

**Accelerating Digital Innovation in Schools  
through Regional Innovation Hubs  
and a Whole-School Mentoring Model**

**WP1/ D1.2**

**DIGITAL INNOVATION PRACTICES IN  
PARTICIPATING SCHOOLS**

**WP1 Leader: University of Bergen**



**I-HUB4SCHOOLS**





**iHub4Schools - Accelerating Digital Innovation in Schools through Regional Innovation Hubs and a Whole-School Mentoring Model**

**D1.2 Digital innovation practices in participating schools, M18**

<b>Project Acronym</b>	iHub4Schools
<b>Project Full Title</b>	Accelerating Digital Innovation in Schools through Regional Innovation Hubs and a Whole-School Mentoring Model
<b>Project Number</b>	Grant Agreement:101004676
<b>Type of Action</b>	Coordination and support action (CSA)
<b>Topic</b>	DT-TRANSFORMATIONS-21-2020
<b>Project Coordinator</b>	Tallinn University (TLU)
<b>Project start date / duration</b>	01.01.2021/30 months
<b>WP/ Result</b>	WP1 / D1.2
<b>Title</b>	Digital innovation practices in participating schools
<b>Result Type</b>	Report
<b>Lead partner</b>	UiB
<b>Due date</b>	M18
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<b>Dissemination level</b>	Public



## Executive summary

D1.2 gives an overview of digital innovation practices of the participating schools in Estonia, Finland, Georgia, Lithuania, and Norway. The deliverable describes how stakeholders from the schools and municipalities, characterise innovative digital schools and the process of developing and changing scaling-up advanced ICT-based teaching practices.

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## 1. Introduction

This deliverable reports from interviews conducted in five countries with teachers, school leaders, and representatives from the school municipality. The aim was to identify and analyse the digital innovation practices currently in place in the participating schools. This includes understanding characteristics of digital innovative schools and support mechanisms for digital innovation practices. In addition to looking at digital practices currently in place in the participating schools, we also investigated how the schools started and kept working to support these processes. The identification of digital innovation practices can help us learn how to support schools and teachers in sustainable evidence-informed implementation of digital innovation. The report from different stakeholders involved in scaling-up advanced ICT-based teaching practices, through interviews with representatives from the municipalities, school leaders and teachers (Figure 1). The two main questions were 1) what characterises innovative digital schools, and 2) how do school leaders and teachers perceive the change to become a digital innovative school?

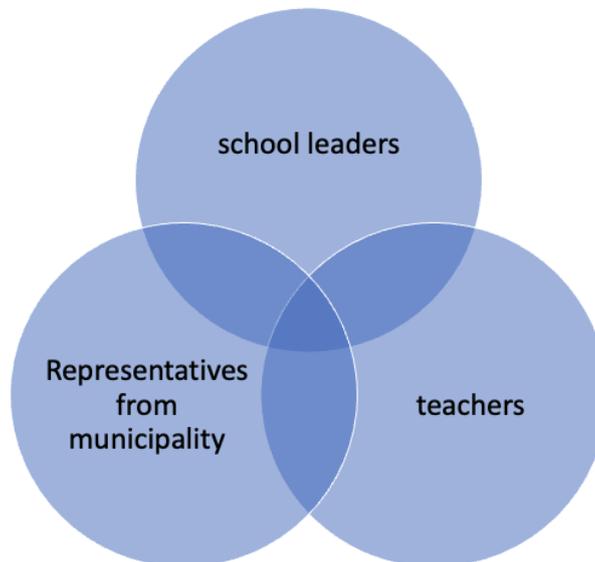


Figure 1. Stakeholders participating in scaling-up advanced ICT-based teaching practices

It should be mentioned that other stakeholders, such as the IT-department, the ed-tech sector, and politicians, are also an important part of scaling-up digital pedagogical practices, hence the



interviewed stakeholders add to an understanding of this process, and the interviews do not provide an exhaustive answer to understanding innovative digital schools as a phenomenon.

The report focuses on the role of the teacher and the leader to support innovative technology-enhanced educational practices and teachers' knowledge of meaningful pedagogical strategies in technology-rich learning scenarios. As we learned from D.1.1, there has been a lot of incentives and investments in the school system to strengthen professional digital competence and usage for teachers. Still, this does not seem to be enough to make a widespread educational change and the needed transformation for the majority of schools and teachers. Hence, it is important to learn more about how partner schools characterise innovative and advanced digital schools, and the processes to enhance digital practices.

Change processes in schools are influenced by many factors that also involve many different roles and stakeholders. Digital technology is one of the processes of change that most professions have encountered, and the benefits and challenges it brings. Many of us know how digital technology affects and changes our conditions as employees and citizens. We therefore also know that these processes affect our role as employees and citizens. Digital technology changes the prerequisites for work tasks and work processes. In our professional role as workers, we must gain new knowledge about use and possibilities. At the same time, we also know that there are new challenges such as: is the technology meeting our expectations, is the infrastructure meeting the required standards, and further challenges are a need to involve people who we did not previously had to involve in our work routines. All of these aspects are also encountered by teachers, in their classrooms as users of new technology. Investigating how partners in the different countries describe their understanding, can help us understand innovative digital schools better. How did schools make changes to become users of digital tools, and what mechanism do bureaucrats, school leaders and teachers, perceive as important to make such a change, and what can we learn from them? In the report, we will try to answer the questions from each country, before we conclude.



## 2. Method

To understand current digital innovation practices in schools we decided to interview different stakeholders in relation to the participating schools. The interviews were conducted during December 2021 and Mars 2022. They lasted approximately one hour, and some of them were individual interviews and some group interviews (Table 1). In addition, we used teachers' written evaluations from a workshop (Finland). For the analysis of the interview we have used Systematic text condensation (STC) (Malterud, 2012).

Table 1: List of interviews in the different countries

Partner	Country	School level	Group/Role	#	Type
UiB	Norway	Municipality	Representative for school owner/municipality (bureaucratic level)	1	Single interview
UiB	Norway	Primary school	Leader team: Rector	1	Single interview
UiB	Norway	Primary school	Teachers	2	Group interview
UH	Finland	Primary school	Principal	1	Single interview
UH	Finland	Primary school	Principal	1	Single interview
UH	Finland	Primary school & Municipality	Teacher and ICT advisor in the municipality education sector	1	Single interview
UH	Finland	Primary school	All teachers from two schools	30	Written evaluation of the schools' digital practices in teams (workshop)
TLU	Estonia	General School	Leader team	2	Group interview
TLU	Estonia	General School	Teachers	3-4	Group interview
TLU	Estonia	General School	Leader team	2	Group interview
TLU	Estonia	General School	Teachers	3-4	Group interview
VU	Lithuania	Progymnasium	Teachers (primary school)	2	Group interview
VU	Lithuania	Progymnasium	Principal	1	Single interview
VU	Lithuania	Primary school	Vice principal	1	Single interview
VU	Lithuania	Primary school	Teacher	1	Single interview
VU	Lithuania	Progymnasium	Principal, two vice principals	3	Group interview
VU	Lithuania	Progymnasium	Teachers (2- primary school, 1 - English, 1 - IT)	4	Group interview
VU	Lithuania	Gymnasium	Teachers (1 primary school, 1- English,	2	Group interview



			career education)		
VU	Lithuania	Gymnasium	Principal & vice-principal	2	Group interview
VU	Lithuania	Primary school	Teachers (2 - primary education, 1 - English)	3	Group interview
VU	Lithuania	Primary school	Principal	1	Single interview
VU	Lithuania	Progymnasium	Teachers (4- primary education, 1- English, 1 - IT)	6	Group interview
VU	Lithuania	Progymnasium	Principal & vice principal	2	Group interview
VU	Lithuania	Gymnasium	Vice-principal	1	Group interview
VU	Lithuania	Gymnasium	Teachers (1 primary education, 1 - IT teacher)	2	Group interview
VU	Lithuania	Progymnasium	Principal & vice-principals	3	Group interview
VU	Lithuania	Progymnasium	Teachers (3 - primary school, 1- mathematics; 1 - IT)	5	Group interview
BSU	Georgia	Public schools of Ajara region of Georgia	Principles	2	Individual interview
BSU	Georgia	Public schools of Ajara region of Georgia	Teachers	10	Group interview

The interviews were transcribed and analysed to identify themes related to the research focus. The researcher (Wasson et al., 2021) identified meaning units, coding them to the identified themes (Table2). The meaning units were put together as a condensate as the starting point for the analytical text and the presentation of the results.



Table 2: Coding scheme

Themes	Codes
Description of digitally advanced school	Sharing culture and collaboration Transparency Examples of practice Teacher perspective School owner perspective School leader perspective
Description of digital innovative school	Appropriateness Teacher perspective School owner perspective School leader perspective
Description of the change	Change strategies Evaluation The relationship between the roles The role of business The role of the teacher The role of management School leader roles Collaboration with other schools Political guidelines
Description of the organization	Cooperation and process
Description of management	Creativity Management strategy Leadership qualities
About technology use	Examples of technology use Infrastructure and coverage Creativity Support for the college Thoughts on the use of technology

Further specific descriptions of the method are described in each of the national chapters.

### 3. Presentation of Estonia, Finland, Georgia, Lithuania, and Norway

In the following, we present the national findings.



### **3.1 Estonia**

Estonia is well-known for high PISA scores, innovative teaching and learning practices and an autonomous school leadership approach. In addition to the previous, the Estonian government has strongly focused on technological advancements and innovation in schools and among educators by supporting infrastructure updates and training activities. This means that Estonian schools, leadership, and educators have quite clear opportunities for innovating the way teaching and learning is carried out or how to share and scale the innovation between schools and teachers in a wider sense. The following description gives an overview of two schools in Estonia where one school is considered as a highly innovative school, meaning that they have the necessary infrastructure, teacher training and support systems. The other school is considered as an average school that has recently participated in a school mentoring training program with the focus on educational technology.

#### **3.1.1 Characterising innovative digital schools in Estonia**

Based on the participants' statements and experiences an innovative school is driven by the collaboration between teachers, educational technologist, and school leader. This largely comes down to the school leaders' leadership, change management and decision-making skills, as represented in Figure 2. which describes the participants' statements on the basis of innovation from individual to school level. The school level consists of the commonalities of the participant replies. The main school level characteristics include:

- Alignment with and common understanding of the schools' goals and aims
- Work and additional training practices within the school
- Infrastructure allowances
- Physical space allowances
- Collaboration between the teachers and leadership

All participants agreed that an innovative school is built on collaboration and the goals, aims and vision of the school. They also added that it is important to be clear on the inhouse and additional training possibilities for teachers, educational technologist, and school leader, stating that there needs to be a whole-school approach to innovative approaches.



A school cannot be innovative if only one singular person focuses on innovative approaches and additional training. It is a team effort where each school family member has a specific, important role. (Educational Technologist)

One of the key aspects of an innovative school is also the technological infrastructure, physical space, and allowances. Mainly teachers and educational technologists felt that the physical environment has to enforce and encourage the use of technology and innovative teaching methods like outdoor, collaborative learning or flipped classrooms. It was considered self-evident that digital competence is an important aspect in applying technology to enhance teaching practices. As expected, there were also some teachers who stated that digital competence and the use of technology is not a priority because of the heavy course content load. Educational technologist and school leader considered rather a gap in digital competence or teaching load, rather than the course content.

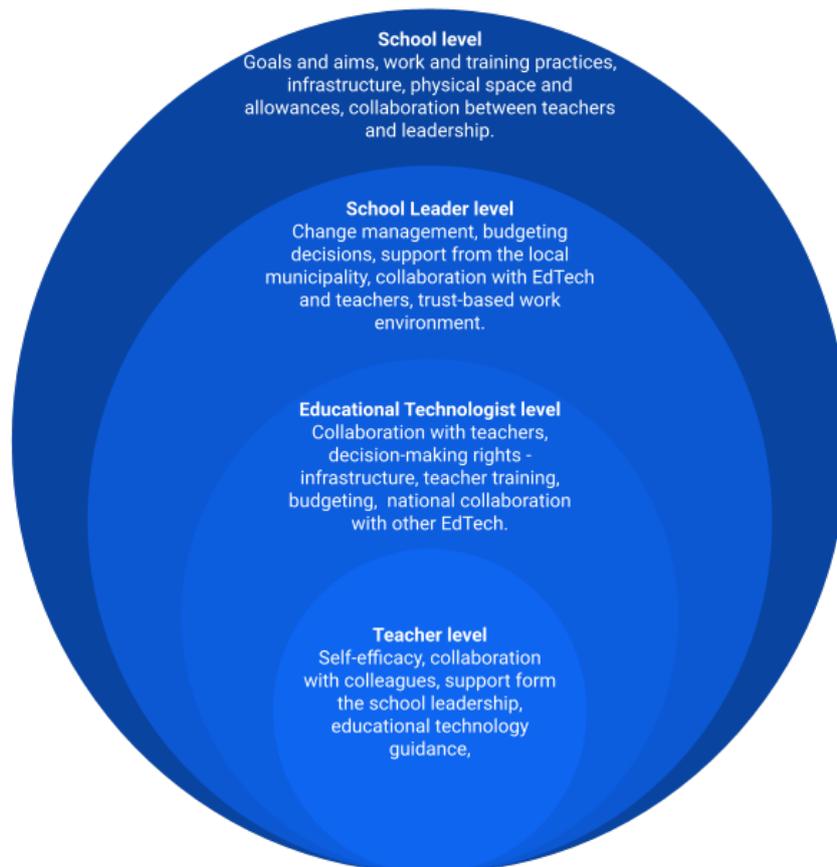


Figure 2. Stakeholder needs and perspectives for an innovative school



## **School leader level**

All school leaders agreed that there needs to be a clear leadership vision for the school which takes into account all the stakeholders within the school. The stated school leader level aspects that affect the innovative school were as follows:

- Change management - clear leadership standards and practices
- Budgeting decisions
- Support from the local management
- Collaboration between the teachers and educational technologist
- Trust-based working relationships and environment

They also stated that a school can rarely be regarded as innovative if the school leader is not ready for the shift towards innovative teaching and learning practices or the use of technologies.

The school can only be innovative if the leadership is supportive. Change and thus, innovation often starts from the change in thinking and in Estonian schools this mostly starts with the school head who holds the budgeting - training and buying technologies, power. (School leader)

As change management was mentioned by all stakeholders, it was quite clear that not only the leadership skills are crucial but also the characteristics of the school leader. The interviewed school leaders believed that there needs to be a trust-based working relationship and environment as the expertise is divided between teachers, educational technologist, and school head. Although the budgeting decisions are mainly done by the school leader, they felt that the discussion should be inclusive and transparent.

I have no use in updating the infrastructure based on what technologies I feel are interesting or usable in the classroom. The input needs to come from the teachers and educational technologist. They have to build the working environment and the least I can do is support with the available budget and processes. (School leader)



The school leaders were also clear that there are some teachers who are not ready to implement technology in their teaching and that those teachers need extra support from the educational technologist. For the interviewed school leadership, it was evident that the Estonian schools' biggest strength in applying technology and innovative teaching practices comes from the educational technologists. Educational technologist acts as a driver of technology-based innovation by supporting, guiding, and motivating the teachers in technology integration. At the same time, they felt that there are some teachers who feel that educational technologist will carry out the technology part while they can focus on teaching the subject. The school leaders considered that at a management level, one mistake was that the role of the educational technologist is not clear.

The school leaders also stated that support from the local municipality is important but not crucial. In both cases it was brought out that the local municipality helps to understand the local school's strengths and weaknesses which could help to plan teacher training and sharing of good practices between schools. However, the highly innovative school leaders stated that if the local municipality is passive, it doesn't stop the teachers and educational technologist to communicate with the neighbouring schools but rather that the innovative approaches stay at school-level and do not scale up because they are not shared to the wider public.

Finally, the school leaders stated that teachers need training to implement technologies, and the school leader also needs training to facilitate the innovative practices and to understand the wider context either locally (county based) or nationally (country based).

### **Educational technologist level**

The educational technologist is considered as a middle-level management team member in Estonian schools, meaning that they are often not regular teachers, take part in management discussions and meetings but lack the ability to make decisions, including budgeting. Main educational technology level aspects:

- Teacher-led collaboration with teachers
- Lack decision-making possibilities and responsibilities regarding infrastructure, teachers training and budgeting



- National collaboration and sharing of best practices with other educational technologists

Educational technologists were clear that innovation within a school happens in collaboration between all stakeholders but stressed that the use of technology needs to be driven by the teachers rather than the educational technologist or school leader.

I have realised that forcing teachers to use technology does not scale well. They will use the technology for the sake of the tool rather than thinking about how it could enhance the learning experience. That's the reason why I no longer force teachers to use technology but rather regularly introduce new solutions with subject based examples and the decision is left to them. (Educational technologist)

They were also clear that in order to update the infrastructure and keep up with the technology trends it is important that the school management includes them in decision making processes or that they have a clear budget allocated to support their activities. Finally, they stated that sharing good practices and collaborating with other educational technologists is really important as it allows them to reflect on issues or scale the innovation between schools. One example they stated was including the students in supporting the teachers in using technologies which was first implemented in a large, highly innovative city school and has now been implemented in smaller schools in Estonia.

### **Teacher level**

The teachers viewed the innovative school as teacher centric, stating that the school is only as innovative as the teachers working in it. Teacher level aspects supporting the innovative school:

- Self-efficacy
- Collaboration with colleagues
- Support from the school leadership - training opportunities, infrastructure, pedagogical support where needed
- Educational technology related guidance and support

They considered that as the teachers in Estonia are autonomous and left to make teaching decisions themselves, self-efficacy is important, meaning that any additional training,



pedagogical material etc. should mainly be acquired by themselves. Simultaneously, they stated that there is some inhouse training and a good collaboration with the educational technologist but that collaboration between other teachers is lacking. Still, it was considered important to facilitate innovative approaches.

All teachers agreed that a strong supportive leadership is important, stating that if the school head is unaware and ready to adopt change it is really difficult for the teachers to do something. Teachers expect that in order to be considered innovative they should have access to additional training, updated infrastructure and pedagogical support while using technologies.

If the school head doesn't believe in technology or change then there is nothing much for me to do. I can experiment in my own class or with a few colleagues but no major changes. (Teacher)

Finally, the teachers stated that the educational technologist has an irreplaceable role in technology enhanced teaching activities as they guide the majority of the activities, keep up to date with the trends and have a clear view on how to implement technology in different subjects. At the same time teachers felt that one educational technologist can rarely cover the entire teaching-staff needs, but believed that it forces them to learn more about technologies and collaborate with other colleagues to build a collective knowledge base.

### **3.1.2 Perceptions of changing a school to become digitally innovative.**

One of the interviewed school teams is considered as the digital innovation forerunners where they have been focusing on updating their infrastructure, training teachers, and actively making school level changes to facilitate their innovative teaching and learning practices. Both school leaders and educational technologist believed that a lot of change towards a more innovative approach starts when the school leader is ready to support and guide the changes but also when the teachers are given the responsibility of providing high quality education including the use of technology to support students' digital competence.

The school leaders stated that in order to build a good school culture it is important to include all stakeholders, including the local municipality in the discussion to understand the weaknesses and strengths but also needs and possibilities.



The educational technologist stated that there needs to be a repository of quality digital learning resources which would ease the teachers in using innovative solutions. They also stressed the importance of technologically well-equipped schools, regular training for teachers or the whole school team and finally the collaboration and transparency of all activities.

The teachers in the high innovative school believed that innovation can only happen if the teachers understand what is considered innovation in their own field. They also did not expect the educational technologist to fully give them ready-made solutions but rather focus on the aspects that the teachers might have missed. Digital competence was considered crucial in using technology in a classroom, but teachers also feared that it might take away from the thought subject.

The school team who is just starting the process of becoming an innovative school stated that the first step is to join a whole-school training programme and secondly to find good examples and experiences. The school leaders and teachers stated that the whole-school training allowed them to really focus on the school's vision, aims and goals and to collaboratively map out the characteristics of their school and an innovative school so they could understand the building blocks.

For the school leaders and educational technologist, it was important that the teachers took initiative and responsibility in innovating their teaching practices, collaborating with colleagues but also voicing their needs towards the management level.

The teachers felt that the change starts when the school leaders have a clear vision and systematically supports the teacher whether it be via training activities, infrastructure updates or including them in decision making processes such as physical space and pedagogical resource (including digital resources) updates. The teachers also believed that there should be central support from either the local municipality or government to really grow as a prominently innovative school.

The main takeaways towards a digitally innovative school include based on all the participants replies:

- Clear vision, goal and aims
- Making school level changes to facilitate the teachers
- Regular infrastructure updates



- Systematic teacher training
- Whole-school training programmes
- Digital competence development
- Repository for digital learning resources
- Teacher-led collaboration with educational technologist
- Transparent decision-making processes

When it comes to supporting the formation of digitally innovative schools the Tiger Leap (a program to support digital skills and use of technology in teaching and learning) started more than 24 years ago. Additionally, there has been a strong support and focus from the government to update the technological infrastructure and provide additional teacher training. Furthermore, digital competence is a central competence in the teachers' qualification standard meaning that all teachers need to have a level of digital competence to facilitate learning with digital technologies and support students' digital competence development.

### **3.2 Finland**

In Finland, the most important means for directing the digitalisation of school education are the national curriculums: the National Core Curriculum for Basic Education (Opetushallitus, 2014) and the National Core Curriculum for Upper Secondary Education (Opetushallitus, 2019), which emphasise the adoption of digitalisation in versatile ways: both as a topic and skill to be learned as well as a pedagogical tool. The curricula also address the working culture and deliberate development of a school as a learning community, including both the staff and the students, which can be interpreted as supporting innovation. Municipalities are responsible for arranging digital resources for schools in order to enable the implementation of the curriculum. Some schools might be more advanced in adopting digital innovations based on their own activity and, e.g., participation in projects with extra funding but, generally we may state that the differences between schools are not substantial. For more detailed description and further references related to the Finnish policy concerning the digitalisation of schools, see D1.1 (Wasson et al., 2021) and Olofsson et al., 2021.

In Finland, we collected data for the study from the city where the schools involved in the iHub4Schools mentoring are located. The city is in southern Finland. The interviewed persons



were as follows: the principals (later Principal 1 and Principal 2) of the two mentored elementary schools (classes 1-6; one is a Finnish-speaking, the other is Swedish-speaking school) as well as one teacher from a third elementary school who works as an ICT adviser in the city in addition to teaching obligations. The schools are ordinary Finnish schools and they do not have any particular emphasis on digitalisation. Two researchers conducted the interviews: one did two interviews, the other did one. Interviews lasted about one hour, and they were arranged online using Teams. In addition, in the autumn 2021 we organised a reflection workshop with all teachers of the two mentored schools where the participants evaluated their schools' digital practices in small teams using a template based on the Innovative digital school model (Ilomäki & Lakkala, 2018). Outcomes of that evaluation are included in the reporting below when applicable.

### **3.2.1 Characterising innovative digital schools in the Finnish cases**

#### **3.2.1.1 Different stakeholders' description of innovative and advanced digital schools**

All the interviewed participants mentioned the level of teachers' expertise when discussing innovative and advanced schools. Naturally they mentioned teachers' digital competence, but also an easy and sensible attitude towards technology, larger repertoire of methods and tools in use, abilities, and willingness to try new and more advanced pedagogical practices with digital technology (like inquiry learning), or interests in creating digital material themselves, and not only using ready-made digital materials or highly structured assignments. Related to teacher expertise, all three participants defined that innovativeness includes that teachers understand when and how to use digital tools: in which subjects, in which grade levels and making decisions in terms of students' learning in different situations.

Another issue that emerged in all three interviews was the sharing culture and collaboration: doing things in teams, joint planning and discussions, co-teaching, sharing of expertise so that the school community is not dependent on individual persons, and networking with other schools and combining resources that way.

Principal 1 also mentioned good organisational structures and proper equipment. Principal 2 and the teacher mentioned a shared school-level digital strategy as a feature of an innovative



school, and they described that in an innovative school the community is conscious about the next steps in development work and want to be at the forefront and seek for new opportunities.

### **3.2.1.2 Leaders and teachers' description of own practices to support the process of digital use and the role of the teachers**

Principal 1 emphasised that two central methods in their school to support digital use are to provide possibilities for the staff to get in-service teacher training (both inside the school and by using external training possibilities) and co-teaching where colleagues learn together and from each other. However, Principal 1 stated that teachers themselves also have a responsibility to keep their expertise up to date even though the employer has the obligation to organise opportunities for professional learning and development.

Principal 2 mentioned that in their school, they introduce new digital tools and, for example, when ordering new materials for the upcoming school year, they suggest new types of materials, but do not force teachers to use them. Principal 2 thought that it is important that the teachers are provided with inspiration and ideas as well as encouragement to rely on their competence in applying digital possibilities. That principal also described that when the school recruits new staff, one of the first things is to ask what the applicants' digital knowledge is, because it is so much needed in the teachers' work.

The teacher was somewhat critical towards some principals' competence in advancing the digitalisation in schools: principals are not proactive enough in development actions, their priorities are elsewhere, and they are not demanding enough in directing teachers to participate in training events or trying something new.

In the outcomes of the teachers' reflection workshop for two schools, the principals were defined to act in an exemplary way in being in interaction with the work community and ensuring good technical facilities. The role of the principal in enabling the sharing of expertise in the community was regarded as essential. Points for improvement were recognized as being in clearer and more appropriate use of various digital channels among the staff, openness of communication and sharing of information. Concerning the teachers' role, especially the team-based working and shared responsibility in supporting each other were listed as good things in



the teachers' practices whereas sharing the teachers' expertise and ideas about good technology-based pedagogical practices inside the community could be improved.

### **3.2.1.3 Examples of digital practice currently in use in the participating school.**

The three interviewees mentioned the following digital practices from their schools:

- A digital lesson as an extra resource is created for the oldest pupils (fifth and sixth graders), which is a lesson that concentrates on digital tools and programming so that the students get a broader knowledge about them.
- In all grade levels in mathematics and environmental studies the teachers use digital books from which they share digital exercises and materials for students. However, students do not have their own digital books.
- Teachers use Microsoft applications quite a lot for giving homework and making tests, forms, and such, which you can expand and use with the students and also with the staff.
- Both schools have a digiteam (two teachers) that takes care of supporting teachers in digital matters and supervises that everything is in order in the infrastructure. A team is better than an individual teacher: the members' expertise complements each other, and the school is not dependent on only one teachers' expertise. The ICT support teachers get some extra salary for the job.
- Knowledge and competence are spread through co-teaching teams, in which teachers share know-how and talk about the training they have attended. The best way is to work together and concretely implement teaching together. Teaching pairs are organised so that their expertise complement each other, which has improved digital skills a lot.
- Take regularly up important and timely topics related to ICT in teacher meetings.

In the outcomes of the teachers' reflection workshop for two schools, the following digital practices were listed in the teacher team's evaluation documents:

- Practices of the teacher community
  - *Pedagogical collaboration and sharing of expertise*: strong co-teaching and teamwork, especially collaboration between class teachers of the same grade level; help and ideas available also in occasional encounters with colleagues.



- *Development practices*: Teacher teams responsible for development work, e.g., ICT team and anti-bullying team.
- *Networking of teachers*: One teacher from the school is a member of the city-level ICT team; tutor-teacher network functioned before but was ended because of corona and discontinuity of funding.
- Pedagogical practices
  - *Pedagogical practices with digital technology*: Using multiple digital learning resources.
- School-level knowledge practices
  - *Common knowledge practices with technology*: Many digital channels in use, unofficial WhatsApp group, students' affairs through Wilma system
  - *Students' involvement in school-level activities*: Students learn to put the laptops ready for themselves, clean them and put on recharge.
- Digital resources
  - *Utility of technical resources*: The goal is to teach only basic skills, so technology is a tool, not a value in itself; each grade level has its own machines in their own teaching spaces that are ready to use and can be used frequently; plenty of equipment in use; information boards.
  - *Teachers' digital competence*: Before corona a lot of good training possibilities.
  - *Pedagogical and technical training and support*: You know that you can get support from the ICT team; low threshold support; PopUp digital support point, especially for the pedagogical issues; new staff members are familiarised with the digital practices; administration service from the city.

### **3.2.2 Perceptions of changing a school to become digital innovative.**

#### **3.2.2.1 Different stakeholders' description of the process of becoming a digital school**

The principals emphasised, again, the role of deliberate professional development for teachers through training opportunities as well as co-teaching and teamwork. Principal 2 mentioned the central role of “digi-ambassadors” who should be well-educated and have enough resources to support other teachers inside the school. The same principal also stated that it is important that ICT skills is not taught as a separate subject, but it should come on as wide a scale in most



subjects, and you are constantly trying to find ways to provide students with broad knowledge in digital technology, and the school should have joint plans and decisions among teachers about the goals in different grade levels.

The teacher emphasised that the school leaders need to give a message to the staff that digitalisation is important, and there should be a clear vision and strategies as well as planned steps for the development work. He gave one example of a school that has invested a lot in a specific pedagogical approach (phenomenon-based teaching) and has built development actions around it. The school has also been investigated by researchers and the conclusion was that all school members (both teachers and students) speak the same pedagogical language and all teachers are committed to the development work - the school has a clear “pedagogical identity”.

Otherwise, the participants did not explicitly describe the process of becoming a digital school, perhaps because they all worked in schools where digitalisation is not specifically emphasised.

### **3.2.2.2 Leaders descriptions of own practices, and role of the different stakeholders in the process**

All interviewed participants talked about the role of city level decisions affecting the digitalisation of schools. They thought that the city should have a centralised digital strategy that defines the goals for using digital tools in schools and support students’ digital competence. Such a strategy, or framework, is currently under construction in the city, and it has been introduced to all teachers in the spring 2022 and the plan is to start the implementation following autumn. Principal 1 commented that in the background of city-level strategies is the national curriculum, which gives a good basis for the development work because it obliges teachers to use digital technology in teaching in versatile ways, but more practical and localised guidelines are needed. Similarly, Principal 2 thought that there should also be a school-level plan for teaching with and about digital technology. The interviewed teacher mentioned that one issue that has had a significant restrictive impact on the possibilities for teachers to use digital applications with students is the EU-level General Data Protection Regulation (GDPR).

There is a new organisation structure in the city for coordinating ICT matters in schools. Previously there was one city-level team, now two teams (separately for eastern and western



areas) have been established, consisting of digi-ambassadors from each school in that area. These city-level teams were experienced to help information sharing and peer support between digi-ambassadors working in different schools. Principal 1 and the teacher complained that some decisions made by the information management unit of the city concerning the technical infrastructure (what applications can be used, what kind of laptops are provided etc.) do not take into account the special needs of schools but are made based on the needs of office workers (e.g., stopping the use of a virtual learning environment and switching only to O365 and Teams applications). They thought that the information management staff's understanding of teaching and learning should be improved. There should also be systematic, practical, and centralised support available through templates and models so that teachers could take the new digital tools into use in pedagogically meaningful ways.

Principal 1 described the responsibilities of different stakeholders in offering in-service teacher training. In Finland, all teachers are obliged to participate in three in-service training days yearly according to the teachers' national "collective bargaining agreement". In the city under study, the city organises some of the days for all teachers, the school takes care of some days. However, the topics of the training vary and only some of them relate to digitalisation, but that is a resource that can be used also for urgent digital issues. The teacher mentioned that principals have much power in deciding what kind of training to organise and how to direct teachers in training.

All the interviewed participants also mentioned the principal's power in recruiting new teachers, in which they can take into account the applicants' digital and digi-pedagogical competencies as well as their previous experiences and networks in the field, so that the new teacher can complement the expertise in the school community and can bring something new in it.

Concerning evidence-based evaluation of digital competences and practices in schools, all participants mentioned that the city does not currently have in use any systematic way of evaluating teachers' or students' digital competence or needs for support. The teacher thought that evaluation instruments should be taken into use at the city level, but there does not seem to be enough interest in that. Principal 1 said that they had earlier used the Finnish OPEKA-survey with teachers, but had experienced that it did not work very well for them. Principal 2



suggested that it would be useful to have a “checklist” both for teachers and students to evaluate whether the digital practices have been implemented and digital skills learned sufficiently in different phases of school education.

### **3.3 Georgia**

In the Georgian educational cases of iHub4School-project, special attention is paid to the introduction and development of digital technologies. In the strategy of *The Ministry of Education and Science* of Georgia (2022-2032) the government has focused on technological advancements and innovations in schools, and the Georgian cases reflect this focus.

The researchers contacted the *Ministry of Education, Culture and Sport* of Adjara, which has selected 5 schools across the region. The schools were selected according to the following criteria: experience, size, geographical area, infrastructure and teacher achievements and Index of participation in various projects/programs. Within the ihub4schools project interviews were conducted with two public school principals and 10 teachers from five selected schools. Individual interviews were held with two principals and group interviews with teachers (2 teachers from each selected schools). Each of the interviews took approximately one hour. After the interview, data was collected and analysed using a coding scheme.

In the following we will report on what characterises innovative digital schools in Georgia and how school leaders and teachers perceive the change to become a digital innovative school.

#### **3.3.1 Characterising innovative digital schools in Georgia**

When talking about an innovative school, the question naturally arises: which part of the educational system is responsible for the implementation of digital innovations in the school? The answer is univocal: the support from the state in the process of building innovative schools is essential, however, no reform can be successful without the active involvement of the school community (teachers, parents, students), especially the principal. The principal is the main connecting link between the state, the society, and the school.

In Georgia, the school principal is an educational leader, whose main goal is to effectively manage the teaching and learning process for students’ academic and personal development; formation, development, and maintenance of a positive school culture; creating a safe and



collaborative school environment; taking care of the strategic development of the school and professional advancement of the team; ensuring equal access to quality education, etc. Therefore, it is clear that the competence, vision and civic awareness of principals are of great importance in the process of development of the school from an innovative point of view.

### **3.3.1.1 Understanding of digital innovative schools (principal, teachers)**

The two principals were asked to describe what characterises an innovative digital school from their perspective. The first principal describes an innovative digital school as having a learning environment with effective technologies, where the digital infrastructure is adapted to the best needs and challenges of pedagogy. The principal also adds that for the last decade, the importance of planning and implementing a learning environment with technology has been described by many international and local policy documents. The principal further explains how the relevance of digital technology was highlighted even more during the pandemic (Covid-19), when the educational environment was switched to online mode.

The second school principal describes an innovative educational practice as using digital tools and resources, critically determining how much the use of digital technologies in the educational process serves to enrich the student's educational experience. The principal also adds that it is important to implement innovative practices as part of the student's daily learning experience, rather than a list of "showcase" lessons that, in the end, do not change anything. The aspect of accurately defining a school-level digital strategy, planning, and implementing appropriate activities is a critically important element, the principal further explains.

Further principals explained how an innovative digital school cannot be established without the participation of the school community: teachers, students, parents - everyone should be involved in this process, and the school's digital agenda should be promoted by the principal in the school.

Having a better understanding about what characterises digital innovative schools in general, we also asked the school principals and the teachers if they would consider their own school as digitally innovative, and why or why not.



School principals mostly assess their school level of being digitally innovative quite realistically. They mentioned that they support teachers by organising training and workshops, by providing computers and other digital tools and equipment, and by encouraging teachers to participate in professional development events. The principals are also supporting teachers by introducing and providing special platforms. Although schools have significantly improved their digital competencies the principals believe that becoming an innovative school still needs some work, stating that “Today the teacher must be equipped with the appropriate tools of the time” (Principal 1), and "There are less and less professions where computer help is not needed. It is impossible to prepare a child for the future without computer technologies" (Principal 2).

To further support the process the principals also assess teachers’ digital competence on different levels, mentioning how the shift to distance learning, during the pandemic (covid19), pushed teachers to advance in terms of digital competence. The state and the school administration have taken various measures in the direction of supporting digital competence. These measures are to promote teachers’ professional development; Equipping schools with technologies; Teacher training; Technology Coach Visits at Schools ("As part of the reform, technology coaches worked with teachers twice a week at school").

The principals also highlighted some advancements in the process such as resources created by teachers themselves. Such resources are tutorials created by mentors – (teaching and learning in the digital era); Bank for Complex assignments – (new school model bank for complex assignments); Facebook page created by maths and physics teachers - this group is designed for maths teachers in the field of education or those interested in mathematics, and currently has up to 14,000 members.

Knowing more about how the principals describe actions done to support the schools, we also talked to the teachers to learn more. In the schools the teachers are open to innovations and are actively involved in online seminars and webinars and study new tools and are eager to share their experiences with co-teachers. There are subject departments in schools, which allow teachers to share their experiences with each other, and here we can mention the new school model and the coaching system that is introduced in schools. The National Center for Teacher



Professional Development has been carrying out Teacher Information Communication Technologies (ICT) trainings since 2009.

During the interview process, teachers mentioned various projects supported by various international donor organisations. As teachers state, within these projects, teachers are given the opportunity to participate in seminars, conferences, share their experience and improve their competence.

To the question: “Do you consider the school(s) to have leaders who focus on changing the school to become more digital advanced? If so, how? “, the school principals mentioned that one of the main tasks of the school leader is to take care of the development of the school. In order to create an innovative school, it should first of all analyse its own achievements and challenges in technology-enriched learning practices and make a self-assessment of the digital maturity of the school by means of digital tools. It is important to establish a common vision of the school's digital strategy (School principal 1). The principal also highlighted that it is important to plan, implement and evaluate various activities to accomplish innovative teaching practices. (School Principal 2.)

During the interviews, we asked the teachers to give examples on new or improved digital tools and tell us about the process from beginning to end.

All interviewed teachers mentioned the support from the state and the school management, which was especially strong during the pandemic period when the learning activities was going online. During this period various learning platforms were developed. This was a resource that helped the teachers to guide students in their learning processes.

Teachers mentioned some specific digital tools:

- **Learning through play** - The digital educational resource "Learning through play" is aimed at grade I-IV, being pupils of elementary schools. The resource can be used for formal and non-formal education purposes.
- **An Interactive Alphabet** - Georgian Interactive Alphabet (Android, iPad, iPhone FREE App). First graders have the opportunity to learn the native alphabet through games, they also have the opportunity to use various games, such as words, syllables, etc.



- **Georgian language grammar e-resource** - designed to help those interested in relevant issues to understand the basic rules of the Georgian language and strengthen their knowledge. The resource includes the theory of basic grammar, various types of interactive exercises, explanatory videos and chatbots (online resource of Georgian language grammar).
- **Chatbot as an educational resource/speaking program** - which answers any questions asked by the student according to the subject and tries to provide the pupil with interesting information through dialogue.
- **Chatbot platform for teachers and pupils** - which allows them to create/build a talking program themselves.

During the interview, both school principals and teachers brought several examples of one of the successful projects implemented in Georgia. Such as:

**The project "Digital School-Georgia"** which was implemented with the financing of the Ministry of Foreign Affairs of Estonia and the coordination of Tallinn University (Estonia). The project was based on the Estonian experience and aimed to improve the quality of education in Georgian public schools by implementing participatory design, data-based solutions, school-level digital strategy and modern digital learning practices.

The general education reform launched by the government, is a third-generation national curriculum developed in collaboration with Estonian experts with the support of the Estonian government and the United Nations Children's Fund. The government has also started to create new, improved learning resources relevant to modern teaching approaches. In order to enhance the quality of teaching, training of educational leaders, school-based professional development and collaboration between teachers, the **New School Model program** (Ministry of Education and Science, 2021) was launched. In addition, the teacher professional development scheme has created better opportunities for entering into the profession and career advancement.

A special attention is paid to **equipping schools with computer technologies**. Namely, in 2021, 400 schools were provided with computer equipment/sets. The aim was to support teachers in their teaching process and to create a working space for teachers and pupils (computer lab). In addition, in the curriculum computer technologies have become mandatory



in the second, third or fourth grades or in all three of them. The introduction of this subject in schools has led to the **creation of an online resource bank**.

In the interviews teachers also mentioned several hindering factors such as poor internet connection, mostly in schools located in villages, insufficient digital skills, lack of IT personal support and technology tools.

School leaders agreed that “pedagogy drives technology, not the other way around. Integrating technology into education involves three interrelated areas: pedagogy, technology, and change management.” (Principal x). They note that change is achieved at the organisational (school) level. Therefore, understanding the importance of technology-enriched learning practices at the "whole school" level, sharing the vision and the participation of the school community in the implementation are essential ingredients of a successful digital school.

School teachers expressed readiness for change and introduction of innovations. "There are a lot of 'smart' tools around to collect and analyse data. It's up to us how smartly we use them to improve the learning experience of our students."

Finally, school principals and teachers emphasised the need to create a school digital strategy. They believe that if a school wants to be a successful innovative school, it must develop a common vision, analyse its own achievements and challenges in technology-enriched teaching practices, innovate and implement new digital tools, services, and materials, and share innovative practices with other schools.

Both schoolteachers and principals agreed that there is a need to share success stories and best practices, both within and between schools. School leaders believed that sharing ideas about digital innovation will facilitate digital change and increase teacher motivation.

### **3.3.2 Perceptions of changing a school to become a digital innovative.**

Teachers and principals strongly believed that it's the combination of these different actions that build a strong innovative/ digital innovative school community. All the stakeholders should



actively participate in the process of advancement/ digital advancement and innovation in the schools. A final important issue is how the support of digital innovative schools should be a continuous process. Teachers and principals believed that it is important to:

- Identify successful practices in schools and encourage schools to share and cooperate with other teachers and schools
- Identify and encourage interesting practices in teachers
- Develop new mechanisms for delivering equipment to schools

Taking this list into consideration the first school principal explained that there are still work to be done in their school to reach a digitally developed school, stating that "It can be said that the school is digitally developed at some level, but we still cannot meet all the requirements that are set for a digital innovative school in the modern sense. In recent decades, a lot has been done in Georgia in terms of introducing digital innovations in schools but in many cases, there are problems with lack of digital technologies, and the purposeful use of technologies" (School principal 1). The principals were aware that getting a school to become a digital innovative school, is not only about tools and equipment, but about how the tools are used. Therefore, improving the digital competences of teachers is one of the priorities as educational leaders. This process is not easy, since not all teachers are ready to use digital technologies, the principals explained.

Finally, all the parties agreed that a very important characteristic of an innovative school is the culture of sharing and collaboration between the teachers and the leaders. Being open to changes, training and receiving and sharing your own best experience.

### **3.4 Lithuania**

Various networks are being established at different levels to promote the creation and development of innovative educational practices in connection to digital transformation in Lithuanian schools. Lithuanian general education institutions interact not only with their founders (i.e., the municipality or the Ministry of Education, Sport, and Science), but also with other public or private institutions, public bodies, universities, etc. to improve the quality of education.



Education policy is the responsibility of the Ministry of Education, Science and Sport of the Republic of Lithuania. The quality of school performance, and thus digital innovation, is also promoted and developed by these institutions:

- a) National Agency for Education (NAE) is an educational assistance institution founded by the Ministry of Education, Sport, and Science of the Republic of Lithuania. At the moment the mission of NAE is to take part in implementation of the State pre-school, pre-primary and general education policies, induce education institutions (except for higher education institutions) and other education providers to ensure quality of education by providing informational, counselling, qualification improvement and (self-)education environment building assistance, conducting education monitoring and education research, developing the education content, and coordinating its implementation.
- b) Centre for Quality Assessment in Higher Education. The Centre implements the external quality assurance policy in higher education in Lithuania and contributes to the development of human resources by creating enabling conditions for free movement.
- c) Municipalities. The municipality is the founder of general education schools in most countries and is jointly responsible for the quality of education. Municipal institutions implementing the rights of the owner of most general education schools and responsibilities and together with the schools responsible for the quality of education, appoint school heads, supervises the activities of schools, initiates their external assessment, assesses students' learning achievements, allocates farm funds to schools, ensures financial support to improve the qualification of teachers and perform other functions.

The Lithuanian education system promotes Technology-Enhanced Learning in Lithuania Education System by focussing on these important and new ways:

- a) Lithuania is currently in the final stages of updating the General Education Programmes. It is important to note that one of the seven generic competences is digital competence - the ability to use digital technologies to complete tasks, learn,



solve problems, work, communicate and collaborate, manage information, create and share digital content effectively, appropriately, safely, critically, independently and ethically (MOKYKLA 2030; link: [Microsoft Word - Skaitmenin kompetencija-2021-11-03 \(mokykla2030.lt\)](https://mokykla2030.lt));

- b) In Lithuania 's Progress Strategy „Lithuania 2030“: attention is to good digital literacy and digital infrastructure.
- c) Creating education curriculum in Lithuania the main integral aspects are important: integrated informatics program in primary education; application of the latest educational trends (digital literacy in education as integral backgrounds in all curricula and etc.)

The Lithuanian research team collected data for this deliverable from the schools that are involved in the iHub4Schools. The data were collected through semi-structured interviews with principals, vice-principals, and teachers in nine schools. All schools have genuine experience in innovation.

### **3.4.1 Characterising innovative digital schools in Lithuania**

#### **3.3.1.1 Descriptions of innovative and advanced digital schools**

All the interviewed participants mentioned what in their minds is a digitally innovative school. All the participants emphasised that an innovative school is a modern educational institution that uses the latest digital content. At the same time, teachers point out that such a school is not afraid of change, not afraid to move forward, not afraid to take risks.

For example, a teacher says: "In an innovative school, there must be free access to the internet, modern equipment in every classroom and everything else that can be interactive" (Teacher 1).

It is important to note that teachers and principals of schools highlighted the fact that an innovative school must include all teachers and all the infrastructure that teachers need in the school. For example, a teacher notes: "An innovative school depends on the availability of tools in the school, if all the teachers in the school can use the tools and have everything in their classrooms or in the places where they work, then it is an innovative school" (Teacher 2).



This idea suggests that an innovative school should focus on empowering, enriching and thus making the infrastructure practical for each teacher.

The thought of the school's vice-principal is also important: "If a teacher has the possibility to work with a specific tool in his/her classroom, he/she will work with it. If a teacher needs to borrow the tool, bring it with him, he will not work. For example, we have had projectors in every classroom for a few years now, so that everything works. As for apps, whoever finds them, shares them with each other and we move on" (Vice-principal 5).

All teachers mentioned science and other laboratories, tablets, microbots, robots, and various digital tools and platforms when talking about the innovative school. As can be seen, the school has to be the hub for the various innovations that are being developed in the business market.

### **3.4.1.2 Descriptions of own practices to support the process of digital use and the role of the teacher**

The importance of cooperation was identified at the following levels:

a) First of all, the participants emphasised the importance of cooperation between the school administration and the school teachers. This trend was most evident during the study and was emphasised by all the participants. It was found that cooperation between administration and teachers in the field of innovation is twofold, with, on the one hand, the administration initiating innovation in the school.

This is visualised by the following thoughts of a deputy: "We needed a tool to communicate in a way that was not just a diary. We decided [researchers' note - the administration decided] that we needed Office365. After a little while, everyone got on board, and it wasn't scary" (Vice-principal 5).

Teachers also highlight the importance of school administration. They say: "It is our vice-principals who keep up with life and look for all kinds of ways to bring what is new into the school. And they encourage the teachers" (Teacher 6). When the administration is interested in innovation, so is everyone else.



b) Collaboration between the teachers themselves has also emerged as an important element in bringing innovation to the school. For example, a teacher says: "Collaboration among themselves, if they learn something they share it with their colleagues. We also have training when we tell each other" (Teacher 4). Another teacher also shares the importance of teachers learning from each other: "The experience of sharing with colleagues encourages us to go further because so many teachers are always discovering something new. We also do integrated lessons, such as computer science with music. And it takes a lot of creativity to combine and integrate several subjects" (Teacher 6). This was highlighted by several teachers and deputy headteachers. One teacher says: "The computer science teacher is also important" (Teacher 5).

c) Cooperation between teachers and students. The participants stress the importance of pupils' digital competences, where pupils can lead by example and encourage teachers to innovate in their schools. A teacher says: "The engine are the children themselves. If there are strong "computer scientists" in the classroom and if they are interested, they will drive the teacher" (Teacher 6).

### **3.4.2 Perceptions of changing a school to become a digital innovative.**

#### **3.4.2.1 Descriptions of the process of becoming a digital school.**

The fact that digital innovations or innovations are necessary, relevant, and appreciated has emerged from the in-depth study of how innovations are implemented in schools. In this case, the school community is testing the innovation in order to assess whether the tool/tool is suitable and necessary for the work of a particular teacher. This is confirmed by the school administration and accepted by the teachers themselves. For example, a principal note: "When we started to implement Office365, no school in Vilnius had it yet. It's never that we attack and do everything at once, but we figure it out" (principal 1).

This example shows that there are schools that are looking for innovations that are not yet in practice in other schools, but are still looking critically and objectively at the suitability of the tools. In this case, the school did not have the experience of other schools, where no one could recommend it, and where there were not yet any positive or perhaps negative practices in place. In this case, the researchers conclude that it is important for a school to have a system for assessing the suitability of a digital tool or innovation. The fact that school communities are



active and critical thinkers when it comes to innovation is supported by further insights from the participants in the study. For example, the vice principal of the school again shares that it is very important to look for different ways in which a particular technology can be used. The vice principal says: "As soon as the technology started, there was the Mice app, when we had to work a lot with the interactive whiteboard, but we used the possibilities of that app in simpler ways. We bought interactive mice for the whole class instead of auto-responders" (Vice-principal 4). Another teacher says: "Test and adapt the tool you have found according to; possibilities. Even it is the teacher's invention to use specific tools creatively in the absence of very suitable conditions" (Teacher 6).

It is important to note that stakeholders focused on the school's finances, which are important for purchasing innovative digital tools. It was pointed out that responsible use of funds is necessary, which is inseparable from the teachers. Because only teachers can decide whether a particular digital tool, etc., is needed, necessary. It can be concluded that teachers must be involved in the testing process of all digital tools. At the same time, however, it is established that not all teachers equally may need a particular tool, but only individual teachers. The participants in the study agree on the need to promote the individuality of the teacher and the responsiveness to his/her needs when innovating in schools. Therefore, an innovative school may use different tools, different digital platforms, or other innovations. Principal 2 confirms: "I think teachers are different too. It's human. A teacher who is interested in it is quicker to pick it up, if no one shows up, he looks for it. The teacher has to want the technology and each teacher may want it differently".

#### **3.4.2.2 Leaders descriptions of own practices and the role of the different stakeholders in the process**

All the participants highlighted the importance of national policies. For example, it was mentioned that in recent years the Ministry of Education, Science and Sport of the Republic of Lithuania has allocated additional earmarked funding specifically for the acquisition of digital tools and the development of digital competences of teachers. Based on the insights of the research participants, it can be assumed that this funding policy has a positive impact on the development of innovative digital schools. The deputy head of the school says: "Funding has changed recently. For several years now, we have been receiving additional funding for



digitisation and we can already buy certain apps. Not just DEMO versions" (Vice-principal 4). Participants in the study also emphasise the importance of municipal decisions and the active role of municipalities in influencing digitisation. It is argued that municipalities need to communicate closely with all schools in the municipality, to identify the needs of schools in line with the State Progress Strategy and other legislation, and to initiate digital innovation on the basis of these needs. Attention was also drawn to strengthening the network of school cooperation. The Millennium Schools Programme, launched in Lithuania in 2022, is also expected to be of value, with school leaders sharing their experiences with other schools. This Millennium Schools strategy is designed to reduce gaps in learning conditions and achievement between municipalities and between schools in the same municipality, and to renew and strengthen existing schools so that all children have the best possible learning environment, no matter where they grow up.

The interviews show that school leaders need to be observers of innovation and the state of education in the heartland, in Lithuania, as this allows them to communicate good innovative practices in the school: "The administration needs to keep pace with all the progress in education" (Principal 2).

School administrators also say that the efforts of the school administration are very important in creating a culture of cooperation in the school. The principal says: "Our culture is one of togetherness, where we all know how to pull together and help each other when needed. A culture of togetherness that is also based on cooperation. When you know that you have someone to ask, then you can achieve results" (Principal 1).

The interviews also identified the need for an improvement framework for innovation and digitalisation in the school. The principal 2 says: "It is important to develop a culture where teachers train each other. For example, now teachers are on Moodle and discuss how to do practical works".

### **3.4.2.3. Examples of digital practice currently in use in the participating school.**

Teachers, who participated in the interviews, mentioned the following digital practices from their schools.

#### **Digital resources and tools:**



- A digital lesson as an extra resource is created for the middle school students (fifth and sixth graders), which is a lesson that concentrates on digital tools and programming so that the students get a broader knowledge about them.
- In many schools in all grade levels of mathematics and environmental studies the teachers use digital books from which they share digital exercises and materials for students. However, students do not have their own digital books.
- For example, many teachers use Bebras Cards in primary school. This is an international initiative that aims to promote informatics / computer science / computing) and computational thinking - not only among teachers and students of all ages, but also among the general public.
- Teachers mentioned that the Eduten / ViLLE learning platform is also relevant in primary school. Eduten is based on Finnish pedagogy. Its exercise library has been co-designed and validated with thousands of Finnish teachers.
- In informatics or IT (Information Technology as it named now in Lithuanian schools), they use micro:bits and, most importantly, we have applied them in many areas, both in science and music. These technologies can be used widely, but it takes time, desire, and creativity.
- Teachers also say that they have Bee-Bot robots, which can help us do many creative tasks. The board game “Scooty Go” is very popular among schools. Teachers use Bebras cards, and the maths teachers use Eduten a lot, so they think that maybe the maths results will go up. Teachers have Eduka and EMA - digital platforms made in Lithuania. Teachers use various Microsoft applications for making tests, practical work.
- All schools use MS Teams (or zoom) for cooperation between teachers.

### **Innovative practice of teachers' communities:**

- Teacher collaboration network connects a primary school teacher and the prospective student's subject teachers working together to deliver joint distance lessons. This helps students make the transition to mainstream education
- A two-teacher system, especially when delivering integrated lessons (e.g., music and computer science).



- Teachers in the school systematically participate in teacher training. Teachers also receive training on digital innovation from external speakers. At the same time, distance learning is made available, e.g., the training programme from the educational masters.
- IT teachers are seen as important mentors in digitisation, providing advice and support to teachers.

### **Pedagogical practices**

- Innovative ideas for interactive lectures (Educreations, Flipsnack, ClassDojo, Padlet, Flippity).
- Innovative ideas for group work, student discussions (Canva, Kahoot).
- Innovative ideas for creating digital lesson activities (MozaBook, BookCreator, Mentimeter, Edpuzzle, SmartNoteBook, Storyjumper).
- Innovative assessment tools (E-portfolios, Plickers). For teacher competence assessment school teachers use “SELFIE for Teachers”.
- Creating a virtual space for students (Planner5D).
- Innovative ideas for group work (Minecraft; Backchannel Chat; Linoit; Classroomscreen; Coggle).

### **School-level knowledge practices**

- Involving students in generating new digital ideas.
- Consultation with other schools in the municipality or district.

### **Digital competences of schools and teachers**

Newly upgraded the General Education Programmes for schools in Lithuania based on seven competencies and the Digital Competence is of them.

Summarising interviews with eight schools in Lithuania we can characterise digital innovative schools as

- Using variety of digital tools for educational purposes, of course these tools are used appropriately and applying different approaches that fit better to students' needs
- Inquiring new strategies and pedagogical approaches
- Actively participating in workshops, seminars and conferences on innovative pedagogies



- Focus on improving students and teachers themselves learning
- Cooperation and collaboration with other schools and teachers, making networks, sharing ideas and resources

### **3.5 Norway**

In Norway, several initiatives were started to support digital competence and usage of digital tools in the schools. Digital skills are part of the basic skills, meaning that this particular skill is a prerequisite for developing skills in all other subjects in the school. To read more about policy and governmental support mechanisms for scaling-up digital usage in Norway, see Wasson et al. (2021).

The partner school in Norway has been working actively with becoming a school using technology to support learning, since 2015. Investigating how the Norwegian partner-school worked in order to support and mentor for technology-enhanced pedagogical practices, helps us to understand what characterises innovative digital schools and to learn more about the processes the school went through in order to become a digitised school, and the mechanisms supporting this adoption of digital innovation. To investigate the phenomenon, we interviewed one representative of the school's owner, one representative from the schools' leader group, and two teachers. The interviews were arranged through our contact with the school leader representative, also being interviewed. Each of the interviews lasted approximately one hour.

#### **3.5.1 Characterising innovative digital schools in Norway**

The Norwegian municipality described in this report is a two-level municipality, with the Head of education (upbringing), and the principal as number two in the decision line. In addition, a planning group and an administration is involved in the decisions. There is also a 10% position in the municipality as an advisor within digitization and professional renewal, supporting educational digital work in the schools, applying for money for assessing learning tools, purchasing learning tools, and issues related to the GDPR. The advisor functions at the intermediate administrative level in the municipality and consults on issues where the school owner or the principals may not have the competence or time. The described roles will be different in other municipalities. The creative interdisciplinary tools are purchased by the



municipality, while the subject-specific ones are purchased by the schools themselves. The subject-specific tools may therefore be different, at the different schools, dependent on what the school management prioritises.

### 3.5.1.1 Descriptions of innovative digital schools

In Norway, the ownership of the schools is normally at the municipality level. The representative for the municipality participating in this project, has previously been working as a teacher in a lower secondary school, actively promoting the use of digital tools. On the question how he will describe an innovative digital school, he refers to the SAMR model. (Figure 3). The model is developed by Puentedura (2012) and illustrates how digital tools are implemented, on four different levels. The first level is the *substitution*, where the tools are used as a substitution to non-digital tools, while the second level is *augmentation* where technology makes a functional improvement. In these two levels, the technology functions as enhancement of teaching, moving into level three and four where the transformation of learning activities are happening. In the third level, there is *modification*, where the technology redesigns the learning activity. The last level in the model is the *redefinition*, where technology not only forces redesigning, but the activity would not be possible without the tools used.

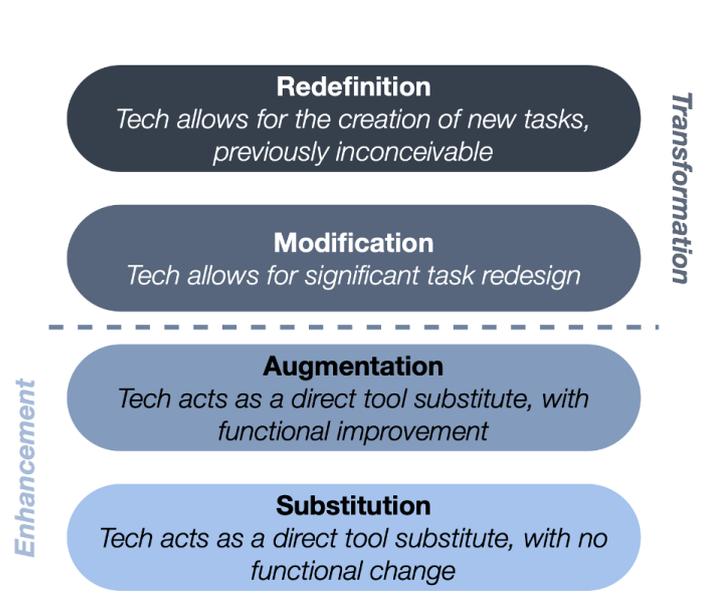


Figure 3: The SAMR-model (Puentedura, R. R. (2012).



The school owner's representative explains how the pedagogical approach is the most important aspect for the school, and this should govern the use of technology. This is the most important characteristic of a digital innovative school. This understanding fits into how he defines the school participating in the iHub4Schools-project "*I consider (school name) the top notch when it comes to being digitised, precisely because they are able to assess when it is appropriate to use technology (...) and are able to use (technology) in a redefining way, and state that "No, we are not going to use it at all now." Having that maturity about it. (...) Having this pedagogical approach, which governs the use of technology, is perhaps the most important characteristic.*" (School owner representative for the Municipality, our translation) The school owner further explains a technologically good school as a school that has knowledge about the SAMR model, understanding the technological level of the school, being able to assess whether they have a proper use of technology. If the tool is not appropriate, then it should not be used. The representative explains how this implies an understanding of when to use digital technology as a replacement for pen, pencil, and blackboard.

The school owner's representative has a focus on the appropriate use of digital tools, with the focus on its pedagogical approach. The representative of the leader group, also being the *Pedagogical change coordination* for the municipality, adds to this understanding. The leader characterises a digital innovative school as "*a school that uses technological solutions in a new way. That explores and think in new ways, instead of just replacing a book with a digital gadget.*" (Our translation). The leader further believes that many people may think innovative schools constantly try out new tools, explaining that the school rather try to get better at what they already use. To be digital innovative is not the case of "*jumping to the latest and greatest*" (our translation). The school rather focuses on a few tools, and makes sure that their use is excellent and competent. The leader further describes digital innovative processes as researching their own practice, making it work, using tools in new ways and sharing the knowledge to develop common practices. This approach supports the school owner's view. Digital innovative schools are not only using the tools appropriately, but also use tools in a redefining way, using what they already have, expanding their repertoire, changing, and sharing new practices for a collective understanding.

Now moving from how the owner and the leader characterises a digital innovative school, we ask how this understanding fits the teachers' practice and how they describe the same phenomenon. The teachers characterise an innovative school as leaning forward, paying



attention, and trying out new digital solutions and resources, while also stressing *the difference* between trying something out and taking something into use. This would imply having a good overview of tools and resources available. Having such an overview would give the possibility for trying out which tools would be appropriate for different subjects and topics. The teacher mentioning tools being designed for natural science, could be used for other topics and subjects. To have an overview will also make you able to use different tools in the same subject and the same class, for different student needs. This will add to the variation of working methods. Digital tools should promote learning; hence an innovative digital school should use digital tools when it is beneficial.

This falls into the understanding of the school owner and the school leader, characterising digital innovative schools using digital tools appropriate, changing, and sharing new practices for a collective understanding with a focus on pedagogy and learning. Still, having a good overview of available tools is a need for being able to teach in varying ways to support students of different needs, for the possibility of using these tools appropriately and developing new practices.

In order to get a deeper understanding of how the school owner, the leader, and the teachers characterise *digital innovative schools*, we wanted to know how they characterise a *digitally advanced school*.

### **3.5.1.2 Descriptions of advanced digital schools**

The school owner's representative explains how being digitally advanced overlaps very much with being digitally innovative. Being digitally advanced, will include the maturity to *actively* move between the levels in the SAMR-model. Hence, be able to *consider* when to prioritise technology to promote a learning goal. The reason for this is because there may be better ways to reach a goal, than to use the available digital tools. Further explaining that those who are most immature, use technology unnecessarily. This leads to added work in a teaching situation. As an example, the school owner's representative explains that some would misinterpret the use of technology as using technology as much as possible, but this is neither innovative, particularly advanced, nor has it any pedagogical function.



The school leader describes a digitally advanced school, as a school implementing new methods, being “*passed the test-stage*” (our translation). Advanced schools are not testing out new things, but actually using the tools as part of their practice. The leader describes her school as a digitally advanced school because everyone has changed their practice, already using digital devices in such a way that they see a change in all classrooms.

Asking the teachers about a distinction, they needed more time to think about the term. Starting to reflect aloud, the first teacher describes how being digitally advanced is about having knowledge about the technology used. This implies knowing how the digital tools can contribute to the teaching compared to not using a digital tool. The second teacher adds that the teaching staff, not only a single teacher, have digital competence on how to use digital tools. The first teacher adds that being a digitally advanced school is having knowledge about best practice and the effect in the classroom. This aspect distinguishes from the testing-out-phase not having knowledge about the effect. The first teacher also points out that in a digital advanced school, you are part of a community, and there is an overview about the practices in the school. Such a community is working together, you complement each other, it is transparent, and you know each other's competences.

The talk with the teachers adds to the understanding expressed by the school owner and the leader. A digital advanced school adds to the innovative digital school. It has moved beyond the testing, where the school is implementing new practices. The school has knowledge about the use of digital tools, and how it will make changes to the classroom. In addition, the teachers are aware of the school's collective competence, there is an acceptance that not everybody should know everything, it's a learning community and the transparency allows them to move forward in the usage when this is required.

### **3.5.1.3 Aspects of Digital competence**

When the teachers brought up teachers' own digital competence as part of a digital advanced school, we wanted the teachers to explain what characterises a digital competent teacher. In the following quotation one of the teachers explains that this teacher is...



...not afraid to push a button or try new things, and are not afraid that the students can teach you things. It is very often students know or have found out how things work before you. You must dare to let go of control and let go of knowing everything before class starts. (...) That you dare to let go. Yes, and know when it is beneficial to use digital tools, and when not to use it. It's not about using it at all costs, but it should actually promote learning. (Teacher 2, our translation)

This quote shows us that using digital tools can make teaching more unpredictable. We have all experienced that tools are not working, but also, it's not possible to know everything about a tool immediately when you use it. The teachers explain that it might be hard for teachers to let go of control and dare to stand in the classroom telling the students that "*Oh, we've got a new thing. We will try it out together.*" (Our translation). The ability to test out with your students without knowing how it will end is part of digital competence. Another aspect mentioned by the teacher is the ability to transfer your knowledge of one tool to another tool, subject, or situation. The second teacher also explains the need to understand that the knowledge students get when using the tool, are sometimes not transferable to paper. She explains how calculating in a digital tool, does not necessarily make the students able to calculate on paper.

Both owner and leader characterise a difference from the digital innovative- to the digitally advanced school. Being innovative is using tools appropriately, changing and sharing new practices, while being advanced is implementing the new practice in their classrooms, not testing, but using because you know this will make a change in the classroom. From the interview with the teachers, we learned that digital competence is not about using a specific tool but being able to transfer the knowledge of using a tool, to the use of different tools, in different situations, in new subjects, with different students. To be able to do this, teachers will have to accept to learn from their students and accept to lose some of the control and overcome the fear this can cause. This shows how the use of technology changes professional practice and the role of the teacher.

Characterising digital innovative schools



- Using tools appropriately
- Inquiring new practices (not necessarily new tools)
- Changing and sharing new practices for a collective understanding
- Focus on pedagogy and learning
- Having a good overview of available tools

#### Characterising digital advanced schools

- Implementing new practices
- Having knowledge about what works
- Know the effects of using tools
- Transparency in teaching staff
- Letting go of control

#### **3.5.1.4 Support mechanisms for a digital advanced school**

*-Everyone! It's a democratic process.* (School leader)

We wanted to hear how teachers and leaders in the school described support for digital professional development.

The starting quotation of the school leader states one of the important issues, and how supporting change must be a democratic process for the whole school. It is therefore necessary for everyone to be involved. The leader describes how the school spends a lot of time discussing and agreeing on the goals for the school, and what they want the school to become. The school is defined as a dyslexia-friendly school, and the leader explains how this work is connected with using digital tools. At staff meetings, they go through the school's own expectations, as well as the parents. The proposals from these staff meetings are sent out in *Microsoft Teams*, for further written discussions. Decisions and changes take place in several stages where everyone should participate in discussing and evaluating the annual plans. This gives the possibility for everyone to be involved in the changes.

So, what conditions do the teachers find to support the development of digital competence? The teachers explain openness, the room for sharing experiences, attending courses, a culture



where they help each other when they need it and feeling safe enough to tell your colleagues when you don't understand. The teachers note that this trust is something they have brought with them from before they became a digital school. The teachers describe how the management makes sure that there is time and opportunities for the teachers to meet, share and discuss experiences. The teachers meet regularly to share their experiences, this makes it possible to keep the practice transparent.

In Norwegian schools, teachers are known for being very autonomous. The description from the teachers and the leader in this particular school, gives us an understanding on how it is possible for teachers to keep this autonomous practice, and at the same time conduct development work in a systematic manner. These teachers describe how the leaders make sure that they have time and space for collaboratively professional development, through openness and transparency. This openness is further described as part of the planning process when the leader explains how development work is supported by a democratic process.

### **3.5.1.5 Leadership for a digital advanced school**

On the question about what characterises school leaders supporting the development of using digital tools in the school, the leader explains that such a leader is actionable in showing support for using digital tools and needs a plan to follow up all teachers - those actively using digital tools and those who are not. The leader also needs courage to “let go of control”. This is not the same as not having any rules or regulations. This is about the willingness to give the teachers autonomy and responsibility. It was explicitly expressed that a school leader needed to be “brave” and to give autonomy to the teachers. It was important that the teachers could go to conferences and to develop their professional skills. Also, there is a need to think strategically, and make changes and new priorities in the budget.

The school owner also brings in the need to do new economic priorities. For innovation projects the leader often has to go outside own unit to find necessary infrastructure and the economic support required. As a leader you need people with competence internally at your own school. To get people involved in innovative work, you need trust, and have good contact with your employees. This requires a certain charisma and relationship with those concerned. Finally, the school owner stressed the importance of having a pedagogical understanding. Digital



technology should not be used exclusively as a substitute but lead to improving the pedagogical activity.

So, what conditions do the teachers find to support the development of digital competence? The teachers explain openness, the room for sharing experiences, attending courses, a culture where they help each other when they need it and being safe to tell your colleagues when you don't understand. The teachers note that this trust is something they have brought with them from before they became a digital school.

Also, creativity plays a part to make the schools digitally advanced. Still, the school owner does not find it important for the leader themselves to be creative, instead it is expressed that the leader's role is to help, facilitate and clear the paths for the creative employees. Further, this is a way of enabling creativity in others. If a leader does not have necessary leader competence, the process will stop. Therefore, the school owner emphasises that an important prerequisite for this work is that the leader has a staff to play on teams with. What the school owner brings up are supported in the answers of the school leader, who points out the importance of cultivating creativity, though the leaders themselves do not have to be creative, but must understand the importance of being allowed to think in different ways.

### **3.5.1.6 Measures for a digital advanced school**

So, what kind of measures support the school's work to be a digital advanced school? On this question, the school leader explained that they have worked a lot to support sharing experiences among the staff at the school. Both in the various teams (1-4 grade and 5-7th grade), and staff meetings with a focus on encouraging teachers to be creative and use digital tools in new ways. The leader explains that one of the measures initiated was an annual conference. This has turned out to be very important for the staff, working together towards a goal and getting the possibility to show the work to an audience. In addition, the staff travels to conferences to build a network. *"The nice thing about digital technology, is the possibility to have a network that is not only local, but national and sometimes international."*(our translation), the leader explains.

We also talked to the school owner about measures that are considered to support the school's digital activities. The school owner is unsure if there is one solution to becoming a digital advanced school. Schools can be in different phases, and the different management levels



should work and facilitate the strategy. Hence, an important part of the measures is to have a strategy and ask what the goals are, and how to reach these goals. This depends on how advanced the school is in terms of infrastructure, competence, and motivation. The school owner expresses that the activities should contribute to the students' learning. Digital technology is not about promoting something that looks good on a front page, but whether the students are actually learning something. There are many questions to answer, such as how to work with organisational culture and anchoring the process? How to work with the pedagogical aspects? What tools should we use? Who are responsible for the selection of tools? Do we understand the edtech market when it comes to digital educational tools? What about maintenance and training? Which tools are the school owner's responsibility, or which are the schools? How is the infrastructure at the various schools? How does the ICT department handle large quantities of gadgets, purchasing, rollout, updates, or security? Are there enough money also for maintenance and repairs? Have all employees received training about privacy issues? Some of the answers will, in Norway, depend on whether it is a large or small municipality / school owner. Some challenges may be small but important, such as the number of sockets, to charge the tools. These are issues are easily forgotten in the big and visionary picture of becoming digital, but it is important for a teacher, standing in the classroom if half of the students lack power for their laptops. In sum, being digitally advanced goes far beyond what lies in the teacher's tasks, the school owner explains, adding "*It's not only about throwing some gadgets into the classroom.*"(School owner, out translation).

Both from the school leader and the school owner we learn that for a school to become digital innovative or digitally advanced, measures supporting not only the single teacher, but the whole school, is needed. It includes far more than what is happening in the classroom, and even goes beyond the school itself, as infrastructure and budgets. Hence, the understanding of the digital classroom must be anchored and supported by the school leadership and the owner.

### **3.5.1.7 Examples of digital practice in the participating school.**

Having learned about support mechanisms for digital advanced schools, we were curious to let the teachers give us a few examples from their digital practice and elaborate on the possibilities of using digital tools. The following dialog makes a good example.



Teacher 1: It is not like we just sit and press on the iPad or the Chromebook. We do lots and lots of different things.

Teacher 2: Yes, it's more in relation to the fact that we have changed how we think. We think "How can we use the iPad ..."

Teacher 1: "...as a tool."

Teacher 2: Yes, as a tool when students are active, for example. They can be outside, they can run back and forth, and then the iPad is a tool they can use ...

Teacher 1: ...as a notebook or ...

Teacher 2: Yes, they take notes, or take pictures, or use for documentation. It is something they got under the arm when bouncing around. They do not sit still and work on an iPad.

Teacher 1: They can...

Teacher 2: They can...

Teacher1: It's also great with headphones and lots of maths tasks. That's fine too.

(Teacher 1 and 2, our translation.)

The teachers' dialog shows that using digital technology enables the students to become active producers. They further explain how digital tools enable variation in their work, it's easier to facilitate at different levels of difficulty, it gives the ability to inquire upcoming questions in the middle of a lesson, and assessment practices are supported. For example, students can present from home, send a film where they talk, and the teacher can easily give oral feedback. The teachers explain how this avoids piles of written assessment work. Many of the learning tools used by the teachers, correct student work automatically, generating a report for the teachers. This is very timesaving, which gives more time for planning, which further improves teaching the teachers explain.

As part of becoming a digital school, the teachers stopped using textbooks, which many teachers find difficult. But the two teachers explained that they now find the textbooks limiting their teaching. One of the teachers explains how working digitally leads to the feeling of being freer when teaching. The teachers further explain that when using digital tools, you are able to work towards the themes and the competence goals, rather than following a book. This further leads to being more creative as teachers, compared to teaching from a book. One teacher draws an example from a science book that only describes 3 different birds. When teaching, this



becomes very limiting. Using digital tools, the students find different facts and can themselves choose what they want to inquire in depth. The teachers explain how their teaching can change depending on what happens in the class, since all classes are different.

From the interviews, we learned how the teachers use the tools actively. It is not about sitting in front of a screen, it is about using the tools actively to inquire about the world. As we read in the dialog between the two teachers, the students use the iPad to go in depth, taking pictures, documenting their findings. Choosing themselves what tool they want to know more about. The teachers feel they are not restricted to a book, but can inquire together with the students. Doing this they are more able to teach towards the competence goals, than they were previously.

### **3.5.2 Perceptions of changing a school to become digital innovative.**

In this chapter we will look at how the school owner representative, the school leader and the teachers describe the process when becoming a digital innovative school (and what characteristics were expressed as important for leaders)

#### **3.5.2.1 School owner and school leaders' description of becoming a digital school (and what was important characteristics for the school leaders)**

So, what changes did the school make to become more digitally advanced in their practices, i.e., where did the initiative come from? What did the school leaders focus on when changing the school to become more digitally advanced?

The process was initiated in the school year 2014/2015, by a former principal at a secondary school in the municipality. One of the teachers in this school was given the responsibility in the project named "*Utenfor bok(s)en*". Translated from Norwegian, this has two meanings: outside the book, and outside the box. The teachers should no longer focus on the book, when teaching, and to do this they would have to change their teaching and think differently. The principal at the school we are talking to, heard about the project and made a similar, but separate project.

In the conversation with the representative from the school owner, we learn more about this early start. When starting the process there were two models used for upscaling the digital use



for schools in the municipality. This was the SAMR model (Figure 3) and the Nesta Innovation Spiral (Figure 4).

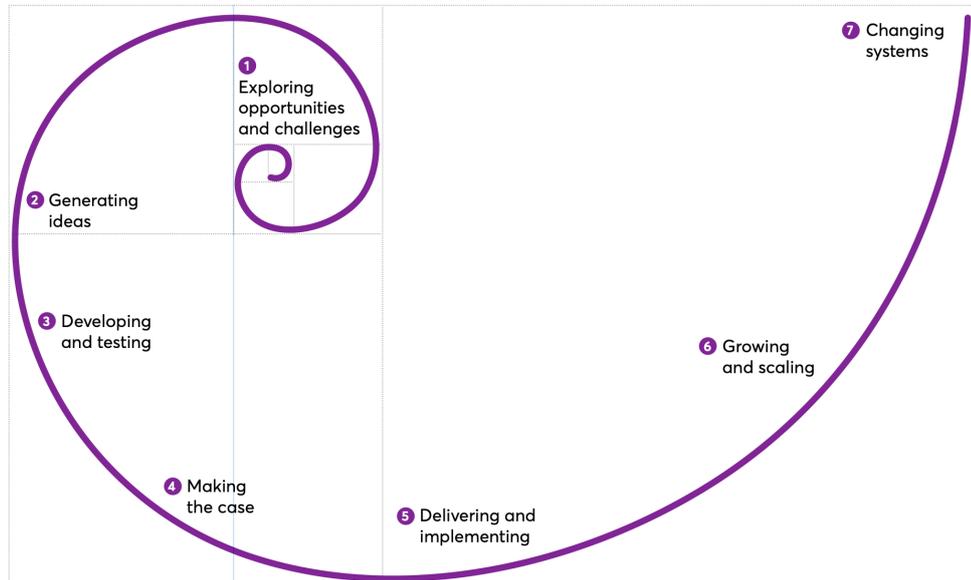


Figure 4. The Nesta Innovation Spiral (Breckon, 2016)

The school owner also emphasises another important prerequisite. Both schools were fairly new schools and had a good infrastructure making it easier to carry out such a project.

Now, leaving the upper secondary school, the school leader explains how the school had a desire to change the assessment practice at the school. The school was already a very goal-oriented school, and students were assessed both in autumn and in spring, with *"lots of assessment on high, medium and low goal achievement."* (school leader, our translation), hence they wanted to move away from leveled assessment, focusing on assessing basic skills (digital skills are one of the basic skills in the Norwegian school). This new focus was related to *assessment for learning*, but also a piloting project about digitising the school fit nicely into these new ideas.

The school leader worked as a teacher in this period (2015), and was asked by the principal to start working with digital tools in her class. The leader was positive, but also sceptical: *"I was very sceptical because I did not believe that there would be better learning, by putting a book into a screen. I still think so, and this thought is the one I still got. What we developed and achieved the first year, is because I don't think doing that provides more learning. The overall idea of digitization is that data and ICT should add something extra. It should add something new."* (School leader, our translation).



In the above quotation, the leader explains how technology should add something more to the teaching practice. The scepticism played a role in the process of changing practice. The leader also refers to another challenge, based on an episode in the early stage of moving towards a digital school. *"I met someone from middle school starting digitization a year earlier, where a teacher said, 'We don't get books, so I wrote the book myself.' We were very concerned about not falling into that trap as well. "* (School leader, our translation) The book is often an important part of teaching. Many teachers find support in using a book, being a challenge not to have one. Still, putting the book away turns out to be a key element moving towards a more digitally advanced school. The leader puts this in relation to a working process called *backward planning*. The leader explains backward planning as teaching based on the curriculum and not on a book, where the teacher decides the resources and content, not the book. Later, we will learn more of this aspect from the two teachers, explaining how the detachment from the book made changes in their teaching.

The leader characterises the school as a whole digital school, a process that took two years. The leader explains the role of the principal as very important. The principal gave much of the responsibility to a few teachers and made organisational and financial changes. The annual plans had a focus on improving digital practice, and they worked to find a common idea for their goals. In the process, there was also a focus on taking care of already good practice, creating a new mix. During the first year there was a focus on sharing experiences, leading to several teachers being inspired to participate in the process. Through the sharing it was more a focus to show the products the students made, rather than a focus on the tools. The teachers could see what the students produced using digital tools. The leader emphasises that they did not focus on digital vs the analogue, they rather focused on what students learn. The students learn when they use tools, whether these tools are digital or analogue. The teaching was planned based on what the students should learn, and how they can show what they learned. This is an aspect they worked a lot on; how students could show that they have learned. The leader emphasises the focus on sharing experience and good examples as a priority. There was also an understanding that the teachers needed time to play, research, and develop.

### **3.5.2.2 Teachers description of becoming a digital school**

Now we will learn how the teachers describe the process of becoming a whole-digital school. As the leader told us, the teachers also explained how the initiative first came from the principal. First, it was by no means the case that everyone was given digital tools. One of the teachers was asked to start, and from this teacher the practice spread to the whole teaching staff.



The teachers were asked if they wanted to start using digital tools. One teacher explains that she had an introductory class at that time (a class with students from several countries) and wanted to start. Using the iPad turned out perfectly. There were pictures and sounds, and the students could hear sounds both in their own language and in Norwegian. While the first graders could already make their own books. They began to increase the number of hours they used technology in the class. Eventually, the school received trial licences for several programs and got more variations in their teaching. The ability to listen to how the letter sounds and use a keyboard with sound, the teachers saw more motivation among the students when they could create texts themselves. Gradually, more and more teachers used these programs, though there was no pressure to use technology. It was still a pilot project. Eventually they experienced how the tools improved learning. As the school leader explained, arranging a conference on the use of digital tools improved the motivation even more. The teachers explain how the teachers who first started to work digitally had an inner drive to make this happen, and somehow decided that they wanted this to work.

Teacher 2: In a way, we wanted to become digital.

Teacher 1: And everyone should become digital.

(Teacher 1 and 2, our translation)

The teachers explain that they were learning from each other, and learning-by-doing. The teachers explain how they first learned a few selected tools and point out that they explored the tools together with the students. The students *"found out a lot. "Look at what I found!" "Wow! How did you do that? It's very good because I was wondering how that worked!"* (Teacher 2, our translation). The teachers describe how they had to change the whole idea about planning and teaching, exploring the tools together with the students. Since those teachers taking part in the digitization process no longer had textbooks, they could no longer work their way through the books -, from the first to the last page.

The teachers explain that it is possible that some of the colleagues felt a pressure for using digital tools in their practice, but they never heard anyone express any negativity about the process. There were even some colleagues going to retire, deciding to stay a few extra years since they wanted to be part of the process.

Listening to the story of how this school became a whole-digital school, we learned that the initiative in this school came from the leader. Rather than focusing on digital vs the analogue, they rather focused on what students should learn. The leader trusted some teachers with the



responsibility to investigate this new practice of using digital tools. We learned how the collective competence development spread in the teaching staff by sharing experiences, with a focus on students as producers. We also learned that the focus on using digital tools fit into additional priorities, such as changing the assessment practice, and focusing on the goals instead of the restrictions of a book. Putting the book away turned out to be a key element moving towards a more digitally advanced school.

#### **4. Conclusions**

This deliverable reports from interviews conducted in five countries with teachers, school leaders, and representatives from the school municipality. From the reporting of digital innovation practices currently in place in the participating schools we have learnt how different stakeholders characterizes innovative digital schools. We used a qualitative method to get a broad understanding of the phenomenon. The schools, and countries are different, and have different resources available to support the scaling-up of advanced ICT-based teaching practices. It will therefore not be plausible to do a comparison between the results from the different schools and countries.

Though the reporting from the different countries is not aligned in all characteristics of an innovative digital school, interestingly we find many similarities. Stakeholders describe having a strategy, a clear vision, a common understanding of goals and aims, and a collaborative culture as very important parts of scaling up digital processes in the school. One very important characteristic of an innovative school is the culture of sharing and collaboration between the teachers themselves and the leaders. Having the possibility for training, openness, time, and place for sharing within the school are also seen as important by the teachers. Another aspect is the practices of the leaders. Support from the school leadership is one of the main support mechanisms to develop an innovative digital school.

Teachers in an innovative school are teachers who are flexible, collaborate in planning and teaching, learn together and from each other. Openness and transparency about competence and practices are another aspect considered important. However, teachers do not accept the innovations “by force” and they have to accept them for their own learning practices. Trust between leaders and teachers is also mentioned by several as an important part of an innovative digital school.



The findings show that models supporting schools in developing digital innovative practices, should focus on a whole-school approach that include both leaders and teachers. The leaders will have a special responsibility in scaling-up innovative and advanced digital practices in developing strategies, making sure there is time and space for collaboration between leaders and teachers for the possibilities of sharing experiences.

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This project has received funding from the European Union's  
Horizon 2020 research and innovation programme  
Project Number: 101004676

