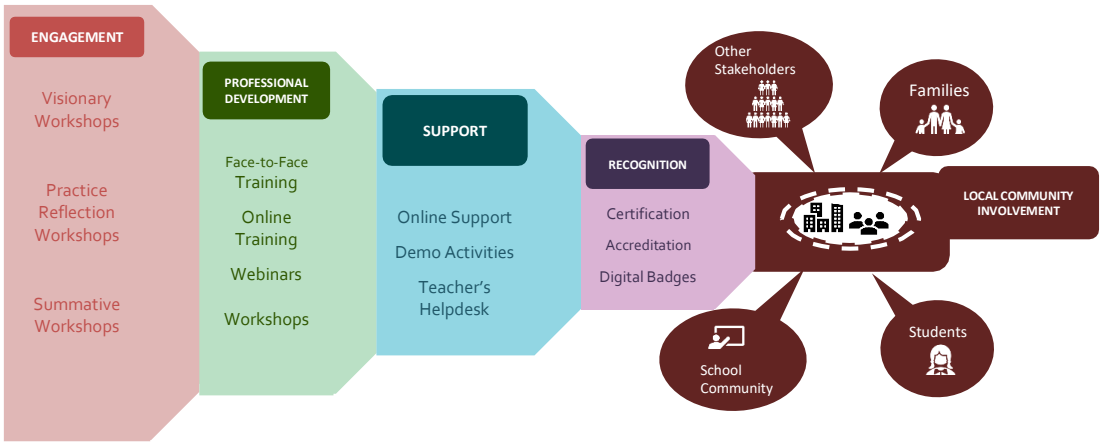

Figure 5: The 5 pillars of community building

The project also aimed to create a community of "change makers," empowered to continue school transformations and support innovation and change sustainably. In order to build a sustainable community of practice in education much more than the provision of training opportunities and certification are necessary. The 5 pillars of community building (Engagement, Professional Development, Support, Recognition, and Local Community Involvement) present a tested strategy for creating a strong and long-lasting community of properly empowered educators. Each of the pillars are subdivided in various actions that together present a strong model for teachers' empowerment.

- **Engagement**: Participants' aspirations are heard, and joint courses of action are established through participatory engagement activities.
- **Professional Development**: Training opportunities are aligned with schools' innovation journeys.
- **Support**: Continuous support ensures that learning from training sessions is implemented effectively in classrooms.
- **Recognition**: Efforts to improve competence profiles are recognized, boosting participants' self-esteem and confidence.
- **Local Community Involvement**: Parents, educators, students, and other stakeholders are involved in designing innovation journeys and evaluating results.

Success in both professional and personal realms often hinges on the effective utilization of knowledge to overcome challenges and drive innovation. Collaborative activities not only equip individuals with essential skills for contemporary citizenship but also recognize that complex societal and business issues are best addressed through collective efforts. This collective approach fosters an appreciation for diverse talents and perspectives, preparing individuals for the challenges of the twenty-first century.

Engaging in group work requires a diverse skill set and knowledge base, and collaboration allows team members to leverage their unique strengths and expertise. Through collaborative learning experiences, individuals gain insights into their own capabilities and areas for growth. Importantly, such collaborative endeavors lead to significant increases in individual knowledge, which is particularly valuable for educators in rural areas where access to resources and professional development opportunities may be limited.

Apart from the set of strategies for digital innovation in rural education that were organised around the following three key thematic areas that are central to the interests and activities of the Learning from the Extremes project: a) Organisation and support for rural schools, b) Equity and excellence in rural schools and, c) Rural schools as community and educational spaces, to facilitate the effective digital transformation of rural schools, exemplary practices on how to increase access to digital educational solutions in rural schools were selected, classified by utilising the same thematic areas, and provided to the participating schools.

Through this structured approach, the inventory aimed to offer practical guidance and inspiration for schools, empowering them to address challenges and enhance their digital education initiatives. Thus, an interactive platform for showcasing successful practices and fostering networking among rural schools was created. Through the inventory, the schools could find actionable solutions tailored to their needs, fostering innovation and collaboration within the Learning from the Extremes community.

Teacher professional development is also crucial for successful educational reform and digital transformation. Access to continuous professional development (CPD) opportunities is key, especially considering the constantly evolving educational landscape. CPD should be tailored to teachers' digital competence levels and school contexts. The European Commission's Digital Competence Framework for Educators (DigCompEdu) provides a shared definition of digital skills for educators. The framework outlines six areas of digital competence and six levels of proficiency. Tools like SELFIE for Teachers help teachers identify their current level of digital competence and invest in further development.

In addition to tailored support from the Learning from the Extremes team, MOOCs offered valuable opportunities for teacher professional development in digital competency and innovation. Platforms like the European Schoolnet Academy and School Education Gateway's Teacher Academy provide free MOOCs covering various topics relevant to digital education and innovative pedagogical approaches. In addition, access to quality digital resources and the ability to create digital content are also essential for enriching teaching practice. National education portals often provide digital resources along with support materials for their incorporation into teaching. Teachers can also utilize online authoring tools to create their own digital content. Platforms like the Go-Lab ecosystem offer a vast collection of online laboratories for STEM education, along with support materials and online training modules. A list of key recommendations for rural schools to effectively exploit professional development opportunities during the Learning from the Extremes project and beyond is as follows:

- Use self-reflection tools to identify specific needs in digital professional growth and seek support through consultation mechanisms.
- Encourage distributed opportunities for professional development and peer learning.
- Select open online courses that provide certification based on evaluation schemes.
- Focus on courses that emphasize student-centered and innovative teaching approaches.

These recommendations aim to empower rural schools to make the most of professional development opportunities and enhance their digital competence and innovation. Students and teachers are central to the digital transformation and innovation in rural schools. No student should be left behind, and all teachers should excel in utilizing digital technologies in their teaching practice. It's essential to explore ways to innovate by embedding professional learning for staff, motivating teachers to increase their digital confidence, and preparing all students to develop necessary digital skills for adapting to rapidly changing societies.

3.6 Local Community Engagement and Support

3.6.1 Rural Schools as Community Innovation Hub

When teachers showcase their use of technology to the community, several benefits arise. Firstly, the school gains visibility as a technology learning hub, thereby enhancing opportunities for additional investment from local businesses or parents' groups. Additionally, enabling students to share their work more widely boosts their motivation to engage in further projects.

3.6.2 Forge Collaborative Ties

Teachers derive valuable inspiration for new projects by observing the initiatives undertaken by other schools. Schools can upload their projects to an online portal such as the one provided by the Learning from the Extremes project, enabling teachers to access and implement these projects in their own educational settings. This platform also facilitates schools in connecting with one another to organize additional collaborations and share resources, thereby fostering the development of informal school networks.

3.6.3 Connection with Local/Regional Stakeholders

To foster successful digital transformation in rural schools, it's essential to engage with local and regional stakeholders. By leveraging stakeholder experiences, rural schools can address inequalities in access to digital education and implement innovative plans for e-maturity. Regular stakeholder meetings and a participatory scenario development approach can facilitate joint action and ongoing consultation. The Learning from the Extremes community platform supported this process by providing tools for community building, consultation, mentoring, and assessment and will continue supporting it to help schools sustain their plans for innovation. To develop opportunities to connect with local/regional stakeholders, schools should:

- Establish intergroup and ingroup interactions among stakeholders to develop and implement innovative practices.
- Participate in regular stakeholder meetings for planning, monitoring, and assessing joint actions.
- Employ a participatory scenario development approach to plan sustainable conditions for digital education.
- Create school networks and invite external stakeholders to contribute innovative technology solutions and good practices.

3.6.4 Opportunities for Community Learning

Rural schools can serve as Learning Hubs for their communities, offering digital solutions for continuous training and education. By acting as Learning Hubs, schools contribute to the digital transformation of economies and societies. The Open Schools for Open Societies (OSOS) initiative provides a model for transforming schools into Innovation Hubs, fostering open school culture and community involvement. Rural schools can become Learning and Innovation Hubs through community building, resource development, and training services. Transforming schools into learning and innovation hubs needs to:

- Procure digital technology solutions for lifelong learning for all members of the rural community.
- Establish horizontal links with local communities for support and collaboration.
- Follow the digital transformation path provided by the Learning from the Extremes project, including needs analysis, vision creation, participation in communities of practice, and transformation into sustainable innovation ecosystems.

The digital transformation of rural schools is crucial for ensuring equitable access to education and preparing students for the digital world. While many rural communities still lag behind in digital education, initiatives like the Learning from the Extremes project aimed to provide support and resources for rural

schools to thrive in the digital era. By engaging with stakeholders, fostering community learning, and following a structured transformation path, rural schools can become centers of innovation and lifelong learning for their communities.

3.7 Reviewing initial development plan

Practice reflection and reviewing the initial development plan aids schools during the implementation phase by recognizing challenges, proposing effective strategies, and revisiting Development Action Plans. Teachers and stakeholders engage in collaborative discussions, sharing project updates, addressing challenges, and supporting each other. Focus areas include teacher professional development, motivation in embracing new technologies, and fostering community engagement as Learning Hubs.

More specifically, the evaluation is based on the following six objectives: **Connect students**, **Develop teachers (Continuous Professional Development, CPD)**, **Save time**, **Access to digital tools**, **More quality teaching**, **Professional support**.

From these objectives, it emerges that measurements should focus on change within the classroom and the school, and among the various stakeholders. Looking inside an organisation like a school unit, several functions and stakeholder layers are identified such as school as an organization, school leader and management level, community level, classroom level, teacher level and student level. The scope of the reflection is to monitor the impact of the school's development plan on their school community, as well as the impact of the consulting and training services and an increase in the performance of the school at different levels. The communities have the opportunity to review and reiterate the lessons learnt during the implementation of innovative ICT solutions and infrastructure, reflect and discuss all together about their experiences, main outcomes, challenges, strategies followed to overcome different issues, suggested good practices etc, involving a variety of stakeholders (e.g., policy makers, researchers, technology providers, students, parents, local authorities) that supported the schools during the implementation phase, to share their views and experiences.

3.8 Sustainability plan

3.8.1 Legacy Planning

Teacher turnover in schools is often observed to have a detrimental effect from year to year. To address this challenge, schools can develop training materials and documentation that can be passed on to new champions, ensuring a continuous and uninterrupted line of support for teachers. This approach helps to mitigate the effects of turnover and maintains consistent support for educators.

3.8.2 Scaling up

Sustainability and extension of the outcomes emerge as a key point of discussion and reflection. Participants can discuss sustainability strategies such as shaping networks of supporters, committing to ongoing professional development, and expanding community engagement. Collaboration within and between schools, nationally and internationally, is also identified as crucial for sustaining and extending project outcomes, whereas active participation in other EU projects and continued engagement with stakeholders are highlighted as sustainability measures. By fostering dialogue, sharing best practices, and addressing challenges collectively, achieving the goals and nurturing rural schools as educational spaces are possible.

The Learning from the Extremes project recognized that fostering a community of educators embracing digital solutions and innovative methodologies requires comprehensive support beyond just providing tools. Thus, the project aimed to empower educators through guidance, support, and training provided

during participatory and training events. Examples of student-centered methodologies, inclusive pedagogical models, and design thinking techniques were integral parts of the opportunities provided to selected pilot sites. Guidelines steered educators toward using methodologies that incorporate digital solutions and tools in their projects. Additionally, a consultation and mentoring scheme assisted schools in adapting chosen methodologies to their specific needs and plans.

National coordinators engaged in demanding consultation processes to support schools in project preparation and implementation, and they were available to all selected schools throughout their projects. Networking efforts naturally led to a mentoring scheme, with innovative schools and educators mentoring others. This mentoring was encouraged during various networking opportunities, fostering collaboration and knowledge sharing. This aimed to facilitate the implementation of selected projects, enriching, and supporting proposed approaches in each pilot site. Guidance and support materials tailored to the needs of selected pilot sites were developed within the framework of the project. These materials aligned with the proposed innovation journeys of schools. Training materials and online support were provided to all participating schools, addressing educators' competence profiles and classroom innovation needs, while participating schools had the opportunity to participate in an international professional development course, facilitating face-to-face training.

4. Different schools, different paths

The Learning from the Extremes Project through its implementation has successfully showcased several strategies to transform challenges into opportunities and introduce innovation into the schools' operations. Following the scenario of disruptive innovation in informal learning, one of the four scenarios for schooling introduced by OECD (2020)[2], that makes learning available without a school structure, classroom, teacher, timetable, or exam, and aims to transform school and not to just sustain innovation, Learning from the Extremes Project tried to demonstrate how, through the effective use of technology and the necessary guidance and support, it can **improve** schools by enhancing facilities, teachers, and leadership; **supplement** schools by collaborating with families and communities; **reinvent** schools to serve as educational hubs that support their communities; and **transform** learning by making it accessible in fundamentally new ways. Four cases of exemplary Learning from the Extremes Rural Schools that represent each of the above paradigms follow.

The aim of the large-scale implementation was to identify – in quite short time – such school environments that could act as reference points for other rural schools and for future actions in the field at policy level.

4.1 The Case of Improving Sîntămăria Orlea Middle School (Romania)

Sîntămăria Orlea Middle School was involved in the cycle and improved its openness and e- maturity scores by 13,5% in less than one academic year. The school created a SmartLab, a laboratory equipped with laptops, a seismograph and educational kits. Over the course of the school year, the students, as well as the teachers, had the opportunity to participate in a series of webinars organized by experts and enrich their knowledge on topics such as geology, geography and seismology. The school also organized a summer camp, in which several activities were STEM-based. In these activities, the students of the SmartLab took the role of teachers, showing their younger colleagues how to use a 3D printer. Over the course of the project, the school collaborated with a series of local as well as national partners. Among those were educational partners such as the Tara Hategului UNESCO International Geopark, a local authority in charge of the Geopark administration, the RoEduSeis Network, a national network of schools of which the main goal is to train teachers and students in analysis and interpretation of seismological data, and INCDFP, also known as the National Institute of Research and Development for Earth Physics. Each of the partners offered support during the duration of our project.

4.2 The Case of Supplementing Joutsan lukio (Finland)

Joutsa is a municipality located in the province of Western Finland and part of the Central Finland region. Joutsa has the population of almost 4500, and is located about 70 km from Jyväskylä, the nearest urban centre. Joutsa high school is an educational institution that operates in Joutsa, and provides education to 64 high school students. The schools developed an innovative project with 3D printers in collaboration with the nearest University (Jyvaskyla). Due to difficulties in purchasing the wifi access points with the budgeted amount, the school was financially supported by the Joutsa Municipality to modernize the wireless network of the whole school centre (school centre include both high school and primary school). The local community has supported the

[2] Back to the Future of Education: Four OECD Scenarios for Schooling, OECD Publishing, Paris. Source: OECD (2020)

operation of the new infrastructure by providing experience and support to teachers and students. A 3D-printing lab was developed and supported by local stakeholders (parents and municipality staff) and it is currently running and expending its activity. The lab is also in operation after school hours to provide training to the local community members and to students who are interested to develop more advanced projects and initiatives.

4.3 The Case of Reinventing IC Druento - Scuola Primaria Gianni Rodari (Italy) as an innovation hub for the local community and other schools

In IC Druento - Scuola Primaria Gianni Rodari, the school technology project aimed to revitalize the school, transforming it into educational hub that benefit the entire community. Through strategic technological interventions, the school has been transformed into a centre of learning, fostering both academic and community development. The implementation of modern technologies has enhanced educational resources, enabling students to access a broader curriculum. Additionally, the school now serves as community hub, offering adult education programmes and vocational training, thereby contributing to the overall skill development of the local population. The school project “Together more” actively engaged diverse members of local community, including the local authorities, mountainous communities, families in the municipality of San Gillio, and neighbouring municipalities. They benefited from the workshops initiated to extend school hours, fostering collaborative and inclusive involvement. Parents, local authorities, associations, NGOs, and cultural and scientific organizations participated in various capacities. Local authorities made resources and spaces available, supporting the logistical aspects of the project implementation. NGOs contributed with additional funding, enriching the available resources. Parents and associations participated through prescribed roles, providing valuable feedback and support during activities. Cultural and scientific organizations pursued their own research and innovation agendas, integrating their expertise to enrich the project's scope. Moreover, the collaboration addressed specific community issues, expanding the positive impact of the project on the entire local context and fostering an educating and collaborative community. The San Gillio school has become an educational and training hub accessed by schools, teachers, pupils from other territories and anyone who felt like trying out new technologies in a school context in an open lab led by students and teachers. A place for discussion, deepening knowledge and sharing.

4.4 The Case of Transforming learning at Kampos Primary School (Cyprus)

The Kampos Primary School is a multigrade school as it has one teacher and four students. They have designed and implemented a unique informal learning experience, the “Digital guided tour in a mountain village: Kampos Tsakistras”. Students had various discussions related their local community and they identified the issue that there isn't any digital or printed media gathering information about the history, architecture, customs, traditions, and the rich natural environment of their region. They decided to tackle this challenge by creating digital content that allows every visitor or resident to explore the most significant cultural, historical, and natural points of interest in the village of Kampos by scanning a Quick Response (QR) code. The students undertook comprehensive research about their village, including its history, customs, traditions, and notable landmarks, drawing information from various sources. They conducted interviews with grandparents, parents, and community members to enrich their content. They gathered old photographs and embarked on a village walk to capture and document points of interest. They studied written texts

and digital materials sourced from websites, encyclopedias, and electronic newspapers. Following the collection of this diverse material, the students collaborated to determine the content for their digital book. Subsequently, using the Book Creator application, each student contributed by creating individual pages about specific points of interest within the village. This shared file enabled collective work on individual pages, allowing students to incorporate collected photos or videos. After a collaborative review process and necessary amendments, they published their digital book. To facilitate sharing, they generated a QR code for the entire digital guide to the village. Moreover, they created individual QR codes for each page of the digital book, which they placed at corresponding points of interest throughout the village.

5. The Rural School Innovation Academy

The Learning from the Extremes project outlines concrete outcomes aimed at fostering innovation and change in European schools, thereby strengthening the education landscape to align with the real needs of Education and Training. Foremost among these outcomes is the **School Innovation Academy**, an integrated mentoring service accompanied by guidelines and recommendations for establishing a school innovation support service. This initiative is poised to drive change in rural school settings across all levels, facilitating the envisioning, management, and monitoring of change and innovation within schools. The School Innovation Academy empowers school leaders and teachers to innovate in a manner that is tailored to the specific needs of their school. It introduces new approaches for leveraging technology to inspire, engage, and interconnect innovative practices within schools. By offering a dedicated framework for transforming schools into innovation ecosystems, it guides schools in evolving as organizations, transform the way all school members envision innovation and change and, finally, transform schooling.

Through the initiatives of the School Innovation Academy, schools will collaborate in co-designing, co-creating, and utilizing digital content, tools, and services for personalized learning and teaching in an open, more effective, and efficient manner. This transformation positions schools as incubators and accelerators of innovation, fostering an environment conducive to continuous growth and advancement.

Based on the experience gained from the implementation of Learning from the Extremes project and other related initiatives, schools may consider the following strategies and actions to be taken for any future actions to generate detailed feedback for school leadership and other stakeholders. Learning analytics are employed to capture, analyze, and utilize comprehensive educational data across the entire organization. This enables school leaders to monitor and partially influence the development of their school to better address the needs of students, teachers, parents, and external policy mandates. These are:

- **Evidence-Based Practice Led by Analytics**: Researchers should gather more evidence from the use of learning analytics to develop systems that positively impact learning. This allows policymakers to develop policies focusing on leadership, professional learning, enabling mechanisms, and data governance with greater confidence. Utilizing school data related to openness and e-maturity can serve as a reference point for actions related to overall school development.
- **Promote Adoption of School Analytics**: A readiness for cultural change sets the stage for acceptance and adoption of school analytics, guiding the development of standards, principles, and procedures by policymakers. Engaging impacted communities in the continual process of adapting and improving organizational responses to change is crucial. The Learning from the Extremes approach can contribute to this aspect by providing a proof-of-concept experiment showcasing the unique potential of school analytics.
- **Inform and Guide Data Services Providers and Users**: Trustworthy and ethical learning analytics practices are supported by policy mechanisms such as standards, accreditation processes, audits, and evidence-based recommendations informed by practice. Researchers play a critical role in promoting sustainability and scalability of policy and practice, ensuring effective embedding of analytics and provision of just-in-time data services supporting good decision-making focused on learning. Balancing investment in data services and users supports both the supply and demand sides of the flow of information, accelerating adoption and positive change.
- **Impact Learning via Analytics Tools**: The primary focus of learning analytics should be optimizing learning to achieve a more equitable and effective educational system, with secondary considerations for accountability, testing, organizational change, or financial efficiency. All stakeholders, including practitioners, researchers, and policymakers, require increased levels of data literacy to effectively utilize this new tool and leverage the insights revealed by learning analytics.

The Learning from the Extremes project offers a robust response to challenges associated with implementing innovation in rural school settings. Through its mentoring mechanism, the project facilitated systematic

innovation by engaging the entire school community. The overarching goal was to describe and implement a process that transforms schools into innovative ecosystems, where school leaders, teachers, students, and the local community collectively share responsibility and authority, benefiting from increased science capital and the development of responsible citizenship. The sustainability strategy of the project focuses on three key areas: a. providing tools, resources, and professional training opportunities for schools to initiate, incubate, and accelerate their innovation process; b. engaging with professional networks and policy directives to influence policy recommendations and inspire evidence-based practices; and c. developing self-reflection tools to map different aspects of schools' operation and organization, correlating data to demonstrate the impact of the self-reflection process.

The **School Innovation Academy** aims to provide a range of teacher courses aligned with specific pedagogical principles drawn from effective teacher CPD literature, particularly in the context of rural education, school organization, digitization, and openness. To guide the future development of the Academy and its courses based on the findings and pilots from the Learning from the Extremes project, it's beneficial to analyze them through the six following pedagogical lenses. Relative to these pedagogical principles, recommendations are made and they are as follows:

- **Facilitating Peer Exchange**: Sustained engagement and interactive experiences are crucial for effective teacher CPD. However, language barriers and technical limitations may hinder peer exchange. Enhancing access to peer-exchange activities during and after courses are essential. This could involve translation services and exploring alternative methods for peer interaction beyond current tools. Additionally, facilitating post-course engagement through platforms like eTwinning or dedicated websites can foster ongoing communication and resource sharing among participants.
- **Community Building**: Despite the importance of community building, large participant numbers can pose challenges. To improve this, consider alternative approaches such as online meeting platforms with breakout rooms and early engagement in collaborative activities. Encouraging participants to connect based on shared interests can also enhance community cohesion.
- **Peer Review**: While peer reviews are valuable, they may lack depth and consistency. Providing clearer guidelines and oversight can encourage more constructive feedback. Additionally, allowing direct communication between participants and reviewers can enhance the review process.
- **Content as Trigger**: While participants appreciate the course content, offering additional resources like academic articles can enrich learning without deviating from the principle of using content as a trigger for reflection and exchange.
- **Flexibility**: Consideration should be given to adjusting course duration and activity timing to accommodate varying participant preferences. Allowing flexibility in modifying submitted work and offering modular certifications could enhance participant satisfaction.
- **Facilitating Transfer to Practice:** Collaborative work on scenarios and lesson plans can improve the quality of course outputs and facilitate knowledge transfer to practice. Allowing participants to select collaborators with similar backgrounds or subject areas can enhance collaboration effectiveness.

The six pedagogical principles underpinning the School Innovation Academy courses demonstrate effectiveness. The recommendations provided offer ways to further support and improve each principle.

The project acknowledges that while innovation presents opportunities, it also carries the risk of widening achievement gaps if not widely disseminated. It emphasizes the importance of ensuring that innovation benefits all stakeholders, particularly in the wake of the COVID-19 pandemic, which has accelerated the adoption of innovative educational practices. As society transitions from this challenging period, it's crucial to reflect on lessons learned and strive for practices that promote overall progress rather than temporary solutions. This era presents an opportunity to reimagine the future of education with creativity and innovation at its core. The findings from the Learning from the Extremes pilots underscore the significant value of School Innovation Academy courses for participants, with many educators expressing their engagement in multiple courses. Furthermore, there is clear evidence of a substantial impact on teachers'

practices within classrooms, schools, and beyond, as well as on their professional identities. However, challenges with the courses have been identified within the project framework. Insights from interviews with teachers offer valuable perspectives on the strengths of the courses and areas for improvement, shedding light on how their learning experiences influence their daily roles as educators. Through constructive critique, they offer valuable suggestions for enhancing the course experience and its effectiveness for teachers.

The outcomes of Learning from the Extremes are consonant with the priorities of European Union (EU) such as the advancement of a robust digital education ecosystem to equip citizens with essential competences and skills for the digital era. Recognizing the pivotal role of digital proficiency in employment, societal engagement, and learning, particularly underscored by the COVID-19 pandemic, the EU aims to address existing skill gaps and promote inclusivity. Through the Learning from the Extremes project, it is affirmed that the proposed Council recommendation on blended learning is of high significance, since it fosters high-quality, integrates diverse learning approaches, offers flexibility and inclusivity, caters diverse learners' needs, including those in remote areas or with disabilities. Following the priorities of European Education Area and Digital Education Action Plan (2021-2027) of nurturing a robust digital education ecosystem and enhancing digital skills and competences, the Learning from the Extremes project aimed to reduce the digital divide between rural and urban schools by supporting learners in remote areas, providing them digital infrastructure, enhancing their digital competences, fostering partnerships, prioritizing their well-being, and utilizing EU funds effectively. Learning from the Extremes tried to provide for schools in remote areas that have no or limited access to educational resources, the opportunity to transform, innovate and become learning hubs not only for other schools but also for the local communities. Through such coordinated efforts and in alignment with EU educational policies, it is evident that the disparities in digital skills across member states will be eliminated, providing an equal, inclusive and evolving digital landscape and endeavouring to transform education and training systems to meet the demands of the digital age.

6. Conclusion

Disparities between rural and urban schools are evident, with rural schools often facing greater limitations due to fewer resources and support systems. The pandemic has starkly highlighted the pre-existing challenges faced by schools, particularly those in rural areas regarding digital readiness such as resource limitations, connectivity issues, and higher turnover rates among young teachers, which exacerbated the digital divide between rural and urban areas and underscored the importance of resource availability for technology adoption, and the critical role of adaptive capacity in responding to educational challenges.

As Europe navigates the digital transition in education, confronting the challenges of the COVID-19 era head-on, the imperative of equitable access to quality education has never been clearer. By prioritizing investment in digital infrastructure, teacher training, and collaborative policymaking, European nations can chart a path towards a more resilient and inclusive educational future. Through concerted efforts and strategic interventions, the vision of a digitally enabled, equitable education system for all learners can become a tangible reality. The European Commission's proposed measures, such as supporting blended learning and enhancing digital competences, highlight a commitment to addressing these challenges at a policy level.

The project serves as a pivotal cornerstone for fostering innovation and digital transformation within European schools, particularly in rural areas. By addressing the unique challenges faced by these schools and empowering stakeholders with the necessary tools and resources, the project laid the foundation for a more inclusive and technologically enriched educational landscape across Europe. The project aimed to empower rural schools to overcome the digital divide and become centers of excellence in digital education, ultimately improving educational outcomes for students in remote areas. Through its comprehensive approach encompassing needs analysis, action plans, scalable implementation strategies, and a strong focus on community and collaboration, the project offers a blueprint for schools to navigate the complexities of digital innovation. These actions contribute to the sustainability of digital innovation in schools by fostering a culture of continuous improvement and collaboration. Through strategic planning, leadership support, and community engagement, schools can navigate challenges and leverage opportunities to drive meaningful change in education. The key recommendations laid out—ranging from initial vision setting and needs analysis to the establishment of a culture of innovation and legacy planning— offer valuable insights into fostering innovation and change within educational institutions and underscore the multifaceted process of integrating technology into education in a manner that is both sustainable and impactful.

The establishment of the School Innovation Academy stands out as a significant milestone in this journey, offering targeted support and resources to facilitate the adoption of innovative practices. By emphasizing the importance of community building, peer exchange, and the effective transfer of knowledge to practice, the Academy plays a crucial role in empowering educators to lead change. The insights gained from the Learning from the Extremes project highlight the potential for digital innovation to transform educational experiences, making schools more adaptable, inclusive, and effective in meeting the diverse needs of students.

Moving forward, the lessons learned from the project, and the School Innovation Academy underscore the importance of embracing a holistic approach to innovation. It is imperative to continue investing in digital infrastructure, providing targeted support to rural schools, and fostering a culture of innovation and inclusivity in education. The cultivation of an ecosystem where educators, students, and the wider community collaborate to reimagine the future of education is very crucial. By continuing to foster these collaborative networks, support evidence-based practices, and prioritize the scalability and sustainability of innovation, schools can ensure that they remain at the forefront of educational excellence and societal progress. In doing so, we can collectively work towards narrowing achievement gaps and building a more equitable and dynamic educational landscape for all stakeholders, navigating the post-pandemic world with resilience and creativity. In essence, the Learning from the Extremes project serves as a testament to the EU's commitment to fostering a digitally competent and inclusive society, where every individual has the opportunity to thrive in the digital era.