The Future of Learning

Providing assets for excellence in the next century
The world is changing, and fast. Digitalization is shaping the nature of knowledge, our culture of work and the way people collaborate with each other. It will open possibilities we couldn’t even dream of a while ago. All of this is also affecting learning.

During the hundred years of her independence, Finland has risen from a poor, peripheral province into one of the most prosperous and advanced countries in the world — and this has taken place primarily based on knowledge capital. Both decision makers and researchers agree that a high level of expertise will continue to be the most important asset in the future success of our country.

Microsoft, together with its partners, congratulates Finland on her centenary independence celebration by providing assets for the development of education and learning, to meet today’s challenges as well as those that lay ahead of us. This booklet, as well as the online portal microsoftmahdollista.fi/edutransformation gives practical tools for schools and teachers to help them accommodate their work to the 2016 Finnish Core Curriculum, and offers inspiring stories about how the current transformation — perhaps the most significant in the history of school — is being carried out in different parts of the country.

The booklet and the online portal are part of Microsoft’s corporate citizenship program in Finland. It sums up the three year long Learning Transformation North Star Program which has brought the globally recognized pedagogical approach of the New Pedagogies for Deep Learning (NPDL, www.npdl.global) to the Finnish educational scene.

We hope that you enjoy these stories and that they will inspire you to create new approaches in your work for the future.

Congrats, Finland, on your first century and good luck for the next one!
The future of learning — visions for the next century

From learning to deep learning

Technology in Learning

The Finnish Core Curriculum of 2016 and the New Pedagogies for Deep Learning (NPDL) -partnership

Stories on deep learning

Reforming learning environments

Game-based learning

IT-systems in the service of learning

Digital platforms for learning

Let's start coding!

The potential of learning analytics

Finnish education system in a nutshell
Thank you for grabbing this booklet! Be sure to also visit our website at microsoftmahdollista.fi/edutransformation. There you will find an online portal, which will open the future world of learning for you. 100 Stories on the transformation in learning tells real stories from schools (in Finnish), offers educational support materials, links to learning environments and games, videos from us and from around the world — ideas and inspiration for school work and life in general.

Microsoft has played a major role in adopting new ways of learning in Finland for several years, in the Learning Transformation North Star Program, together with domestic and international partners. During the three-year program, new pedagogical thinking has expanded from seven to 28 cities and hundreds of schools have had the chance to adopt the ideas of deep learning and digital tools in education. The work has been done in three pillars: vision- and policywork, learning transformation and digitalization. The 100 Stories tell about the successes of the program and encourage to continue the good work.

100 Stories on the transformation in learning
The tool set includes:

- For schools and teachers
  - A tool for the assessment of broad-based competences
    How far have the teacher and his/her students progressed in the mastery of the broad-based competences defined in the Core Curriculum of 2016? Professor Kirsti Lonka together with a group of the most esteemed Finnish researchers in the field of pedagogy have created a Tool for the assessment of broad-based competences. The tool which is published both in English and Finnish helps the teacher analyze how far he/she has reached the goals of the Core Curriculum. The tool is easy to use — take the test and start using the tool at microsoftmahdollista.fi/edutransformation

- For municipal IT-designers
  - An IT architecture model for municipal IT-designers
    We have also created an IT architecture model to help understand how IT services should be designed and what kind of elements they should include on the municipal level. This model can be downloaded in English and Finnish at microsoftmahdollista.fi/edutransformation

- For the education management of the municipalities
  - A tool for peer auditing among schools

Together with Finnish and international experts, Microsoft has developed practical tools to support the digitalization of the school system as well as individual schools. These tools can be downloaded for free on the 100 Stories on the transformation in learning website.

The great challenges of humanity are global. Policy makers around the world are wondering how to prepare children and young people to meet and overcome these challenges and what kind of skills they need for it. International studies such as the PISA of OECD have made education and training objectives and methods a matter of international comparison and competition.

However, more important and more fruitful than competition is cooperation. In Finland, we are involved in international development efforts in the field of learning, for example through the NPDL network, which currently comprises 1000 schools in 10 countries and 4 continents. Through this network, each participating school, teacher and students can enter into cooperation with their peers on the other side of the globe.

The Microsoft MIE Expert global network of teachers offers every teacher the chance to network and find further professional training. The Microsoft Showcase Schools network offers an international learning and mutual sparring opportunity at the school level.
The high standards of education in Finland is based on a clear national ethos that people are the most important asset of the country and that they need excellent education to help maximize their potential.

One of the greatest strengths of education in Finland is that it gives everyone government-funded equal opportunities to study, regardless of their social and financial background. Another asset are the teachers, who are highly trained, with university degrees. They are held in high regard.

Children enter school at the age of seven, with a year of pedagogically motivated preschool before that and quality early childhood education services available at affordable costs to all families. Teaching small children focuses on their inherent strengths and supports their sense of safety and the development of their emotional life and social skills. Teachers motivate pupils with encouragement. Performance is not graded with numbers until later in school years and there are no standardized national tests before the matriculation examination at the end of high school.

The universal nine-year-long comprehensive school is the bedrock of education in Finland. After completing this basic education everyone has the opportunity to continue in general and/or professional education according to their interests and inclinations. Continuing to study is possible in various forms throughout life. All education is free of tuition charges, from the pre-primary level to institutes of higher education and even further.

The Finnish government decides on the general objectives of education. The Finnish National Agency for Education decides on the national Core Curriculum, which gives room to local and individual emphasis and additions.

However, the Finnish education system faces the same challenges and transformation needs as the rest of the world. The PISA 2015 study also indicated that Finland needs to pay attention to the growing differences between regions and between pupils, to reducing the impact of the pupil’s home background, as well as to improving attitudes and motivation concerning education and learning, especially among boys.

Strong action to develop the school system has already been taken through the renewed National Core Curriculum, which has been implemented since 2016.
Early childhood education and care (ECEC)

Pre-primary education — 6-year-olds

0–6

Basic education
7–16-year-olds

Comprehensive schools

Voluntary additional year of basic education

Pre-primary education — 6-year-olds

Early childhood education and care (ECEC)

Primary education

Lower secondary education

Upper secondary education

Post-secondary non-tertiary education

Bachelor’s or equivalent

Master’s or equivalent

Doctoral or equivalent

Doctoral degrees
Licentiate degrees

Universities

Master’s degrees

Universities

Bachelor’s degrees

Universities

Bachelor’s degrees

Universities of Applied Sciences

Master’s degrees

Universities of Applied Sciences

Work experience 3 years

Specialist vocational qualifications*

Further vocational qualifications*

Matriculation examination

General upper secondary schools

Vocational qualifications*

Vocational institutions

* Also available as apprenticeship training

Liberal adult education

Adult education centres
Folk high schools
Summer universities
Study centres
Sports institutes

ISCED-classification 2011

0 Early childhood education
1 Primary education
2 Lower secondary education
3 Upper secondary education
4 Post-secondary non-tertiary education
5 Bachelor’s or equivalent
6 Master’s or equivalent
7 Doctoral or equivalent

1–1.5

1–2

3–4

3.5–4

5–6

6.5–7

7–8
The future of learning — visions for the next century
Learning is experiencing a more profound change than perhaps ever in the history of education — and it is happening right now. This change requires new thinking and approaches from all parties involved, from decision makers to the families of each pupil and student.

What kind of world are our children preparing for?

Andreas Schleicher, the OECD Deputy Director for Education and responsible for the PISA assessment has stated that, in the future, the world economy no longer pays for what people know but for what they can do with what they know.

During this century, work is transforming into something completely different from what it used to be. Technology will abolish a great deal of current jobs and will change all work radically. Work becomes more mobile, the limitations of time and place will disappear. There is much less demand for routine skills than today, but instead a great demand for specialized knowledge.

Whereas careers in the same job or same branch used to be even life-long, today’s children will probably have had many careers in different branches by the time they reach their forties — some of which we cannot even imagine yet. Alongside big industry there will be smaller corporate networks. Markets and branches are changing, and the development of new services and products requires cooperation between experts of different fields. Interaction between people becomes even more important and there will be unprecedented opportunities for enhancing it.

And if we used to try and assess the kind of skills a preschooler is going to need to be hired in a job twenty years from now, the question of the future is, what kind of skills the current preschooler needs to create jobs for themselves and others?

Why does the old model of school not work any more?

The core idea of school education has so far been to transfer knowledge and wisdom from the older and more experienced to the young. Teaching is divided into subject matters, the content of which is to be studied and repeated in exams. The basic structure of school and learning has been the same from the beginning of school — even the classrooms look as they used to a hundred years ago.

This model of learning served well in the world where knowledge was limited and stable. The school produced youth equipped with sufficient knowledge to serve a uniform society and to work by an assembly line or in the office.

This model of school does not serve the future. The amount of knowledge available is growing exponentially, and we have practically unlimited access to it. In this scenario, skills for finding and using knowledge become more important than studying some predefined set of it — although general knowledge will continue to be of value.

The transformation of education concerns us all!

Teachers are developing their work and interesting innovations are made in schools — but this is not enough. Because the transformation of education is a profound change in the way of thinking, it must extend to the entire learning community and all those who contribute to it: from legislators to municipal decision makers, from education management to each school, principal and teacher, all pupils and students as well as early childhood education and parents.

We all need to stop for a moment and reflect on what we need to know during this century and how to best learn it.
The Finnish Core Curriculum of 2016 and the New Pedagogies for Deep Learning (NPDL) - partnership

The new Finnish Core Curriculum of 2016 has changed and will change many things in the everyday life in Finnish schools. The education of today and tomorrow will emphasize skills, community-based practices, knowledge building, problem-solving, ongoing evaluation, self evaluation, as well as the use of technology.

To support this transformation in Finland, the Learning Transformation North Star Program has, during the past three years, introduced the world-renowned global New Pedagogies for Deep Learning (NPDL) framework in Finland. It is an international, systemic research and development program of learning, teaching and school culture, which provides tools and training for policy makers, local authorities and schools in the transformation of learning.

The NPDL movement is founded originally by the Canadian Professor Emeritus Michael Fullan and his colleagues, on the concept of deep learning, which consists of interaction with real-life challenges. Deep learning involves practicing the ability to manage and interpret existing knowledge by combining it with new information, in order to build new meaning. The teacher’s role is changing from a distributor of knowledge to mentor and promoter. The teacher’s job is to identify the students’ strengths and needs, to create understanding of real life and to guide the students in solving genuine problems. The new learning objectives require learning partnership, which includes both teachers, learners and their families. The students are required to take responsibility of themselves as well as others in and outside of school. Teachers need to embrace this transformation with courage, be active in planning and developing their teaching and learn to evaluate their own work.

With the support of the Learning Transformation North Star Program nearly 200 schools and kindergartens in around 30 municipalities have adopted the NPDL approach to pedagogy. The program will continue in the Finnish municipalities, with the support of Educode, a government-owned consultancy company specialized in the development of education. Educode is constantly recruiting schools and municipalities to join to program.

Want to learn more about NPDL? Read more about the global NPDL movement: www.npdl.global. NPDL in Finland: www.educode.fi/npdl/
7 broad-based competences

The Finnish Core Curriculum 2016

Aiming at personal growth and growth as a citizen

Thinking and learning to learn

Cultural competence, interaction and expression

Self-care and everyday skills

Multiliteracy

Information and Communication Technology skills

Working life skills and entrepreneurship

Involvement and activity in building a sustainable future

6 deep learning competences

NPDL

Character

Citizenship

Collaboration

Communication

Creativity

Critical thinking

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The change begins from decision makers

The profound change in learning will require strategic decisions at all levels of the government. All decision makers have experiences and memories from their own school times, but the future cannot be built on those.

According to a study carried out before the 2017 municipal elections in Finland, the decision makers of Finnish municipalities have a positive attitude towards education and learning, and they consider these important. Despite this, actual everyday life in schools, the new Core Curriculum and the future themes of learning are quite foreign to them.

Education is becoming by far the most fundamental area of municipal decision-making. Regardless of their own professional background and experience, decision makers need to know the requirements of future learning, in order to provide Finnish children with what they need for a successful future.

We will need understanding, imagination and courage to meet the challenges of the future and to renew the school.

What does an innovative school look like?

In Finland, there are already dozens of schools on the road to reform. Certain common features describe their culture:

- Innovative schools approach tasks by process thinking — every stakeholder understands the entirety of the organization and their own part in it. Everyone is also committed to a cyclic mode of development consisting of:
  1. a clear new objective,
  2. the creation of a new innovation in order to meet the objective,
  3. putting the innovation to work,
  4. assessment of the results and
  5. further development of the original goal.

- Schools have the ability to create, acquire and transfer knowledge, and to transform their own actions to reflect new knowledge and concepts. Data acquired through technology and analyzed by it is also important for the development of the school on a systemic level.

- Innovative schools use new technologies primarily to increase the ability, courage and creativity of their students in building knowledge individually and in groups. Technology can also recommend individual contents and study paths to the students.

Renewal requires strong leadership

Education renewal does not happen by chance, it requires active leadership. The world can no longer be changed from top to bottom, or by charismatic leaders — change is a dynamic, community-based process. In the modern world, leadership means mutual support, interaction, creation of a common vision, and engagement in it. School principals play a key role in the creation of a new culture.

The New Pedagogies for Deep Learning includes mutual sparring and constructive evaluation within and between schools.

Five tips for managing change

Educational Counselor Martti Hellström has been responsible of training principals in the management of change in the Learning Transformation North Star Program. Mr. Hellström gives five tips for the management of change:

1. Focus first on your own thinking and make sure you understand the kind of change you are leading. Which activities will cease, which will be reduced, which ones continue to grow, and what completely new features will need to be introduced? Then take a strong leadership in the change and prioritize the new pedagogies.

2. Do a benefits analysis and sell the change with the benefits.

3. Listen carefully to the emerging opposition and examine the arguments carefully.

4. Together with everyone involved, make a clear plan with a timetable and an outline for distribution of responsibilities.

5. Make sure that you identify the emerging problems and resolve them quickly according to the procedures agreed within the community.

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From learning to deep learning
Learning is changing from knowledge distribution to a profound development process of thinking and skills. The role of the teacher as well as the student will change, and the importance of communication and creativity will grow. Digital learning platforms allow each learner to design their learning to suit their individual needs and styles and the analysis tools will provide teachers with precise information on the kind of support his/her students need.

What is deep learning?

Deep learning is real interaction with real-life challenges, and thus meaningful in a profound way. It involves practicing the ability to manage and interpret existing knowledge by combining it with new information, to build new meaning. The acquired information does not remain on a superficial level in the student’s mind, but will be experienced and processed in a deeper level and stored in his memory. According to the NPDL pedagogies, deep learning progresses step by step from limited evidence of skills to proficiency.

Deep learning is not limited to the school, as learning happens regardless of time and place. Knowledge is actively built also on spare time. If the family comes across, for example, a historical site on a holiday trip, the student can post information on it in an electronic notebook. The data will remain in the file, and the student will be able to get back to it at school.

The students’ goal is to become creative, collaborative problem solvers. They are encouraged to do more and more for themselves, influence their environment as well as to seize the opportunities that arise in their life and career. They develop skills for active citizenship and creating new innovations for a complex, digitalized world.

Renewing lessons

If you ask anyone from a preschool kid to a grandfather to draw a picture of a classroom, he will draw the teacher teaching in the front and children receiving information and knowledge in neat rows.

The school of the future does not, however, follow this configuration. The teacher will change from being a dispenser of information into a pedagogical expert, organizer, facilitator, promoter, and coach. Social and emotional skills will take a major role in the capacities of the teacher.

According to the new pedagogies, a learning situation will proceed as follows:

1. First of all, the student needs to understand what the knowledge or skill to be taught means. Concepts must be explained. For example, it is not enough to ask the children to behave properly, but there needs to be common understanding on what proper behavior means.

2. Create a situation that enables learning.

3. The children are given an opportunity to practice the skill in a natural environment, taking into account their age and stage of development. Do not do things on behalf of the children!

Example: A first grader and rotten apples

There was a first grade teacher who gave her students a task concerning their day-to-day environment, with the following instruction: “when you encounter a suitable theme:

1. take a photo,
2. make an interview with an expert (the expert can be anyone) and
3. then write a short description.”

A little first-grader boy took an interest in trees. An apple tree in his own back yard puzzled him. The tree had begun to produce rotten apples. The boy took a photo of the rotten apples. His father went to a garden shop to ask what it was all about and what had to be done. He learned that the apple tree was infested by monilinia fructigena, and got instructions to destroy the tree and plant a new one. The son videoed his fathers interview. A kid his age won’t write a long report, but he did manage to scribble a few lines. He brought the picture, the video, and his report to school and shared it with others.

His work was talked about in class. Not only did all the pupils learn something about the apple tree and the monilinia fructigena problem, but the teacher took the opportunity to build new information around the story: he asked, what other kinds of trees exist, what kind of fruit grow in them, where do these trees grow, and so on. The boy who studied the apple tree got practice in using both a pen and digital tools, in building information, communication and interaction. This means he practiced all the skills that cannot be studied by reading a textbook and which the boy is going to need when he enters working life.

Young entrepreneurs teaching information technology

The new Finnish Core Curriculum also includes employment and entrepreneurial education. Many schools use the materials provided by an NGO called Nuori Yrittäjyyys ry (Young Entrepreneurship, part of JA Europe and member of JA Worldwide) and set up special youth businesses.

One such was a business called SAATE Ny, established in the Kirkkojärvi School in the city of Espoo in 2014. The digi-native ninth graders turned the roles around. Their business idea was to train teachers in Microsoft Office 365 programs. In addition, they taught the use of computer and equipment installation.

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The problem of the bike racks as an opportunity to learn

Principal Vesa Äyräs of the Juvanpuisto School in the City of Espoo tells the following story:

“...Then I realized that by doing that I was taking a learning opportunity from him. So instead, I asked him to do a report on the bike racks: how full they are, how the load is distributed, whether the weather affects their use etc. The student observed the use of the bike racks for two weeks and drew up a report which he then presented to the janitor. Not only did he serve the entire school community, he also got to practice many essential skills he will need in life and in his future work.”

Communication Deep Challenge in Oulu

The sixth graders of the Oulujoki School took up the communication challenge of the Deep Challenge Series in the autumn of 2015. They studied, among other things, the means of verbal and nonverbal communication, cultural differences, as well as successful and unsuccessful interactions and they did this in international cooperation. The final product of the project was a set of videos about nonverbal communication.

Students planning their own learning

All Vantaa city high schools have participated in the Learning Transformation North Star Program. In Tikkurila High School, the principals have spent some time with each teacher individually to elaborate the questions of deep learning from their perspective. Critical thinking and collaboration have been considered the main themes.

The teachers of the school have carried out experiments on reorganizing school work: for example, Swedish and Mathematics courses have been combined, and in the spring of 2016 there was a course called What Shall We Do Today, the contents of which were defined by the students. Principal Ari Ranki sees great opportunities in this:

“When the student understands that he is personally responsible for his own learning, it will contribute to his success in the final exams. It is the responsibility of the teacher to explain why things are learnt.”

Deputy Principal Saija Tynkkynen has had the students practice the use of communications technology with a future-oriented housing task in mathematics. First the students must determine their own life situation in five years’ time: what job they will have, where they live etc. and then search the Web for information on how the daily expenses in this situation accumulate.

Read more on this topic in general: Deepchallenge.org
The new ways of learning also require reform of the physical learning environments, and the introduction of technology on a large scale. The classroom of the future is flexible and it encourages students to act, interact and create — and it is, of course, comfortable. Classrooms of this style have already been built in schools in different parts of Finland, in a cost-effective way and in accordance with the principles of sustainable development.
Future education will profit from a lot of functional ideas that have been developed in the digital game world. This does not mean using games to make school only more fun, but creating rich, collaborative learning experiences. Game-based learning means primarily the application of characteristic elements of games, game design and mechanisms in learning.

In a game-based educational event, the learning task is divided into logical sections, and the participant will be rewarded as he progresses in the learning objectives. Substance mastery, collaboration, sharing and creative thinking are worth rewarding. However, the internal desire and enthusiasm of the learners are more important motivators than collecting rewards. In a game-based learning event they must have a genuine opportunity to influence and choose. The aim is to provide a positive learning and emotional experience for everyone.

In game-based teaching methods, the teacher provides learning resources and encourages cooperation and trials. When necessary, the teacher provides new tools for thinking. Learning games can also be international and the playmates from the other side of the world. This situation simulates the model of cooperation in many workplaces.

The fast-changing future world of work requires willingness to take risks and tolerate uncertainty, and this must become a part of the school culture. Everyone in school should be allowed the opportunity to try, even without immediate success.

Here we have a lot to learn from the world of games.

Jack may receive a poor grade in school, after making a lot of mistakes in a test, and this doesn’t feel good to him. The same Jack doesn’t mind at all, when he hits “game over” on the screen of his computer game. He plays the game again and may reach the next level in the following round.
The Minecraft game world offers an unlimited learning environment

*Minecraft* is a game developed by Markus Persson from Sweden. Published in 2011, the game has reached more than 100 million registered users. It is one of the most popular games of all time, and has a lot of players in all age groups.

In the Minecraft world you first build a small house to huddle in when the night falls. After that, imagination is the only limit — the player can build a tree house, a giant castle, an undersea research facility, or anything else — the open game world is theoretically infinite. It is made up of solid 3D-cubes, which can be removed and repositioned. The player can use a variety of materials, which he buys in different ways. Key game features include, among other things, the manufacturing of objects, digging, fighting, adventures, farming, animal breeding and building. The game doesn't have a definite goal.

In October 2016, Microsoft released *Minecraft: Education Edition*, which is available in 11 different languages in more than 50 countries. *Minecraft: Education Edition* develops many broad-based competences, such as investigative and creative work, collaborative learning and problem-solving skills. The game offers a creative learning environment, where you can actually build a lesson on any theme, visualize, and carry out projects, as well as explore different topic areas. When teachers get to master the new features of the game, they can collaborate better with their pupils and use the game-based learning tool in the learning process.

*Minecraft: Education Edition* also contains a classroom, where teachers can change the settings, communicate with students, provide goods or transfer students in the Minecraft world. The application displays a map of the Minecraft world, a list of students, the settings and a chat window.

You can start by visiting the *Minecraft: Education Edition* website education.minecraft.net
Technology in Learning
Technology has a key role in the future of learning — it is not a subject matter among others, but the platform on which all learning takes place. New technology and algorithmic thinking can be used to get deep into the learning process, to support and to analyze, and to provide unprecedented tools for creativity.

Digitalization reaches much further than mere devices

E-books, PDF files, and other digital material is already used in school, at least in high school. Electronic material is good, but is, after all, only traditional material in an electronic format. Digitalization involves a much greater transformation. It is, in fact, changing the nature of learning on a very deep level.

The digitalization of learning allows for the inclusion of the learners. The current technology enables the creation of truly personalized learning experiences that support new learning and curriculum objectives. New technology also helps to identify students with learning challenges and provide support to them before they drop out.

Principals, teachers, management and other staff of educational institutions will also benefit from it. New technology offers them good tools to work more efficiently — so that technical tools are not a burden but a facilitator, and even fun. These include, among other things, effective sharing of information and other forms of interaction.

The new technology also allows for more efficient management of everyday processes. Many tasks that have required work can be automated. Things will be done in a sensible way, saving time and money.

Digitalization can also be used to create something entirely new: solutions and services that take studying and learning to a new level. And this is not about the hardware, but what they are used for — and, above all, the deepening of interaction between people.

Pen or keyboard?

A word about the devices, even if digitalization is not primarily about them. The choice of device affects learning. Research * shows that technology can either support the thinking and problem-solving ability and creativity of the students, or limit it. At worst, the students’ thinking and behavior are modified to suit the technology available.

The keyboard seems to facilitate work as compared to writing with a pen, but the pen has considerable advantages:

- Pens adapt to our thinking. They can be used to convey words, symbols, numbers and graphs.
- Compared to touch screens, a pen supports more accurate writing and development of thoughts, which is required for breaking down concepts, deeper understanding and learning.
- The use of pen reduces cognitive load and thus improves learning. The use of a pen is already largely an automation in our brains, and makes use of existing templates in the brain. Interfaces that reduce cognitive load and improve average performance also reduce the level of disparity between students.
- Writing with a pen affects the brain directly. Children learn letters better by drawing than by looking at them.

Learning is best served by the use of a digital pen, because it supports sharing, storing, commenting, repetition and the recycling of contents — also virtually with other users. The pen interface is often included in devices with other interfaces such as voice, touch, and the keyboard, which can be interchanged smoothly. This option supports a broad range of content production, flexible collaboration, thinking and learning, as well as the development of effective pedagogy.

A digital pen improves learning outcomes in mathematical and scientific subjects as well as in writing essays and making notes. The use of a digital pen increases the students’ ability to generate ideas, solve problems, communicate and develop complex ideas, to make accurate findings as well as to learn while taking notes. In writing foreign languages the students produce 30–60% more ideas and better sentence structures with a pen than with a keyboard. Also in many language subjects the keyboard limits the scope of expression while the pen supports it.

* Oviatt, Sharon: Computer Interfaces and their impact on learning

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Moving to the cloud

The goals for IT infrastructure are defined in collaboration with the participating municipalities and schools. All the services offered by Microsoft aim to respond directly to the challenges schools face.

Situation before: Access to services limited

Previously all connections to the schools services were limited to the school premises. The goal is to move away from this model in the next 5 years.

IT-systems in the service of learning

Azure

Acts as a directory connecting students, schools and apps

Microsoft Intune

Enables one login to enter all services, such as 3rd party apps

Various 3rd party apps

Data centers

The students can now login to their Office365-account from any device, anywhere
The cloud and the role of IT management

Today, almost every school owns its own equipment, servers, storage systems and networks. This means a large number of equipment, which often takes up the entire IT budget. Much less funds, if at all, are aimed at data and applications — which constitute the actual body of work.

**The introduction of the cloud** is now turning this structure upside down. Devices and infrastructure take up fewer resources, because the schools do not need to own them. The funds can be directed to data and applications, which create actual value to learning.

Therefore, the digitalization of the operating environment is not primarily carried out by purchasing equipment, but by defining objectives and the means and services to achieve them. User-friendly infrastructure allows access to information and services regardless of devices, time or place.

To achieve this, the entire information technology systems at the municipality level must be assessed and transformed accordingly.

**From confusion to a smoothly running service**

Currently, most schools use a number of different, separate systems and services. This causes problems to students, teachers and administration, as there are parallel services even for the same purpose, and people are unsure of which to use for each purpose. In addition, each service requires different usernames and passwords.

From the user’s perspective, it does not matter where the services are provided from as long as they work. However, a system that is growing constantly more complex is a logistical challenge for the IT administration. Security risks may become unmanageable and unnecessary costs occur.

In the era of cloud services, it is important that organizations make clear decisions on the services being used and on their support.

We at Microsoft have built ready-made infrastructure architecture templates. The systems migrate gradually to cloud and a hybrid model is used in the transitional phase. More information on this can be found in the IT architecture model, from the address [microsoftmahdollista.fi/edutransformation](http://microsoftmahdollista.fi/edutransformation).

**The new role of the IT management**

The growing importance of technology will also change the role of the IT management. It has previously been responsible for the operation of equipment, networks and technical support services. Today, procurement is planned and budgeted for a long time to come — one year is a long time in the current computer technology. The devices are expensive, and a big part of purchases have failed or been outdated already at the time of purchase.

In the future, IT management is at the heart of learning and teaching, and producing solutions for its service. In the modern IT scene, short-term trials of a couple of weeks can be made in order to find appropriate services and solutions. In the era of cloud services, these experiments are not high risk, because they do not require investment in equipment.

The newly appointed IT Manager **Tuukka Soini** of the **Omnia** Joint Authority of Education in the region of Espoo has a mandate to develop the role of technology in the organization to a whole new level. He uses the NPDL tools of systemic thinking, according to which the systemic change must be managed at a wide enough range.

The first thing Mr. Soini did was that he froze the acquisition of any new equipment in order to assess the needs of the organization as a whole and not spend the diminishing resources in individual purchases.

“Technology and pedagogy must be developed hand-in-hand. It does not change anything, if the students continue to sit in the classrooms, going through the same content at the same time using a laptop instead of a book. A real digital revolution means the expansion of learning beyond classes and workshops into the world, and from traditional school times to suit everybody’s individual timetables. It also means the use of digital communication and media equipment, and the chance to prove the acquired skills by video clips, for instance”, Mr. Soini says.

www.microsoftmahdollista.fi/edutransformation
Digital platforms for learning

Digital learning platform is a web or mobile application used to support learning.

A learning platform can be used to write, publish, read and comment on the study material — texts, images, videos, exercises and the like, as well as to complete assignments and return them electronically. It can be used in the classroom, at home, or anywhere where there is access to a computer or a mobile device. Advanced learning platforms also include learning analytics to help the teacher as well as the learner monitor progress and find personalised learning material to support learning.
Claned — a Finnish learning platform conquering the world

The fastest growing Finnish digital learning platform is Claned, produced and published in 2016 by the startup company Claned Group Oy, which was established in 2013. The company is growing fast, and the platform is currently used in several European countries as well as India, Australia and Indonesia among others.

The Claned learning platform is hosted on Microsoft’s Azure cloud and features all of the services of an advanced digital learning platform. Study materials are always available and organised, as well as all the comments accumulated during the learning process, assignments, practical work and data concerning learning. The program recommends materials and study buddies to suit the pace and interests of each learner. The student can do assignments and tests in the Claned platform. The teacher can reach the entire group through it and keep track of everyone’s studying efforts.

The browser-based Claned is independent of devices and operating systems. As students use Claned in their free time and holidays, their work can continue in the world beyond the classroom — learning takes place everywhere and at all times.

The Claned learning analytics analyzes the students’ work at all times, and it does not require any special effort by the teacher. The teacher finds all the information he/she needs about the progress of individual students and the group. The analytics will tell the teacher, who need special support, who do not finish their assignments, and who are at risk of boredom by assignments that are not challenging enough. It helps the teachers do their job a lot more efficiently than the traditional means.

The individual Claned account moves with the learner from one school and institution to another, and all the accumulated data and material will remain in a safe place. The organizations purchase the service for their staff and students, but it is free to the end user.

Claned is used by all types of learners, educational institutions and courses – primary schools, high schools and higher education institutions. It is also used e.g. for the training of personnel of the United Nations, the Western Australian Catholic Schools and the Economic Information Office of Finland providing business administration courses to high school students. The City of Helsinki Education Department has acquired the Claned learning platform for all of the city’s teachers starting from fall 2017.

The Claned Group develops its service in cooperation with Microsoft.

Check it out and create your own Claned account: www.claned.com

Digital natives and the teacher’s role

The school children of today and tomorrow are digital natives, meaning that digital services and tools have been a key part of their environment throughout their life. They can be fluent with devices and may sometimes be able to advise their teachers on how to make some device work and how the cables should be connected.

In spite of this, the teacher must take the pedagogical lead in the class and also in the digital environment. Claned an easy to use tool for the teacher provide a safe and constructive learning environment.

Supporting a cooperative culture

The Claned digital learning platform encourages teachers and schools to cooperate. The more people using the platform share their materials with each other, discuss and bring their experiences and best practices into common use, the better the learning platform enriches the learning experience for all.

Encouraging dialogue and cooperation in the digital transformation of learning has been a key element in the further education for teachers provided by the Microsoft Learning Transformation North Star Program. This work continues in the municipalities, in the form of training courses offered e.g. by Educode consultancy and education services and The Claned Group.

Check it out and create your own Claned account: www.claned.com
Let’s start coding!

The future civic skills include not only the use of IT but also an understanding of how it is built and the principles of its function. This is called algorithmic thinking, and is also part of the new Core Curriculum of Finland. According to the Core Curriculum, each student learns the principles of algorithmic thinking and to program simple programs, at latest in secondary school. Programming skills are not the main objective, and not all will become coders, but it helps learn new ways of thinking.

Micro:bit gets everybody programming

**BBC micro:bit** is an easily programmable, palm-size sheet computer, which can be used for small school children in education. It can be programmed by editors using a PC, tablet or mobile device. The micro:bit can be used for the construction of all types of equipment from robots to music instruments.

The micro:bit has a variety of features, such as 25 red LEDs to display messages. The device has two programmable push buttons, that can be used as joysticks or as “pause” and “skip” buttons for a playlist. The BBC micro:bit detects movement and direction. It may be connected to other devices and the Internet via Bluetooth or a USB cable.

The micro:bit has many uses in education. It gives a chance to design and develop new services, teaching tools, solve problems, have fun — kids turn from information technology consumers to producers. The simplicity and versatility of the device make it an easy and fun way to start digital experimentations.

The devices are very affordable — the entire class can be provided with them for the price of one laptop computer. The Micro:bit Foundation and partners offer a wide variety of teaching materials for broad-based learning. Learning support is available in the form of training courses, technical support, voluntary help, a variety of activities, tutorials and more in-depth projects. Micro:bit Foundation network services, educational resources and projects are free of charge.

Learn more: microbit.org
Finnish girls* want more practice in STEM subjects

62% understands the importance of STEM subjects
Only 37% sees themselves in working in the field
75% hopes for more practical training
27% says they do not have enough female role models
44% wishes more encouragement from parents

It revealed six important factors for getting women interested in science:
1. Practical experience and practical training in science subjects
2. Equal treatment for men and women in science and technology careers
3. Female role models in the field of science and technology
4. Teachers encouraging girls to study science
5. Parents encouraging girls to work with science and technology
6. Understanding how science can be applied in practice

Girls and technology

Today, about 90% of 16 year-olds interested in coding are boys and only 10% are girls. The reason for this is clear — coding education is not included in the curriculum and coding has taken place entirely on their free time. Support and enthusiasm has had to be found in their own environments, and this has been the case mostly in boys’ groups.

The girls’ lack of interest in technology is a challenge, not only in terms of equal development and employment opportunities, but also to the success of the technology industry. It needs a variety of perspectives and know-how, in order to flourish. The information society cannot be built without the contribution of women.

A recent study by Microsoft explains how girls and women can be encouraged to study mathematics, science and technology. A total of 11 500 European girls and women took part in the study.

11,500 11–30-year-old girls and women in Finland, Belgium, the Czech Republic, France, Germany, Ireland, Italy, the Netherlands, Poland, Russia, Slovakia and the United Kingdom took part in the Microsoft STEM study in 2017.

"The new Core Curriculum of 2016 helps students learn digital skills and brings phenomenon-based learning to schools. We will help young women get excited about science and technology, when we provide chances for practical training in school, at home and hobbies."

Kati Tiainen
Director, WW Digital Learning Strategy Team, Microsoft
One of the coolest digital innovations in learning is Learning Analytics, or programs that deal with the data generated in school work, for understanding the different ways of learning, its progress and challenges.

An increasing number of educational institutions are starting to use digital platforms in just about all learning. Learning analytics means the use of analytic tools in these digital environments. Analytic tools provide the teacher with efficient information on the students’ learning styles, special needs and risks. The teacher can, for example, instantly check who in the class have done their homework, or how and where the students have searched for information. Analytics tools can also suggest learning materials and other content for learners themselves, according to their individual needs and orientation. They provide a valuable aid in the prevention of social exclusion.
Steamlane analytics service helps in the fight against social exclusion

Every year, more than 8% of the Finnish vocational education students, or more than 10 000 students quit their studies and do not achieve professional qualification. The risks are great, to the young people at risk of social exclusion themselves and to the society as a whole: How do they find a meaningful place in the world and grow to be productive members of the society, instead of creating high costs and human tragedies, in case they drop out of working life? The vocational schools face the challenge of balancing their expenditure with student-based financing.

Together with learning experts, Steamlane, a Finnish education analytics start-up founded in 2015, has developed a data-analytics service, whose elements are:

1. An analysis model for the prediction of dropping out of studies, based on data collected at the vocational institute.
2. Analysis model for recommending support measures.
3. Meters for supporting decisions and measures.

The purpose of the service is, therefore, to find forecasts and recommendations from the data generated in the school. This will allow for earlier and more effective support for the students, at a point where they do not yet have insurmountable problems, but there is a risk of delay or, at worst, interruption of studies.

It is essential that the new information and recommendations derived from the data leads to actions and decisions, because without them, this new information will remain useless. This often requires a reform of the practices of the Institute.

Steamlane Oy, founded in 2015, has developed its pilot program in cooperation with Tredu (Tampere vocational college). The used technologies are based on the Microsoft Azure cloud as well as on the Microsoft Power BI Program.

Check out the services of Steamlane here: www.steamlane.com, info@steamlane.com.
Microsoft supports, develops & helps

The Global mission of Microsoft is to empower every student to achieve more. Technology is a good servant to pedagogy and can help provide possibilities to the classroom that are otherwise impossible to obtain.

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