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INNOVATIONS IN THE ILE PROJECT: A PRELIMINARY SYNTHESIS

This synthesis draws on the large pool of ILE cases (the ‘Universe’), the more in-depth case studies (the Inventory), certain other examples, as well as wider literature in order to lay out the findings emerging from the ILE fieldwork. It is, as yet, only preliminary and will be substantially revised prior to any publication in 2012.

Different authors were responsible for the different chapters (as referred in each case). The structure of chapters is:

Chapter 1: Cases and Innovations in the ILE ‘Innovative Cases’ Strand

Chapter 2: Launching and Sustaining ILEs: A Preliminary Analysis

Chapter 3: Organisational Features in the ILE Cases

Chapter 4: Who is the Learner?

Chapter 5: Innovation in the Role of the Learning Professionals

Chapter 6: Rethinking Content

Chapter 7: Rethinking the Use of Resources

Chapter 8: Technology-rich Innovative Learning Environments

Chapter 9: The Nature of Learning in the ILE Case Studies

CHAPTER 1: CASES AND INNOVATIONS IN THE ILE “INNOVATIVE CASES” STRAND

An “innovative learning environment” in the broad specification for the “Innovative Cases” strand meets the following criteria:

- It serves the learning needs of *children and adolescents* (approximately aged 3 to 19 or some band within that), whether exclusively or in mixed-age environments.
- It is an intentional departure from the traditional approach of the large body of general or vocational education in its own context – i.e. it is *deliberately innovative*.
- It refers to *holistic learning arrangements for learners in the same context through time*, rather than very part-time supplements to the main menu of learning they experience. Hence, it means more than particular learning episodes or even courses.
- It is not reliant only on the charisma or commitment of a single innovator(s) but it enjoys a *broader organisational foundation* and it does not depend on highly elevated tuition fees that might severely limit its *potential to be replicated*.

While an ILE may be generated by a general initiative or policy promoting innovation, an ILE is not the same thing as a general initiative (such as a policy drive to teach mathematics in a new way): the project is examining real cases on the ground rather than broad intentions. This also means that our focus has been on cases with a track record that are embedded in practice rather than prototypical experimental ideas, however promising, that have not yet been implemented.

While many of the ILEs of interest to us are located in places called a “school”, we have deliberately avoided the language of “innovative schools” as well as definitions couched in terms of “classroom”, “school”, leadership structures etc. Such terms focus on the school as an institution, not on how learning is organised. Moreover, not all the learning of interest to us takes place in schools or classrooms and in some cases the learning environment is partly or entirely outside the formal school system.

The focus is thus on the *full-time, over time* experiences of the learners involved as structured by this ensemble of factors rather than on particular episodes, lessons or even courses. It is on *mix* of activities and arrangements, not on particular “treatments” or pedagogies taken in isolation. It is also more *holistic* than a common understanding of “environment” as a setting for learning (e.g. a physical or technological or social environment).

The Project ‘Universe’ and ‘Inventory’

The pool of cases accepted into the ILE project has been termed the project “Universe”. This pool of innovations is not fixed: it is continuing to expand, both as new systems and organisations join the project and as we successfully identify new cases that fit our criteria and have been willing to complete the template document (see Annex)..

So far, the current Universe contains cases primarily submitted by the participating systems and organisations. There are around 120 to date. In the current phase of the ILE project, we are identifying new examples so that this will grow to around 150 innovations. These have all been drawn on the

current synthesis, and the chapter on “tech-rich” cases in particular looks beyond the innovations put together as part of this exercise to include others that are relevant to the analysis.

With our focus on dynamics and quality, however, the self-reported profiles did not offer a sufficiently robust evidence base. It is to capture this richness and complexity that the ILE project in its second strand has sought to investigate particularly interesting ILE cases already in the main pool with more detail and rigour. These we have termed the Inventory.

The selection of cases to the Inventory was made by the international ILE team, and the research carried out in the participating systems to a shared framework using independent researchers. Over 30 such case studies in different draft forms have been received so far of which those most complete have been made available to the Banff conference. The chapters on the origins of the innovations and on the nature of learning in particular have relied especially on these more in-depth sources.

The case studies conducted for the inventory of innovative learning environments address the following *four* areas:

- A. The *aims of the ILE and the nature and history of the innovation*, including relevant contextual factors and the strategies used to implement, sustain and develop it.
- B. The *structured patterns and characteristics of the learning environment*: the cross-sectional and through-time configurations of learners, teachers/facilitators, knowledge and content, pedagogies, sequencing and assessments; and the use made of facilities and space, technologies, and community resources.
- C. The *nature and quality of the learning* taking place in classrooms, workshops, laboratories, and in the non-formal and other settings.
- D. The *impact and effectiveness* of the ILE: compiling the documentary and other evidence as it exists on such outcomes as those conventionally used in education (achievement and attainment levels, drop-out, graduation, etc.), those specific to the ILE’s own aims and philosophy, attitudinal and motivational indicators, and the so-called 21st century competences.

The “Learning Environment” Framework and Innovations

For the ILE project, a “learning environment” refers to:

The ensemble of the key ingredients – learners, ‘teachers’, content, resources, organisation (pedagogies, scheduling, assessment etc.) – in dynamic interaction with each other over time, in the same context and replicated for different groups of learners in that context.

This refers to any such environment, innovative or not. It is particularly useful for the ILE project as it allows us, first, to clarify what we mean by a “learning environment” and then, second, to identify along which dimensions it is innovative – how many of them and in which combinations. This has been adopted in this synthesis with separate chapters on organisation, learners, learning professionals, content, and resources.

Examples of innovative approaches on these dimensions are:

Innovations in the profile of the learner:

- New groupings or profiles of learners (e.g. novel age mixes)
- Targeted approaches for specific groups of learners (e.g. populations on the move).

Innovation of those engaged in teaching and orchestrating learning (the “teacher”):

- Innovations in how teaching resources are combined or organized (e.g. team or multi-disciplinary teachers)
- Bringing in different experts or adults or peers to work with or instead of teachers (e.g. members of the community or non-school specialists).

New foci for content and knowledge:

- Shifting focus of what is the primary objective of the learning (e.g. values, multi-disciplinary approaches, creative expression, 21st century competences)
- Innovations in who defines legitimate knowledge (e.g. co-constructed “curricula”, learner or other group definitions of content).

Innovative forms and uses of infrastructure, resources and technology:

- Innovative use of educational space and infrastructure
- Novel pedagogical materials and sources of knowledge
- Additional forms of non-traditional resource applied in the learning environment (e.g. community resources of different kinds)
- Innovative uses of technology, whether using innovative technology or using technology in innovative ways to do things conventionally done otherwise.

Innovations in organizing learning

- New forms of scheduling over the learning day, week, month or other unit
- Experimental or non-traditional pedagogical approaches
- Innovative mixes of groupings in terms of e.g. abilities or size of working groups (use of lectures, tutorials etc.)
- Innovative uses of assessment, in combination with other aspects of teaching and learning
- Particular approaches to individualization, guidance etc.

CHAPTER 2: LAUNCHING AND SUSTAINING ILES - PRELIMINARY INSIGHTS¹

Introduction

There is wide agreement among professionals in education and educational researchers alike, that leadership and change have become core topics in the field of education. Whereas there was little systematic research on issues related to educational change until about twenty years ago, the acquisition of “change knowledge”, a subtle understanding of the complexities of innovation and change in education and “what works” to create sustainable change has become a core question. Little of the research on innovation in schools conducted so far is cross-national. Most studies look at leadership and change within smaller units of education systems, such as individual schools, school networks or schools boards.

The ILE database therefore provides for a unique opportunity to take a broader, cross-cultural look at innovation and change, the leaders driving it and the contextual factors impacting on it. The case studies promise to deliver important insights regarding the successful and sustainable implementation of 21st century learning environments. (This draft chapter is based on a first analysis of the cases submitted to the ILE Inventory until July 2011, and will be revisited after the Banff conference.)

Without genuine change at the micro-level of learning change efforts at the meso levels of entire organisations and the macro level of education systems will not be reaching learners themselves. Research on educational innovation has time and again shown that many reforms initiated and processes top-down have never properly reached the individual learner. On the other hand, there is a vast history of educational innovations never disseminated beyond the micro-level of an individual classroom. These innovations are started by highly creative individuals or small, effective teams but hardly ever achieve scale to the implementation. The progress made is often rapidly undone by the fluctuation of individual leaders or other contextual circumstances. There is now a vast research body showing that learning environments can be sustained and disseminated most effectively if they do not work in isolation but are connected to professional learning communities or wider networks with a clear focus on improving learning.

The following analysis will look at change from the initiation (section 1) to the transformation of entire organizations (sections 2) to scaling: the development of communities of practice and networks across innovative learning environments (section 3).

„Starting the change“: Initiating innovation processes

Educational change follows different pathways. Change can take place incrementally and thus transform schools over time to lead to a whole new understanding of schools and how the work. *Europa-Schule Linz, Impulsschule Schmiedefeld, Vienna Primary School* and *Lobdebrugschule* fit that pattern of change. Having started out as more or less traditional state schools they introduced a range of changes over time to respond to societal changes and to adjust the school to the needs of diverse student populations. Innovation is a response to problems that have become visible in the daily life of a school, such as students compliance, parent participation or teacher motivation. Innovation can also be the response to wider societal changes, such as changes in fundamental values taking place over the course of a generation.

¹ This chapter has been prepared by Anne Sliwka, Heidelberg University of Education

The counter model to incremental change is more radical innovation, a planned substantial change rather than incremental steps. Contextual factors often drive processes of innovation: Similar to business, innovation in educational institutions can be linked to organisational objectives such as positioning a school in a competitive market to achieve growth objectives. Some cases report a competitive situation as starting point for a process of change an innovation. *PROTIC*, an innovative school within a state school in Quebec, Canada, was initially founded because the school was losing students into innovative private schools in the neighbourhood. Apparently, the school did not match any longer the upper middle-class expectations its clientele had of what schools should be like. Parents were invited to articulate “voice” in order to avoid “exit” (OECD 2006a). Similarly, *Lok Sin Tong Leung Wong Wai Fong Memorial School* in Hong Kong, located in a public housing estate with families with low socio-economic status, suffered stern enrolment problems before it started a deliberate process of innovation. Only seven primary one students had enrolled at the school, so that it did not meet the government minimum requirement of twenty-one pupils. To avoid having to shut down the school, the school opted for significant innovations in both pedagogy and design of the school environment.

A different kind of mismatch was the trigger for a quite radical innovation in *CEIP ANDALUCIA* in Spain. The school is located in the Seville district Polígono Sur, a marginal neighbourhood with 90% of the population being Roma suffering from social exclusion. The principal describes the area as “one the biggest pockets of poverty in both Spain and Europe”. Before the decision for a complete turnaround there was cultural conflict between teachers on the one hand and students and their families on the other hand resulting in “serious coexistence problems”. They were based on antagonism between the social and professional culture and identity of teachers and the identity of students and their families. At the start of the innovation the absenteeism rate at the school amounted to 60%.

“Teachers showed great distrust [...], ignorance and contempt for the Roma culture, they had little or no relation with families, little coordination and work in common. There was a lack of analysis, reflection and debate, and a high fluctuation of the teaching staff. In short, *CEIP Andaluca* was a failing school before the principal and the teachers who saw themselves facing the dilemma ‘Either take the bull by the horns, roll up our sleeves and analyse the situation [...] to establish coherence between our work and the situation we are in, and, as a result, go to work happy and with no fear, or ask for a transfer or a secondment, take sick leave due to depression and leave’.

The school then started a process of fundamentally transforming itself to a community school, with which both students and parents can identify.

Educational change can be stimulated by external factors, such as large-scale policy initiatives often driven by educational research findings. But not all change is driven by outside factors. There are many examples of grass-root changes started by innovative practitioners in individual classrooms and schools. Few of those changes ever reach a system-wide scaling but there are examples of grass-root changes which have spread significantly through systems and become mainstream. The educational philosophy of *Institut Beatenberg*, Switzerland, for example, has widely impacted the understanding of learning in a range of schools in Switzerland and Germany.

Educational innovations can be based on research findings and thus have a fairly strong empirical and theoretical foundation: The idea for the *Itinerant Pedagogical Advisors* in CONAFE/Mexico was developed after a close analysis of the PISA research on individual learning support for students being a key success factor in the Finnish school system.

Many successful educational innovations stem from the creativity and problem-solving of practitioners in education who come up with new ways to do things in the school and the classroom. Principal and teachers at *Mount Waverly Primary School* in Australia noticed “a surprising level of student disengagement, despite overall high academic achievement”. Because of positive attainment results there was no external pressure to improve test scores, but an increasing number of families in the region opted for private education. The traditional annual school play did not help to overcome the

high level of disengagement, because it offered core roles only to a few “stars” and let the other students be “really turned off”. *Anim8tion*, a project in which clay figures are brought to life in student-made animation films, was seen as a way to reengage students and to reconnect them with their school emotionally and motivationally. One of the desired outcomes was to provide opportunities for those students, who are typically not successful at school, to see themselves as achievers.

The case studies confirm research findings on the crucial role of leaders in innovation. Almost all of the case studies emphasize the crucial role a leader has played in the process of innovation or change. At *Vienna Primary School*, for example, the former school principal is clearly seen as “the initiator and agent of the innovations”. Initial resistance on the side of some teachers were met by her “with ingenuity”. Similarly, at *Implsschule Schmiedefeld*, a “confident headmistress” is “monitoring the working process of the different teams, to assure the quality and effectiveness of school”. At *Europa-Schule Linz* the school principal’s confidence in the teachers gives them great scope of action within the legal framework. Teachers can experience self-efficacy and thus experience a high level of personal and professional satisfaction. Participation in innovative projects at the school is generally voluntary, so that teachers do not feel under pressure. The bureaucratic aspects of the innovative projects are taken care of by the local school board and the school principal thus “relieving the teachers of additional administrative tasks”.

In many cases leadership in innovation clearly has been a team effort. Several case studies stress that the innovation would not have been possible without a distributed form of leadership within and sometimes even across institutions. New models of schooling such as *Unlimited School* in New Zealand, the *Australian Math and Science School* or *John Monash School* depend on the collaboration of different experts for their success. Increasingly, research findings impact on innovations in schools. In *Mount Waverley Primary School* the idea of introducing claymation instead of a traditional school play was partly based on research. The school’s ICT coordinator states:

“I got involved in research and looking at how kids learn and what engages them... I went to a lot of professional learning courses, did a lot of reading and looked at innovative technologies...”. Science learning (John Monash and Australian Math and Science School).

In some of the cases researchers and practitioners collaborate closely. The Finnish *Likeele!* Project, for example, was developed through close cooperation of practitioners and researchers at the universities of Helsinki and Oulu University.

Several cases report that systematic research comes in late in the process of innovation, and practitioners in some of them expressed their wish to see more of an active interest by researchers in their innovative practices.

Partnerships seem to have had an important impact on innovation in almost all of the cases. Connections with the wider environment are critical for success (Fullan 1993). *Europa-Schule/Linz* in Austria names its close co-operation with the nearby teacher training college as one of the main reasons for the continuous development of the school. The partnership allows for a high level of participation in research projects and brings in a constant influx of new teachers. At *Vienna Primary School*, the “permanent international contacts in projects like Comenius” have supported the innovation process. At *Mount Waverley School* in Australia, strong partnerships have developed through, and are critical to the introduction of the *Anim8tors* project. The school developed a unique relationship with the Academy Award winning Melbourne-based animator, Adam Elliott, who had won two Oscars for his clay animation films. The Parents and Friends Association supplied technical equipment and funded a visit from Adam Elliott. Teachers were trained in animation techniques at the Australian Centre for the Moving Image (ACMI).

John Monash Science School (JMSS) was founded through a university-government partnership designed to meet the perceived problem of insufficient students in science and maths disciplines in universities and shortages of applicants for science-oriented occupations. The university staff works closely with the school staff to develop curriculum, and often “take a hands-on role on teaching content”. The school staff see reciprocal benefits for their own professional learning and students’

disciplinary understanding in working so closely with experts across specialist fields. Innovative partnerships with parents play a crucial role in *CEIP Andaluca*, *Miwon Primary School* in Korea and *Unlimited School* in New Zealand. *Culture Path* in Kuopio/Finland and *Fiskars Village* in Finland would simply not have been possible without the artists, with whom innovative forms of collaboration were started.

It is noticeable that almost all cases refer to an active and deliberate staffing policy. *John Monash Science School* enjoyed “the advantage of selecting both staff and students”. The teaching staff was selected because of “their outstanding records in their previous roles, and clearly committed to the pursuit of excellence in teaching and learning”. The Primary school in Vienna, for example, has made sure that the school board does not “hire someone, who is not in line with the school”.

The ILE case studies suggest that a change in space can serve as a trigger to innovation. Quite a few cases report about new buildings and their effect on pedagogy. At *Mount Waverley* school the idea of the innovation was enhanced by the opportunity to apply for a new building, which was purposefully designed to create flexible learning spaces, a shared ‘great space’. This facilitated working across all learning spaces, integrating multiple disciplines, co-operative learning for students and a team teaching approach. Several schools perceive the open learning and working areas which they have been able to create as a trigger to a more open, project-oriented approach to education. At *Lakes South Morang P-9* School in Australia the small teacher space encourages collaborative work, but the openness and availability bring their own particular demands, ‘...the glass discourages any sense of privacy or “down time” for teachers’, according to the principal. New buildings do make a difference but some schools have been highly innovative without them. *Jena-Plan/School* in Germany states has completely reinvented pedagogy in spite of being located in a very plain and unaesthetic school building.

„Transforming entire organisations“: Creating consistency, synergy and sustainability in educational institutions

The first section has shown that there are different triggers for innovation and change in schools. Research suggests that not starting an innovation but sustaining and scaling it are the main challenges. Many innovative educational ideas are discarded or never gain ground to change an organization sustainably (Evans, 2000). Innovative ideas are often too dependent on charismatic individuals. The progress made may be rapidly undone by the fluctuation of leaders and other contextual circumstances. Certain factors, however, do support consistency, synergy and sustainability of change in educational institutions and make it possible to transform entire organizations.

The case studies clearly suggest that the establishment of professional learning communities within schools is a particularly powerful structure to achieve those aims. A majority of cases report on successful ways of linking professionals within schools in learning communities exchanging ideas and working together on common artefacts. Teachers at *Vienna Primary School* “constantly communicate about professional things”. At *Europa-Schule Linz* teachers talk about their lessons and discuss what went well, what went wrong, what reasons for failure might have been and what they could do differently.

At *John Monash Science School* teachers developed “rich curriculum and assessment practices within a culture of collaboration and respect”. Many of the innovative cases have set aside a special time for professional learning and curriculum development. At John Monash, Wednesday afternoons when students are undertaking extra-curricular activities with ‘non-core teaching staff’ is reserved for ‘strategic professional learning’ in teams. The sessions include a range of professional learning activities, facilitated by a member of the leadership team, different faculties or discipline groups. Staff members share hands-on learning activities and experiences:

“We had rotating sessions. Half of our staff [...] heard from our English faculty about how to make instructional movies using the software [...] and I’m really proud to say that the Maths teachers made one [...] explaining to the kids how symmetry relationships in trigonometry work, something the kids always find hard.”

Having to learn new skills at *Mount Waverley School* for the production of the animations meant teachers were positioned as co-learners learning from both colleagues and students: “Students [were] able to teach us and teach their peers”. The learning process for students and teachers is described as “fluid”, and teachers adapted to a range of possibilities. There was a sense that the program improved communication and reflection in, and on, practice amongst teachers. Several cases report that the continuous work on common artefacts has strengthened the ILEs shared identity. Staff at *John Monash School* experienced their “complete ownership over the development of the vision for learning and the new curriculum” as highly energizing. Especially the shared work on what the school calls the Learner’s Developmental Framework has created a consistent understanding of the school’s philosophy and daily practice on learning.

Several case studies suggest that the layout of work spaces makes a difference to professional learning and sharing. At *John Monash Science School*, teachers’ planning areas are incorporated into the learning commons creating new opportunities for teachers, traditionally used to closed-off private areas and personal desks: “It has almost forced us to work with each other in the same ways we expect the students to”. Space models behaviour and encourages teachers to rethink their relationships with each other and their students. As in several other ILEs physical spaces have created new opportunities for collaboration between students and staff, staff and staff, and students and students. In more open spaces ‘knowing what others are doing’ becomes an implicit part of everyday practice and allows for mutual learning and inspiration: “I’ll see someone doing something, and I think oh that’s a great idea” (Teacher). High levels of teacher and student visibility encourage teachers to observe how their peers are teaching and make teachers more accountable. In some cases, however, open spaces are seen more critically: At *Mount Waverley School* some teachers perceive “added and unexpected levels of distraction”. While the assumption had been that flexible learning spaces provide greater flexibility to undertake multiple teaching modalities simultaneously, the learning spaces, because of proximity, required both self-regulation and synchronicity in pedagogy and type of activity.

Professional learning communities make it possible that innovations limited to one area or age cohort may impact the entire school. The 6th grade claymation project, Anim8tors, has inspired the different year levels to start their own projects combining ICT with literacy: In Year 3 and 4 students write photo stories and in Year 5 students undertake multi-modal 3-D authoring projects.

In some cases the broader alignment of innovations is hindered by the prevalence of a more traditional understanding of schooling. Parents do not always understand the merits of an integrated curriculum and still perceive subjects “as standalone curriculum areas that can and should be assessed independently”. Similarly, students taking part in the *Culture Path* project in Kuopio, Finland, found the working methods of the drama workshop “distinctly different from normal schooling” and had difficulties in assessing the merits of the learning experience afforded by the drama workshops. The students initially associated the productive outcomes of the drama workshop to be mainly relevant to the acting profession, but later acknowledged having learned communication and concentration skills.

„Going to scale“: Developing networks and communities of practice across environments

The case studies contain surprisingly little information on their wider networks. Some quotations from the case studies make it clear that scaling is not possible without appropriate resources: The school “provides an exemplar that could be replicated provided that the partnerships can be negotiated and resourced. This requires significant investment of time and money, as well as commitment and expertise.” (*John Monash Science School*). “Given the right circumstances, the program would be transferable to other well-resourced schools, as long as it was adapted to cater for local circumstances.” (*Mount Waverley School*)

The *Beatenberg, Switzerland* case provides interesting insights into ways of scaling innovations across systems. The school’s principal has influenced school development in the German-speaking countries with his educational concept: “There are roughly 25 visitor groups of about ten people every year. The headmaster has given 33 talks and multi-day seminars in the past ten months”. The so-called “Learning Factory” was created in cooperation with Ulm University. It offers training as learning

coach as well as further programmes to promote school development. Several schools – e.g., schools in Germany and Switzerland – have now adopted elements of the *Beatenberg* learning environment. Whereas *Beatenberg* is a private school outside the state systems, *Europaschule Linz* explicitly views itself as a “role model”, for other schools because it “is part of the school system with its given rules and constraints. Within this regulatory framework the school has found a way to creatively use the given scope and to constantly look for new solutions to upcoming problems and challenges”.

Final questions

The preliminary analysis of the Inventory cases shows that it is worthwhile to gain more information on the process of innovation and scaling for all of the ILE inventory cases and opens up a whole range of relevant questions for discussion in the ILE network:

- What is the right balance between charismatic and distributed leadership?
- Partnerships really seem to matter, but how can all schools be linked to partners stimulating innovation and change?
- Is flexible staff selection a prerequisite for innovation and change?
- What kinds of spaces facilitate sustainable innovation, effective learning and student/teacher well-being?
- What are the right incentives for intense and on-going collaboration in “professional learning communities”?
- How can innovation be transferred and disseminated if resources are limited?
- What are the limits to the transfer of ILEs?

CHAPTER 3: ORGANISATIONAL FEATURES IN THE ILE CASES²

This chapter reviews innovative approaches to the organisation of learning that appeared from the ILE cases. The organisation of the learning environment is at the centre of the ILE framework because to an important extent it “brings it all together” - connecting learners, teachers, content and resources in ILEs and forming the basis for many of the innovations. Organisational aspects have thus appeared throughout the examples that were discussed in this synthesis report, for example, because mixed-aged groupings, team teaching and parent involvement all rely on a certain organisation of the learning environment. In addition, this section describes innovations in the organisation of the learning process itself. The chapter is divided into innovations of the use of time, groupings, interactions, work forms, and assessment.

We begin with a discussion of the scheduling and planning of activities over time, such as in recurrent day structures and daily rituals that help create learning routines, yet are part of schedules that are flexible enough to allow complex projects and inter-disciplinary work. Then we move on to a discussion of changing student groupings, which covers topics at the class and school level, that is, both the switching between smaller and larger learner groups of mixed or homogenous abilities, transitions through grade levels, and co-operation with external institutions. The next part deals with the changing interactions between and among students, teachers, parents, and community members, which are here discussed with a special focus on one-on-one teacher-student time, mentor groups, and the use of ICT resources for improved communication among students, teachers, and parents. Finally, we discuss student-led individualized learning, and the role of assessment and feedback in learning, including formative assessment, student-student feedback, and public celebrations of student work.

Planning over time

The distribution and planning of activities over time is crucial for the functioning of learning environments. Schedules can be an important instrument to bring structure to the school day, help clarify the organisation of activities and contribute to the establishment of learning routines. For example, by planning rituals which begin each school day or conclude each learning week, or by introducing a regular day structure. On the other hand, many cases in the ILE project use time with much more flexibility than is traditionally the case in schools, in order to allow work that takes longer than single lessons, such as off-campus excursions and complex, challenging projects. Time is also not always assigned to subject-specific teaching so that learning can be inter-disciplinary, and so that there is room for personal coaching and support activities. Finally, the ILEs often give their students the freedom to plan their own activities over time, although always with the necessary guidance and within clear learning frameworks.

Rituals

Rituals can help make the school day predictable, structured, and meaningful; they demonstrate that the activities that are repeatedly integrated in the day are important, and create routines of reflection or planning. Several ILEs begin and conclude the school day or week with such a special moment. For example, *the Lobdeburgschule* in Jena has a Monday morning circle to start the week and a final circle on Friday, to end the week with a reflection on learning processes. The aim is to begin and conclude the week in a positive way for everyone. On Monday morning, the students and teachers come

² This draft chapter has been prepared by Gesa van den Broek, Radboud University Nijmegen, Netherlands.

together to discuss the weekend or holiday experiences, and talk about aims and plans for the following week. The session is also used to introduce new overarching topics for interdisciplinary work. On Friday, the pupils reflect on the past week and their own learning process. Teachers and students can express ideas and suggestions for the support of future learning. A second example is the *Projektschule Impuls*, Rorschach, where the day begins with a morning circle, where a “speaker-stone” is passed around and the children can talk a bit about their feelings or thoughts. This school also opens its doors to the students about 20 to 30 minutes before the official start of lessons, to give them the possibility to arrive at school early and get ready for the class work.

Recurrent day structures

The fact that students at many ILEs are given time to learn and explore in a self-directed way does not mean that the school days are not structured by the teachers at all. On the contrary, many ILEs create frameworks that offer guidance and a clear structure as to the timing of certain work forms. For example, the *Projektschule Impuls* has a very regular structure of the day. After a morning circle, the classes start with a foreign-language session, followed by group work based on learning plans and then a period of absolute quietness, indicated by a sandglass that runs for 25 minutes. During this time, the students remain at their workplace, and do not speak or walk around. Later in the school day, the students work in project-groups on teacher-designed or individually chosen work plans.

A second example is the Austrian *Hauptschule St. Marein* where the first three units every day are reserved for German, mathematics and English, whereas the remaining units of each day are devoted to topic-specific interdisciplinary teaching (projects) covering all subjects.

Flexible use of time

Complex, challenging projects easily take longer than single lessons, and similarly excursions are difficult to integrate into rigid schedules. Therefore, several ILEs use flexible schedules that can be adapted to the requirements of pedagogic activities. For example, in the *Discovery Trust* schools in New Zealand students are expected to be at school for six hours each day, but timetables are flexible and start anytime between 8am and 10am, and finish anytime between 2pm and 4pm. In addition, students can negotiate days off site after presenting an “off site learning plan and off site learning record” to their learning advisor and parents. The students choose which classes they attend from rosters of classes, choosing among “toolbox” sessions such as in mathematics, science and English at different levels. Each student’s timetable of learning is negotiated according to the identification of his or her current strengths, interests and needs. It consists of course-based topics and Independent or collaborative Learning options - known more widely as “inquiry learning” where learners direct their own learning experiences. The learners choose what and how they carry out each inquiry and are supported to drive their own successful learning experience. These choices determine the students’ progress through school levels.

A different example is the *North Union Local School* in Ohio which offers its students several flexible scheduling options, which include, for example, early bird classes, extended day classes, and Saturday classes. High school students can take classes during regular operating hours, take classes early or late, take classes via correspondence courses, and take classes online.

Time for (inter-disciplinary) project work

The ILE cases found very different approaches to make time for projects that relatively short, subject-specific lessons cannot accommodate. At *Cramlington Learning Village* in England for example, the scheduled school day ends early every ‘Project Wednesday’, so that students can pursue enquiries both in and out of school, drawing on support from teachers, external experts, and their peers. The regular timetable is also suspended for a number of weeks each year, for example, for extended research projects during two ‘immersion weeks’ in the summer, when the students can work greater depth than is possible even in a half-day block. All days begin at the *Lobdeburgschule* Jena, Germany with a 2-

hour open plan learning phase. This period always starts with a welcoming in a chair circle, and there is a break for a common breakfast.

Groupings and Interactions

Learning is a social process, which occurs throughout interactions, negotiations and co-operations. Many ILEs have a heterogeneous group of students, where children with very different backgrounds, skills and interests come together. Embedded in a well-designed personalized pedagogical approach, the students can here benefit from each other's different experiences. An important aspect of creating the optimal social setting for such cooperative work is that the ILE cases intentionally use varying groupings of students and change between different work forms, such as individual work, cooperation in pairs or larger teams.

Heterogeneous student groups

The *Hauptschule St.Marein* in Graz, Austria reports that the within-class differentiation that its teachers use to develop the students' skills and talents, offers an enormous impetus, in particular to students with an average or low motivation to learn. These students are motivated to try to catch up with the top achievers, while at the same time it means that particularly gifted and talented children will get enough stimulus and challenge. The latter can benefit in terms of social skills by taking part in an integrated peer support system. How is within-class differentiation organized? For example, in the *Projektschule Impuls* in Rorschach, Switzerland, students regularly work in "project-groups" of four, in which the students have different roles. The oldest student (class 6) is "the Boss", the "Vize-Boss" is one year younger, the "Assistant" from class 4 is two years younger and "the Beginner", is the youngest in the team. In the course of their school career, children learn to assume responsibility in each of these different roles.

The comprehensive school *Schüpberg* (Bern, Switzerland) is a small school with a multi-grade classroom with students of varying cognitive and physical abilities. The school lays particular emphasis on the heterogeneity of the student group, and regards the heterogeneous student body as a stimulating and motivating influence on the children's social and cognitive development. Activities are adjusted to the development of the individual child and accumulation of children in problematical phases is avoided. A tutor system in which children learn to teach each other has been established to enable the children to experience different roles, and to reduce stigmatization.

Varying group formations

In several ILEs, teams of teachers work with relatively large groups of students, who switch between

One-room mixed-grade classes

Among the ILE cases, there are three small schools with mixed-grade classes in Bern (Switzerland). These schools form a network of classes including students of several grades because they serve a very small catchment area. They intentionally use the heterogeneity of their students as a pedagogical basis for an individualized education aiming for integration and autonomous learning. For example, by means of a tutor system to stimulate the children to learn from each other and embedded in strong individualized work in which students work on the same topic with different approaches. (*Primarschule Lindenfeld, Gesamtschule Lindental, and Gesamtschule Schüpberg*)

activities in smaller and larger groups. For example, in the *Presteheia School* in Kristiansund Norway, groups of students vary in age and size, and count 33 to 54 children. The school uses the time in the large mixed groups to build relations between students who would otherwise not socialize, which

reduces bullying at school and increases feelings of security and confidence. It also makes it easier for students to find someone to have a good and trusting relation with someone, because they can choose among more students. The role of teachers and other staff is deployed flexibly. Students in the *Lakes South Morang School* (Victoria) also work in a variety of structures. The largest configuration is the campus divide into early years (prep – year 4) and middle years (year 5 – 9). The next layers are sub-schools that stay together for three years, year levels and pastoral groups, which meet for 30 minutes every day. Each student participates in group activities, whole class and individual tasks.

At *Lok Sin Tong Leung Wong Wai Fong Memorial School* in Hong Kong, the timetable is co-ordinated in such a way that discipline-based classes run at the same time for all students. This makes it easier to invite guest speakers who give a lecture, and to do extended projects in larger groups. Activities vary between work in large groups, and at other times, smaller group rotations. Similarly, the *St. Marein* school alters between units of basic instruction directed to the whole class, and units of add-on content to stimulate particularly gifted and motivated children and/or units that consolidate content and support students with an average or below-average motivation to learn.

Transition through grade levels

Many ILEs take steps to improve the transition through grade levels and between schools. The aim is

Rotating Interactive Groups

In the Andalucia pre-primary and primary school in Seville, Spain, students are brought together in heterogeneous groups (regarding ethnic group, gender, motivation, performance, etc.), with the aim to motivate the students, encourage them to help each other, and help them to better understand the learning process. The whole class of students is regularly divided into small interactive of four or five students. The lesson comprises activities that each last 15 or 20 minutes, and are accompanied by a teacher or other adult. Once the time devoted to one activity has finished, the adults rotate to another group, so that they spend some time with all the groups every lesson. Each group carries out a different activity, but the general subject matter of all activities is the same.

that the transition through grade levels within a school depends not on age and class levels, but on the students' development. A good example for this is the *Gesamtschule Lindental* in Switzerland, which uses no grade retention and does not attribute its students to a grade level. At this small school, all students from age 6 to 15 are included in a single class. They do not follow the program of a certain grade level, but instead receive an individual program corresponding to their level of development. This enables the students to work through the content of nine school years corresponding to their individual cognitive and intellectual development. Allowing students to pass through school at an individual pace in such a way avoids the frustration of repeated failures for children who struggle with school and fosters all students' self-esteem.

In order to ease the transition from pre-primary school or kindergarten to primary school, and from primary school to secondary school, some learning environments cooperate with other educational institutions to make contact with prospective students and parents early, in some cases even before formal schooling starts. A good example for this is *Presteheia Primary School* where the collaboration with a day-care centre is also used as an opportunity for the students to practice their social skills. Students are trained to be good "big brothers" or "big sisters" for younger children from a day care centre, who come visit the primary school before they become students themselves. For example, *the Presteheia* students celebrate Christmas with these children, and arrange reading sessions for them.

Cooperation with external partners or universities to enrich curriculum

In order to optimally challenge talented senior students and to offer an up-to-date curriculum, some secondary schools collaborate with external institutions such as research institutes and universities. For example, the *John Monash Science School* in Clayton, Victoria is located on the campus of Monash University. This selective senior school offers an individualized and specialized program with a focus on science and math. It draws on the expertise and resources from the university to offer its students enhancement subjects and integrate contemporary research into the lessons. The students are also stimulated to take classes at university and collect credit points for college - something that is also done at the *North Union Local Schools*, Ohio. Here, a comprehensive educational academic advancement programme is used to encourage secondary school students to take a challenging academic course load. Students have the autonomy to plan an individualized learning plan that meets their needs, and are offered a variety of advancement options such as dual credit courses for high school and college credit simultaneously, flexible scheduling and extended school day options.

Changing Interactions

One-on-one teacher-student time

Learning in many of the ILE cases is strongly individualized and personalized. Rather than using the same approach for all children, teachers are expected to function as personal mentors who support all students in an optimal way, building on each student's unique talents and needs. This requires individual feedback on performance, reflections on the student's progress and planning of future learning aims, which are often embedded in one-on-one conversations during which a teacher acts as guide or learning advisor and helps the students plan their way. For example, at the *Gesamtschule Schupberg* in Bern, the children as well as the teachers write feedback into their learning booklet ("Lernheft"), which contains auto-evaluations, feedback, learning aims, etc. The entries are subsequently discussed in individual conversations between child and teacher. Other cases that use one-on-one coaching can, for example, be found in Australia, New Zealand, and UK.

Bellair primary school in Victoria, Australia, for example, sets aside time for such individual conferencing for each student each week. This one-on-one time with their teacher (learning advisor), is used to celebrate, support and track the student's learning progress. Students bring evidence to the conferences to demonstrate the progress that they have made throughout the week, and the teacher then leads them to deep discussions about the next steps that they need to and want to take, and help them formulate new learning goals. In the *Discovery 1 Unit* and *Unlimited Paenga Tawhiti School* in New Zealand as well, learning advisors have weekly one-on-one meetings with students in their home base. Part of this regular 'catch-up' is that the student's learning goals are continually revisited and monitored and that individual or non-class based learning is monitored. These schools also have more formal Education Plan Meetings, in which the student meets with his/her learning advisor and parents at least three times per school year to reflect on past learning and sets new goals for the next period of time. The aim of these meetings is to build an understanding about individual needs, wants and directions, and establish expectations and goals for the year. In the *Cramlington Learning Village* in England, teachers serve as 'learning guides'. Each day, they have a 20-minute personal talk with one of their students, so that each student has one of these talks at least once every six weeks. Parents are also invited to the conversations.

Mentoring activities and patronage systems

Many ILEs regularly plan meetings of small groups of students with a teacher guide to allow the students to build relations with peers of different age, and to implement a safe environment for regular pastoral care. Often this requires an organisation that allows teachers to bring students from different classes in contact. For example, at *Lok Sin Tong Leung Wong Wai Fong Memorial School* in Hong Kong, mixed-age caring groups which are led by a teacher meet on one evening per month for a group activity, like sports or eating together, and in the *Lakes South Morang School* (Victoria, Australia), pastoral care groups meet with their teacher for 30 minutes every day. It is not always easy to find

time for such activities, but innovative solutions exist, such as at the Austrian *Hauptschule St. Marein* where the length of the teaching units was reduced to 45 minutes - five minutes shorter than Austrian standard. Over the course of the day, this “saves” 25 minutes, which can be devoted to coaching and support activities.

A different approach is to use a “patronage” system, where older students are assigned younger students for whom they function as “patrons” who help them with their study. This is, for example, done at the *Prirodni School* in Prague, where students from the upper levels also give lectures for the younger ones under the supervision of a teacher. Also during research and art projects more experienced students are expected to take responsibility and practice team leadership, when they teach their less experienced schoolmates.

ICT communication portals for email communication also among parents and teachers

Several ILEs from British Columbia, Canada, make use of new technologies in order to bridge the distance between schools in rurally isolated areas. For example, at *Glenview Elementary School*, students interact with children from other schools by means of blogs and videoconferencing. The teachers from these schools meet to plan common inquiries and activities are embedded in a number of face-to-face gatherings as well as communications through technology.

Connecting Classrooms

The teachers from three elementary classrooms in geographically isolated districts in British Columbia collaborate to engage their students in videoconferencing and online collaborative work. The students from the three schools participate daily on a website, where they share multimedia content that they created, engage in online literature circles, weekly forums, and also collaborate on a year-long inquiry project. The teachers each lead one videoconference per week for the whole group of about 70 students, in an area based on their expertise and passion, and manage an accompanying online forum. The videoconference is collaborative, and students at each site are stimulated to participate by asking questions, sharing smart board work and engaging in online forums and chat rooms. The students frequently message each other and their teachers. The forums are also used for formative assessment, based on a set of standards that the three classes sculpted together. The online interactions are complimented by three face-to-face gatherings a year, and parents are involved by means of Connected Classroom family nights. At the beginning of the year, the project is launched via a live videoconference at all three sites, and it ends with a Celebration of Learning in a similar format. Parents can also browse the website to see what the children are working on.

Open learning, individualized learning

Many ILEs have a strong focus on teaching students to become self-regulated learners, and on the individualization and differentiation of learning. They aim to give the students an active role in the learning process, share responsibility between teachers and students, and let the students learn to work in an independent way where they can self-regulate their learning process. At the same time, there is a strong emphasis on personalized, individualized approaches to learning, to ensure that activities optimally stimulate each child. Many cases in the ILE project meet these two goals by using phases of open learning, during which students work independently with day- or week-plans that specify

learning objectives. Such lists can contain competences, specific tasks, or knowledge that is to be acquired. Sometimes these objectives are very specific; sometimes the students can choose between different activities with which they can demonstrate that they met the requirement. The work plans are often designed by the teachers or made in negotiation between student and teacher, and are instruments to guarantee that every student works on tasks that offer the right amount of challenge given his or her level of development.

For example, at the *Presteheia School* in Kristiansund, Norway, teams of teachers create week-plans for their students. These plans are posted on the school homepage, and signed by the parents, to sustain communication between the students' school and home. The learning objectives that are specified on the plans typically span one or two weeks, and are based on the national curriculum. The plans also include space for students to influence the use of the available working time, and they feature social goals. To monitor the students' progress, there are tests every two weeks. A different example from the same country is *Vigra School*, where an individualized approach is used during Language Workshops. In these workshops, the students learn to make their own books, and alternate between listening, speaking, reading and writing. Importantly, all students receive tasks adapted to their level of skills. At the end of the class, they come together for a discussion where each student can summarise what he or she has learnt. Finally, at the one-classroom *Lindenfeld Primary School*, Burgdorf near Bern, individualized learning in heterogeneous mixed-aged classes is realized by means of daily and weekly schedules. Group work is organised in such a way that students work on the same object but with different tasks. There is an emphasis on variety instead of competition, and students are encouraged to help each other.

Modern technology offers additional options to individualize learning. At *Vigra School*, for example, some learning assignments are available from internet. The students work at their own levels in a reader on an individual basis. Using the functions of the learning program, educators can keep an eye on each student at his or her particular skill level; adaptation here is optimal, and the chances for each student to be able to advance in reading and writing are very good.

Week-plans, Learning Contracts, and self-directed work

At the *Lobdeburgschule Jena*, each school day contains phases of self-directed completion of tasks. The students work with individual learning plans that specify competencies, tasks and topics but can decide about the order in which they want to work, as well as the speed, the working forms and the worksheets. Repeating an already studied topic is possible as well as dealing with worksheets of higher competencies or future grades. The students can work with partners, alone or with the help of the teacher. Almost every day starts with such a free work phase that focuses on topics of German and Mathematics. There are also phases of open learning that are not guided by materials, in this case the students receive a topic on which they work independently, choosing their own focus and procure the information themselves. It is also possible that students choose a topic freely, based on their own interests. Importantly, the work is always embedded in clear structures and specific long-term aims. For example, the students sign a "learning contract" at the beginning of the school year with the learning aims for the whole year, which they formulate based on consultation with their teachers.

Individualized learning paths

In open learning phases, during which students work independently on personalized work-plans, activities and content can be well adapted to the students' interests. Students also often get the freedom to decide in which way they want to fulfil learning objectives, for example, choosing the

topic that they do a research about or write about, or picking their own focus within a larger topic. For example, in the Norwegian *Breidablikk* School, all students learn to achieve objectives of the regular curriculum, but they can influence how they learn by choosing, based on their own interests, among paths with a focus on environments and outdoor-activities, sport and life style, music and culture, or media and craft. These “paths” are then used as overarching topics for teaching, for example, students in the sports and life style track learn to calculate average speed.

In many ILEs, the students have the chance to choose which activities they want to pursue in order to meet their personal learning goals. For example, at *Bellair Primary School* in Victoria, Australia, the students work towards individual learning goals which are supported by a negotiated curriculum, and they can choose from a range of workshops on different subjects (reading, writing, maths, languages, etc.) to best meet their needs, and therefore each have their own individual time table. A different example is the *Priodni School* in Prague, where students work with lists of study requirements that cover a period of three months. Within this time, students have to fulfil four to six requirements per subject, but it is up to them to choose the right time for each of them. Possibilities to prove the fulfilment of requirements are for example a properly kept notebook or portfolio, teaching aid created by the students, etc. Selected areas of the curriculum are obligatory for all students, but they can decide about when to prove their knowledge and can choose from additional requirements to direct the course of their education.

Assessment

The *Discovery Trust School* in New Zealand pursues a highly personalised approach to learning, and the students are given much freedom to take responsibility for their learning. In order to monitor and guide their project, there are Individual Education Meetings for all students at the beginning of the year and at the end of each term. These meetings are three-way conferences between the child, parents/caregivers and the learning advisor, where the student reflects on past learning and sets new goals for the next period of time. During such a meeting, an Individual Education Plan is developed, negotiated and monitored with the children and their parents at least three times a year. Parents are encouraged to participate in the process by helping to set goals and taking responsibility for supporting them. The staff share their professional opinions, inform students and their families about literacy and numeracy requirements as well as learning goals aligned with the national curriculum and suggest new opportunities or experiences for learning. Throughout the school year, regular short one-on-one teacher-student sessions are used to evaluate the progress, formulate new short-term goals and discuss the students’ growing portfolios.

Many ILE cases stress that they use assessments not to determine which students are better than others or to label performance as “successful” or “failed”. Rather, they use assessment to closely monitor the students’ progress to be able to guide and shape the students’ learning so that all students can optimally realize their potential and so that the teachers can adapt activities and materials to the current needs of their students. Students are not compared against each other but instead against their own individual learning goals, which they often formulate themselves and are encouraged to reflect upon. Regular, detailed feedback is given to guide the students learning, and teachers and students together determine where the students are on their learning path and where they are heading next. Much emphasis is also placed on students’ abilities to realistically evaluate and plan their activities and on the ability to give constructive feedback to their peers.

For example, at the *Discovery I* schools, the assessment philosophy is to ensure that all assessment impacts positively on student learning and is appropriate to the child’s learning goals. No testing takes place unless it enhances and benefits the child’s learning and allows the learning advisor to work with

students to plan the next steps. Assessment conferences take place five times a term, of which at least one meeting is a formal Individual Education Meeting, where any standardised data is shared, evidence against personal goals is discussed, and next steps, considering the social and emotional growth of the child, are planned. The remaining conferences of the term focus on the child's progress, feedback and feed forward. Learning is assessed in a variety of ways including Learning Advisor feedback and feed-forward with respect to the achievement objectives, individual reflections and learning stories. Learning advisors also have weekly one-on-one meetings with students. As part of this regular 'catch-up', the learning advisor will monitor any individual or non-class based learning the student is doing. Evidence of learning is collected in the student's portfolio and increasingly the school is trying to ensure students have a 'toolkit' of skills and processes that will enable them to assess or judge their own work. Individual student reports may include comments in relation to assessment of academic, social, interpersonal and meta-cognitive outcomes, key competencies, and qualification and certification achievement. Issues identified in reports become the basis of feedback and feed-forward in the IEP meetings.

Monitoring student progress

Although the ILE cases often replace or supplement traditional testing and grading with forms of assessment that are more formative, this does not mean that the assessment procedures are not clearly structured. On the contrary, many ILEs establish a routine of evaluations, progress discussions and feedback, and for this they often make use of portfolio's or reports that the students and teachers update and discuss in one-on-one sessions, as well as of public displays of the products of work.

For example, at the comprehensive school *Schüpberg* in Bern, Switzerland, the children as well as the teachers write feedback into a learning booklet every two weeks, which is subsequently discussed in individual conversations between the child and the teacher/facilitator. The booklet, for example, contains auto-evaluations, feedback, and learning aims. At the *Lobdeburgschule Jena* in Germany as well, students work with individual learning diaries, in which they document their daily and weekly learning aims and reflect on their progress.) Teachers at the *Rodica Primary School* in Slovenia evaluate learning results in different ways that complement regular school assessment. Together with the students, they make use of questionnaires and other instruments to evaluate the learning progress. There are regular student-teacher meetings to talk about the students' progress, and the students also present their results and products in public, in part by using films or multimedia presentations or during art exhibitions. The students keep a portfolio of personal achievements with products, files, assignments and short teachers' reflections.

At *Bellair Primary School* in Victoria, Australia, students choose among different workshops and each has an individual time table. In order to keep track of their progress, the workshop teachers take weekly notes about the students, which the students discuss with their personal learning-advisors in weekly one-on-one sessions. In these sessions, the student's progress is also tracked in an excel document, and discussed in relation to the student's learning goals. The main system for assessment at the *Presteheia School* in Norway is that every fortnight the pupils are tested according to the teaching goals they and their teachers set in the two previous week-schedules. The students know that they will be tested and which goals to achieve. This is a written test, an assessment, to find out what they have learnt and they can compare it to what they themselves had predicted beforehand about how well they had accomplished the goals.

For assessment purposes as well, teachers make increasingly use of modern technology. At the primary school *Skofja Loka-Mesto* in Slovenia, for example, e-classrooms complement other forms of assessment of knowledge. The teachers gain a complete insight into their pupils' activities: when and how much time they spent in an e-classroom, which sources they were reviewing and which activities they performed. Parents also have access to major part of e-classrooms, which enables them to

Fostering Life Competencies

The underpinning objective of the Danish *Lisbjergskolen* is to promote four integrated 'life competences' in the learners: competences of knowledge, of self-assessment, of conduct, and of 'being'. Each learner has a plan for interpersonal and educational development ('the child's storyline') with individual meetings between each learner and a teacher every two months to review progress according to the plan. Portfolios are an essential feature – all learners work with three different portfolios: The working portfolio that contains almost all of the pupil's work in progress; the selection portfolio is more formal and focused and contains a more limited part of the students' work, which the students select together with their subject teacher. Work with this portfolio is linked to concrete assessment criteria and stimulates self-reflection. Finally, there is a presentational portfolio with 2 to 3 products from each subject that are chosen in dialog with the primary teacher.

monitor the activities that are in progress in individual subjects, check their children's work, and offer them support.

Alternative grading systems

The traditional end-of-year school report, which students and parents anxiously await without knowing how the teachers will rank students' performance, has been largely abandoned in the ILE cases. Instead, formal reports are replaced by or supplemented by a comprehensive system of counselling, self-evaluation, and teacher feedback, and many different ways of informal celebrations of good performance. Some of the ILEs do not use any formal grades, others complement the traditional grade lists by more detailed meaningful reports. For example, at the *Zakladni School* in Chrudim, Czech Republic, the first five grades receive only verbal evaluation reports, because the teachers consider this feedback more effective than grades. The students' performance is monitored by weekly reports, and the final evaluations are combined with student self-evaluations. At the *Lobdeburgschule* Jena, every student gets an appraisal about methodological, social and personal competencies from the teachers' perspective. This is in addition to the yearly school report, in which each epochal lesson is graded (grading is, however, not relevant for transfer to the next class level). The assessment results from different performance records. Student representatives have decided that the students use the same criteria for their self-evaluation instrument, with which they assess themselves. Every epochal lesson is thus reflected on by both teachers and pupils.

Recognition and public celebrations of student work

Several ILE cases found innovative solutions to reward the students' performance and create public

Independent Education Plans

At Unlimited Paenga Tawhiti, students, parents and learning advisors come together to develop an Independent Education Plan (IEP) which establishes a key point of contact with the school, builds an understanding of individual needs, wants and directions, and establishes expectations and goals for the year. Discussions at IEP meetings usually include any bench-mark testing which informs the learning goals for the student. If necessary, this may lead to referrals to specialist staff, such as a counsellor, for diagnostic testing. Reports on student progress are recorded at the end of each 5 week unit.

presentations of the students work. With respect to the first, there are some original examples among the ILE cases. For example, the *Mypolonga Primary School* in South Australia has a shop which is run by students and for which the school uses a special assessment system. Each activity in the school shop has criteria which establish the quality of the service performed. The students receive different badges for "excellent" performance with respect to these criteria and are promoted to different badges after several positive performances (in a hierarchy from red, blue, and other colours to silver and gold badges). Students who passed through all levels of badges, receive a "quality assurance badge" which enables them to assess the performance of other students.

Public displays of the students' work are also common in many of the ILEs. They make visible and celebrate what has been done in each classroom, and provide children with a public recognition of their work, showing them that their work is important and interesting for a larger audience. Such celebrations, exhibitions or shows are also great occasions to involve families and the larger community in the children's work. There are many different forms in the ILE cases, ranging from film festivals in Australian schools, celebrations involving live-video conferences in geographically isolated Canadian schools, to school-wide elections for student fair play awards for social competences in Slovenia.

But the public display of achievements at school can also be integrated in the normal school day, for example when changing exhibitions of student work are used to decorate the hallways. In the *Lok Sin Tong Leung Wong Wai Fond Memorial School* in Hong Kong, the writings of students are displayed in a "Story Garden": Writing is the main theme of the school garden, and writings of the students are laminated and posted on the walls next to the garden. Another example is the "tree of dreams" in the *CEIP 'Andalucía' Learning Community* in Seville. This learning environment has undergone an extensive renewal; in this process, the students, families and teachers wrote or drew their ideas or visions for the school that they dreamt of on pieces of paper. Whenever such a dream has been realized, the respective paper is added as a leaf to the branches of a "tree" of fulfilled dreams. This tree which was placed in the hallway and documents how the school makes more and more ideas and visions happen.

CHAPTER 4: WHO IS THE LEARNER?³

Whether students learn in mixed-age groups in one-class schools in remote areas in Switzerland, or in heterogeneous mixed-ability classes in a primary school in Hungary; whether parents of students with migrant backgrounds learn in language workshops alongside their children or distance learning initiatives bring schooling to children who otherwise cannot access education – the practice in many of the innovative learning environments in this project reflects changes in the learner profile, and an interpretation of the role of the individual learner as well as of learner groups that differs from traditional approaches. The following section reviews some of these innovations. First, we focus at cases that show innovative ways to reach out to groups of learners that are otherwise often neglected by mainstream education and therefore likely to fail or drop out of school. We also discuss how some ILEs focus at the students' parents. Second, we review examples of successful work with heterogeneous student bodies, both with respect to the integration of students with various physical or cognitive special needs and in multicultural settings. Finally, there is a section on learners in mixed-aged groupings.

Targeting specific student populations

Some student populations are difficult to reach with methods of regular education because they cannot or do not come to school in the first place. You can think of children from families who frequently move, teenage mothers, students with adjustment problems, children who experienced violence or drugs, etc. It is important to find solutions to reach out to these children to make sure that they are not left behind, and the universe contains some innovative approaches to this task.

One way in which learning environments can bridge the distance to their learners is by means of technology: For example there is the Portuguese distance learning initiative which gives its learners access to a virtual, national-curriculum-oriented learning environment via on-line sessions (PRT.001). This ILE aims at children from circus families who were otherwise changing schools very frequently (30 times and more per year), as well as at other students who have difficulties to regularly attend classes and are therefore likely to drop out of school, such as teenage mothers. They use internet and video conferencing to teach the students. The content is adjusted to the students' interests to increase motivation, and there are regular one-on-one tutor sessions, all to guarantee a stable and effective learning process to support the students' successful conclusion of compulsory education.

Other approaches for students at risk of dropping out of school and for students with maladjustment problems are intended to help the students associate learning with positive feelings by providing them with first experiences of success related to education, and also have the purpose to teach the students basic (social) skills like appropriate behaviour and punctuality. For example, the *Breidablikk Lower Secondary School* in Sandefjord, Norway has a special trajectory for students with maladjustment or drop out problems. In this programme, the students are taught in small groups and work on a farm, where they do wood work and take care of animals. There is a strong emphasis on practical pedagogics, for example, mathematics learning may be linked to practical challenges in constructing cages for animals or calculating the circumference of a tractor wheel. A different example is the *Life Skills Center of Trumbull County* in Ohio where high school students at risk of dropping out are supported by a team of teachers, intervention specialists and social workers, who focus on raising

³ This draft chapter has been prepared by Gesa van den Broek, Radboud University Nijmegen, the Netherlands.

students' reading and math proficiency, as well as employability and integration in society. Concrete measurements in this ILE include needs assessments, individualized learning plans, daily reading assignments to increase the students' vocabulary, student volunteering in the community, work placements, and strong emotional support. The *College of the Home Mission Society* in Huvilakatu, Finland as well tries to create a safe and pleasant atmosphere for its students in need of special support and lets them learn in a homelike environment in an apartment with furnished rooms and a kitchen. In this programme, the students learn how to self-control their life, how to follow rules and directions, and how to form a realistic image of themselves as learners.

CEIP ANDALUCIA has been transformed in recent years. Nowadays, there is much more empathy towards, and involvement, knowledge and recognition of , the Gypsy culture The active participation of a bigger number of families has made it possible to build a relationship of trust, as they have a better knowledge of the way the school works. Families adopt a positive attitude towards conflicts and appreciate the figure of the teacher as a referent. They see education as a tool for the development of their children and school as an opportunity. The school's opening-up to the outside, as well as the presence of families and other agents of the immediate social context, is also important. A culture of active and democratic participation based on mutual knowledge and respect is encouraged. provision of social-community services for families, apart from the academic services for students, is also worth stressing. Teachers have high expectations of what students can achieve and an inclusive perspective of education to achieve educational quality for all students is adopted in a place that has one of the biggest pockets of poverty in both Spain and Europe.

Parent classes and the definition of "Learners"

Parents' expectations, encouragements and subjective messages about the importance and value of education have enduring effects on the academic attainment of their children (Schneider, Keesler, & Morlock, OECD 2010). For this reason, most of the ILEs take steps to involve, connect, and in some cases *educate*, the parents of their students in order to enable them to (better) support their children's learning process, and to build a collective sense of community in school. For example, the primary school *Vigra* in Norway has introduced "Parent School" meetings (Foreldreskulen) that encourage families to take an active role in the learning activities of their children. During these meetings, the parents learn about the school's basic expectations of parents, and receive clear tasks on how to follow up on their child's progress, in particular on the reading development. Topics also include research results on the significance of parents for pupil learning, and the school's teaching concept and methods.

Parent classes like those in *Vigra* reflect on-going transformations in the definition of the term *learner* in at least two ways: First, parent classes reflect an increasing recognition of the importance of connections with the learners' families and social networks. This is visible in many cases, and it is in line with a new focus on learners as individuals with different needs, interests, ambitions - and support networks. Second, parent classes express principles of lifelong-learning because they show that the modern concept of a "learner" is not limited to children but includes parents (and adults in general), who continue to work on their skills and have the need or desire to learn new things throughout their life.

Apart from the activities for students at *CEIP ANDALUCIA*, there is also the so-called 'Mothers' School', where a dressmaking workshop combined with a literary discussion is organised. Both teachers and volunteers take part in this activity, which takes place in a classroom suitably equipped and decorated with samples of work done by them. A group of mothers gather together to learn about an activity which is useful for them and for the school (the curtains of the assembly hall were made by them) and, above all, to share experiences, discuss and think about life in family, the involvement of families in the education of their children and any other aspect they might find interesting. While they do their manual work, a group of teachers and volunteers perform plays to introduce them to literature, since most of them are functional illiterate, and also as a tool to run a literary discussion and have some topics for debate and discussion arising. The day of our visit they were performing 'A Doll's House', by Henrik Ibsen. It seemed that mothers were not paying much attention, as they were very

concentrated on their work, but then, during the literary discussion, they participated intensely, with lots of personal issues after the dramatised story. In their own words, *'the activity is like a kind of therapy'*. It all takes place in a very close atmosphere, in confidence and allowing free expression.

Benefitting from diverse heterogeneous student groups

Many of the innovative learning environments in this project deviate from traditional practices to segregate students into different classes or schools according to ability, and instead pursue a more integrative approach: they aim to provide education to “all” children, and include into their student body children with special needs due to physical, cognitive or behavioural differences. Such integrative approaches lead to heterogeneous student bodies and learning groups, which have traditionally been regarded as a challenge for pedagogic work. The ILEs in this project, however, exemplify how student diversity can be used to the benefit of all learners when embedded in activities that are suited to meet the needs of different learners (the chapters on content and organisation discuss more extensively how ILEs organise work in heterogeneous groups and respond to the increasing demand for individualized learning in order to meet the different needs of their different students). In such environments, students benefit from heterogeneous groupings, because they learn to cooperate in teams of various constellations, learn to take on different roles, and gain competences in multicultural and multilingual settings.

In the Finnish *Keskuskoulu School* in Lieska, the inclusive education of children with special needs is done by means of sensory, motor and cognitive exercises that enable the students to calm down and concentrate, and improve students' self-confidence and monitoring of their own behaviour. Exercises are coordinated by teaching assistants before or even during the regular lessons. Like this school, many other cases in this project also include in their classrooms students with physical or cognitive differences by using differential teaching methods tailored to the individual student's needs and interests. At the *Hauptschule St.Marein* in Austria, students are taught in integrative classes, including students with physical or cognitive handicaps. Instead of streaming students in groups according to ability, teacher teams apply within-class differentiation, and alternate between basic instruction of the whole class and add-on content for motivated students or extra support for students who need it. The organisation of the school day has been changed such that extra time can be devoted to student coaching and individual student work each day.

Multilingual student groups

Many ILEs show promising approaches to the integration of children with migration and/or multilingual backgrounds. For example, the *Europaschule* in Vienna makes extensive use of native language teaching in various languages, cooperates with partner schools in other countries, and organizes regular informal meetings for parents and teachers. In these “cultural cafés”, parents (especially those from a migration background) and teachers meet outside school in a non-formal setting to form social networks between representatives of different cultures and to discuss relevant topics such as the role of the native language. The school also offers basic German courses for student parents. Also in Vienna is the *Europäische Volksschule Dr. Leopold Zechner*, which involves its many students from multi-ethnic and migration backgrounds in language and culture workshops, in which all students get to know a language and culture of other students and teachers at their school. For every workshop period of six weeks, the children can choose among nine different languages, ranging from Arabic to Portuguese. The school also has several language classes in which all students learn together with students who are native speakers of the language that is taught.

This is a good example how the rich cultural experiences of a diverse student body can be used to the benefit of all learners, showing students that their cultural knowledge is valuable and worth sharing, and enabling all students to gain intercultural competences. This is a principle that is also visible in other ILEs, for example in the cross-cultural awareness programme at the Korean *Miwon Elementary School*. This school organizes multi-cultural days and extra-curricular activities like bilingual newspaper making or bilingual presentation contests to stimulate the exchange between students with different native languages and cultural backgrounds. The students' parents are strongly involved in the

school as well, both in after-school language classes taught by multicultural parents, and in Korean language classes for non-native speaking parents that take place in the weekends and during school vacations.

Mixed-age learner groupings

Learner groupings in ILEs are often (intentionally) mixed in terms of age, with the group compositions being based on the students' state of development rather than their biological age or assignment to school grade. Often, the mixed-age groups are flexibly adapted to the changing needs of the individual children involved, reflecting how the dynamic role of learners in innovative learning environments allows the teachers to optimize group constellations. Among the benefits of mixed-age groups is that students acquire social competences when they learn to act in heterogeneous teams, and learn to take on different roles, such as both mentor and mentee during collaborative learning and peer-coaching². Also, talented students can proceed more smoothly through grade levels while weaker students can receive the support they need without feeling left behind.

Mixed-age groups can cover very large or smaller age ranges. An example of the first is the one-room school in Lindental, Switzerland, where the youngest pupil is 7 years old, and the oldest is 16. Although each of the students is assigned to a grade level, they are instructed as one group by means of team teaching and much individual student work based on personalized week plans. Over the course of several years at the school, the students become integrated members of a learning community, naturally pick up rules and methods from their older peers, and learn to learn in a social setting, by asking their peers for help as well as teaching others. An example with a smaller age range is the Danish *Lisbjerg School* where two large mixed-age groups comprise three years each (6 to 9 or 10 to 13). The students are also organized into smaller groups of 12 pupils, which are also mixed in terms of age. Teaching is differentiated and alternates between work within the bigger and the smaller groups. Every student follows an individualized learning path (called "the child's storyline"), and documents work in different portfolio's. Importantly, these portfolios are used to evaluate the students' progress against their individual development and learning aims, rather than against other pupils.

Later sections will comment in more detail on the ways in which heterogeneous learner groups are organized and flexibly adapted to learning activities in different ILEs. What is relevant to stress here is that the learner groups are based on the children's state of development, on their changing needs and interests, and on pedagogical considerations with respect to work forms and group compositions, rather than on a rigid categorization of learners based on their biological age or a fixed class level.

Concluding Remarks

The reviewed examples of innovations in the learner profile illustrate how students benefit from working with others who are different from themselves when the circumstances allow them to share experiences and knowledge in an atmosphere of genuine interest and exchange. Learning about different backgrounds, abilities, needs, and interests prepares the students for a world in which social skills and intercultural competences are of utmost importance. The inclusion of parents in school and the use of flexible age-mixed groupings as well are an expression of changes in the role of the learner, who is more and more perceived and treated as an individual with a unique background and needs, who benefits from flexible groupings instead of rigid assignments to grades and classes.

CHAPTER 5: INNOVATION IN THE ROLE OF THE LEARNING PROFESSIONALS⁴

Long gone are the days when ‘teachers’ were simply expected to stand at the front of a classroom to transfer their knowledge to ‘learners’, who, like sponges absorbing water, collected this knowledge only to release it again when wrung out. Innovative methods of teaching abound that challenge these traditional methods and allow learners to learn in new and different ways.

The compilation of innovative learning environments features a number of cases with new approaches involving those engaged in teaching and orchestrating learning. This dimension of the ILE classification includes innovations in how teaching resources are combined or organised (e.g., team teaching or multi-disciplinary teachers). This also comprises the engagement of different experts, adults, or peers to work in conjunction with, or instead of the traditional ‘teachers’. Below, drawing from our compilation, we will first probe some of the aspects of innovating the ways that teaching is combined and organised, and then explore novel conceptions of who can meaningfully ‘teach’ learners.

Innovations in Combining and Organising Teaching

Team teaching can be defined as a group of two or more teachers working together to plan, orchestrate, and evaluate learning activities for the same group of learners. Generally included in team teaching are models wherein a) two or more instructors teach the same students at the same time, or b) wherein the instructors work together yet may not teach the same group of students.

Where two or more teachers teach the same students at the same time, there are a number of possible approaches. There is the fairly traditional approach to team teaching, in which the teachers share the instruction of content to all students. An example of this would be when one teacher presents new material while another teacher builds a diagram on the board. There is also a number of more innovative approaches to team teaching. A more *collaborative* approach would be a situation in which team teachers work together to design the course and teach the material by exchanging and discussing ideas with the learners. Not only do the team teachers work together, but the course may also use group learning techniques for the learners, e.g., group work and student-led discussions. *Parallel* instruction would involve both teachers teaching the same material to different groups, usually at the same time. *Differentiated* team teaching entails dividing the class into learning needs groups, in which teachers teach the same content at a different pace. A number of cases from the Innovative Learning Environments compilation feature innovations in the various approaches to team teaching as described above.

Team Teaching

When team teaching was first introduced around the 1960s, it tended to be a fairly traditional affair in which teachers in essence took turns. One teacher might present a lesson while another sat in the back row of the classroom. They might then trade places, with the second teacher leading an exercise, and then divide the classroom into two groups with one teacher leading each for more practice. Although team teaching in the classroom—in its most basic sense—has been around for some time, more innovative formats that we find in many ILEs have the potential to foster a number of pedagogical advantages and can be an excellent way to build flexibility and engage learners.

⁴ This chapter has been prepared by Vanessa Shadoian-Gersing of the OECD/CERI staff.

Furthermore, team teaching can be an unlikely means of building flexibility into a seemingly rigid learning situation. Instead of adhering purely to the standard arrangement of one teacher for a thirty-student classroom, in certain subjects the *Cramlington School* features two teachers for a sixty-student classroom. This set-up adds flexibility to the timetable and allows teachers to split into groups in any way that suits their needs—such as for parallel or differentiated instruction. This also allows them to run cross-disciplinary sessions, including an enquiry facilitated by a science and media teacher in grade 8. The result is that teachers across many disciplines can build flexibility at no extra cost to the school. The process of team teaching can also help to model and release the creative energies of collaboration, resulting in new and novel ways of orchestrating learning that are engaging to learners.

In addition, team teaching can also provide a means of differentiating instruction within mixed-ability groups, allowing for the needs of diverse student abilities to be met. In *the Hauptschule St. Marein bei Graz* in Austria, students are taught in mixed-age integrated classes, including some students with special needs. Instead of streaming students into ability groups, teacher teams apply within-class differentiation, alternating between basic teaching for the whole class and add-on content for highly motivated students or extra support for less motivated students. In light of research findings suggesting that students in mixed ability groups tend to fare better than those in streamed ability groups, differentiated team teaching can be seen as a potentially powerful approach for effective learning that enforces equity.

An additional benefit of team teaching is that it inherently provides a basis for informal feedback between the involved teachers about their shared experience. As we see in a number of cases, formal and informal feedback among teachers can be an excellent means of building professional relationships and ensuring that teaching is fostering effective student learning. More formal case examples will be discussed under ‘teacher team cooperation for planning and evaluation’ below.

Team Collaboration for Planning and Evaluation

Collaboration among teams of teachers can be an excellent way to plan and encourage critical reflection and evaluation of teaching practices within professional learning communities. As noted above, the collaborative process of team teaching often organically encourages informal reflection and feedback. In addition, when learning environments *formally* incorporate a deliberate structure for this type of reflective collaboration for planning and evaluation, it can be a powerful tool for recording, learning and sharing good practices. An interesting case is that of the *Quality eLearning Centre* and *Enquiry Zone* in Victoria, Australia, an ILE aiming at purposeful and inspired learning and teaching, wherein teachers open up their classrooms and work in teams of teachers to model and share good practices—not only with their colleagues, but also with students and the broader community. In this case, the roles of the teams—which feature teachers and leaders—are manifold and can include curriculum, pedagogy, program development, student management, and well-being. The teams collaborate and continually refine processes and capabilities to improve learning outcomes—truly resembling a learning organisation.

Other notable approaches to formal collaboration for planning and evaluation in teacher teams can be found in the ILE compilation. In the *Siftung Deutsche Landerziehungsheime Hermann-Lietz Schule Haubinda* in Germany (Thuringia), groups of teachers form teams divided by age level in the lower grades and subject matter in the middle grades. Regular meetings take place throughout the academic year to unify the curriculum and to encourage interdisciplinary projects and learning. In the *Projektschule Impuls*, Rorschach in Switzerland (Bern), teams of teachers teach mixed-ability groups (including students with special needs) and practice continuous self- and external-evaluation to ensure that they can constantly innovate and improve their methods. In the *Dalton up-to-date School* in Austria, teachers meet regularly in teams to discuss their own practice, and also meet with other school representatives monthly to evaluate practices overall at the school.

Teacher Professional Development

Continuing professional development is crucial to ensure that teachers in all learning environments can update their skills vis-a-vis the needs of their learners—reinforcing all the dimensions of good teaching throughout a teacher’s career. In *innovative* learning environments, the professional development needs may differ somewhat from the more ‘traditional’ needs, and may be better addressed in the context of the particular ILE, instead of a central professional development establishment. In the *Ballarat High School* in Australia (Victoria), such an approach is a main innovation of the learning environment and is particularly well developed. The school uses a set of teaching objectives as a “framework” for learning in the upper grades, forming part of a professional learning programme for all staff. A central role is played by learning advisors - teams of teachers who meet weekly with small groups of students and help students organise their learning. A leadership team develops and monitors this learning advisor approach and coaches staff in the implementation and assessment of changed practice linked to the framework. Learning preferences of the students, but also the staff, are measured with psychometric questionnaires, which are taken into account when planning tasks and learning strategies. This continual focus on professional development helps to ensure that the learning advisors can effectively support and challenge learners to fulfil their full potential.

Several other ILEs in the compilation feature a deliberate focus on innovative teacher professional development. In the *John Monash Science School* in Australia (Victoria), students are almost exclusively taught in large groups with teacher teams, and supported and closely monitored in smaller groups. To ensure that the competencies of the teaching staff are constantly updated to reflect the school’s strategic directions, all staff members are required to complete an individual staff development plan, including identifying suitable professional learning opportunities. Every teacher can thus access three hours of professional learning and curriculum development each Wednesday afternoon while the students are undertaking other co-curricular electives. At the *Primarschule Lindenfeld, Burgdorf* in Switzerland (Bern), professional development is based on evaluations conducted by the University of Bern’s teacher education unit, as well as on frequent internal evaluation. At this primary school focusing on individualization and differentiation of learning, one evaluation has focussed on differentiated, mixed-age teaching methods—suggesting that they should be extended. Using a variety of training tools such as video sequences, this theoretical and practical focus on distinct forms of differentiated teaching in combination with characteristics of successful teaching has borne fruit and elucidated the direction of the school’s development.

Teacher Professional Development: Mentoring Schemes

Another form of teacher professional development is teacher-led professional development, which often includes a significant mentoring component. Often utilised for less-experienced teachers, mentoring programs, research suggests, incur significant benefits to novice teachers, or *mentees*, as well as for the experienced teachers, or *mentors*. Mentoring can also take place among peer teachers. In an *innovative* learning environment, this type of relationship can provide valuable support and informal reflection—especially crucial when innovating. Research suggests that benefits of mentoring relationships include improving professional competencies, encouraging reflective practice, and collaboration. In addition, it can prove valuable in fostering new ideas about curriculum and practice, which can greatly benefit the learning environment.

Many ILEs engage in teacher mentoring programmes in order to reap these benefits. At the *Valby Oppvekstsenter*, an early development centre and primary school in Larvik, Norway, pedagogy is inspired by social-constructivist ideas and is open to alternative philosophies if deemed useful for the learners. Because pedagogical methods employed evolve according to the various learners’ needs in this ILE, continuing professional development is considered essential for teachers to be able to continually choose the best methods and interventions. This professional development is organised through peer mentoring, wherein teachers collaborate with a colleague project-mate to carry out

learning assignments, develop and reflect on good interventions and later share improved practices with the rest of the staff.

In Hungary, at the *Alternative Foundational Programme* within Kuno Klebelsberg Primary and Grammar School, a primary school using differentiated teaching methods in heterogeneous classes that include students with special needs, teachers take part in one another's lessons to learn from one another and beginning teachers are paired with an experienced colleague to mentor them and help them prepare for their lessons. At the *American Institute of Monterrey's AIM/I-PAL System*, a public-private partnership between the AIM and a less-resourced public school, AIM teacher mentors train their public school peers in pedagogical methods focusing on ability development rather than content acquisition. In the *REOSCH, Ressorcenorientierte*, a school featuring martial arts and meditation as forms of mental training in Switzerland (Bern), individualized learning is facilitated by teachers who engage in weekly peer consulting to exchange feedback and share experiences.

A rich example is found in the *Lakes South Morang P-9 School* (Victoria, Australia), wherein we see the interplay of the above-mentioned approaches: teaching teams are cross-curricular and complementary, with team members planning and teaching together, as well as coaching one another. This blend of team teaching and collaboration is interesting one in seeming to result in a more holistic approach to teaching and learning. The cross-curricular nature of the teaching teams provides a balanced, engaging multi-disciplinary approach to learning that includes an integrated project called "Investigation".

To support these efforts and to ensure that they are accessible to teachers school-wide, a collaborative data storage system is available for sharing documentation, assessments, etc. among teachers, thereby facilitating the sharing and take-up of good practices among peers. Experienced team teachers also engage in coaching other teachers at 'the Lakes' on various teaching approaches that cater to different learning styles. This collaborative relationship among teaching staff contributes to an impressive cycle of constant and relevant professional learning for teaching in innovative learning environments.

New 'Teachers' for Innovative Learning

Yet, learning activities do not have to be facilitated only by licensed teachers. Bringing in different experts, adults or peers to work with or act as teachers (e.g., members of the community or non-school specialists) can help to bring material alive to learners and complement what is taught by the official 'teacher'.

Peer 'Teaching' Among Students

When students are engaged both as learners and as 'teachers' to their peers, a collaborative learning experience is provided, wherein the potential benefits include: enhanced understanding of the subject area, as well as improved confidence and study-skills. In the *Presteheia*, an age mix and LP model in Norway (Kristianssand), much emphasis is placed on providing students with experiences of mastery by allowing them the opportunity to teach other students, both in mixed-age classes and in collaboration with the on-site day-care centre (e.g., students arrange reading sessions for the younger students in the centre).

External ‘Expert’ ‘Teachers’

Another way to make material come alive and to allow for more authentic learning experiences is to include non-school specialists as learning facilitators. In the Community/School Film Festival at the *Manchester Primary School* in Victoria, Australia, the objective is to engage primary school students with the curriculum through experiences of developing short films. Filming is used as a cross-curricular activity involving flexible movement around the school, group negotiation, and is regarded as a tool for students to demonstrate their understanding. Teachers and film technicians support the students, and the project culminates in an authentic film festival, fostering exchange of resources and expertise.

The *Fiskars Model Elementary School* in Finland is a blended learning environment that combines the regular curriculum of all Finnish primary schools with additional pedagogical methods, such as learning-by-doing and active learning in authentic, “real-life” contexts. The learning environment is defined as the whole village community in which the small primary school is situated. Artists and craftsmen from the village administer student workshops on diverse topics, such as woodworks, fine arts, or glass-blowing. These workshops serve to diversify and deepen the teaching and learning taking place at the school, afford “real-life” contexts and authentic environments, and foster practical skills and the development of creative problem-solving abilities. The dimension of using knowledge found in communities, as well as with parents, in innovative learning environments will be further explored in the section on ‘resources’, below.

CHAPTER 6: RETHINKING CONTENT⁵

Innovations with respect to the *content* of learning can be broadly divided into two areas: First, there are changes in the primary objectives of the learning, and second, there are changes in the way that these learning objectives are defined.

Changes in the primary objectives of learning

The primary objective of innovative learning environments is to equip learners with 21st century competences like the ability to apply meaningfully-learned, well-integrated knowledge flexibly and creatively in different situations and the ability to cope with the social, intellectual, communicative, and emotional demands of diverse and rapidly changing environments. There is also a large emphasis on (meta-)cognitive and organisational competences that students need to become successful, self-regulated lifelong learners, or, as the Danish *Lisbjergskolen* puts it: to encourage and qualify children to “act independently and to become self-directed, self-reflected and self-evaluative learners”. These objectives set ILEs apart from more traditional institutions that focus strongly on factual knowledge acquisition. In the following, we summarize the most prominent means by which the cases in the project universe changed their content of learning to meet 21st century learning objectives. We begin with an overview of authentic, inter-disciplinary, and inquiry-based learning. Next, we point at specific new foci of content that arise from global developments, such as increasing interest in sustainability, intercultural communication, and digital literacy.

Authentic learning

Innovative learning environments make the learning experience *authentic* and meaningful by engaging students with real-life problems, offering hands-on experiences, and incorporating the students’ historical, natural, and cultural environment in learning activities. *Authenticity* is here loosely defined as the degree to which content is “realistic”, i.e. representative of problems that are relevant in the world outside of the classroom, and also as the degree to which the content is related to the students’ personal experiences and interests.

Learning from real-life problems

Central to authentic teaching are realistic “real-life” problems, which are interesting for learning activities because they are more complex and challenging than problems commonly presented as well as being more relevant and interesting for the students than theoretical cases. An excellent example of this is the Mexican Democratic Citizenship program implemented at *Colegio Guadalupe*. Here, students get the opportunity to identify problems that affect their own educational community, and then work on generating, implementing and assessing possible solutions to these problems. The students plan projects based on their own research, for example surveys and interviews in their community. They then choose aspects of the situation to improve, and work out their own ideas to do so with an action plan, following a series of goal-oriented, collaborative activities. The aim of the programme is to help the children develop their own potential to actively participate in a democratic society and to become self-directed individuals with a strong motivation to achieve goals for the common good. At the same time, the students build and integrate knowledge in diverse content areas from real experiences. A second Mexican example can be found at the *Center for Studies Design at Monterrey*. This college has established co-operations with enterprises and institutions that submit

⁵ This draft chapter has been prepared by Gesa van den Broek, Radboud University Nijmegen, Netherlands.

“real-world” projects which student teams then work out – making the whole way from brainstorming to final evaluation, with professors acting as counsellors in this process.

A different example is the three-year long house building project in which students at *Breidablikk lower secondary school* are engaged. The students design, construct and furnish houses at the scale of 1:20, and in this process get to play the roles of architects, builders, gardeners, electricians, real estate agents, etc. The school cooperates with several local companies in order to provide its students with this authentic practical learning from hands-on experiences.

Hands-on experiences

Work on real-life problems often goes together with hands-on experiences, which are a good means to activate learners and let them use all senses during learning. Instead of only passively listening to abstract descriptions, students become more involved in their learning when they get the chance to try out and experience things with their own eyes and hands. Such hands-on practice also increases the chance that students are later able to actually put into practice what they learnt. Importantly, this principle is not limited to handicraft and art work which tend to be the first associations with the term, but can also be used to teach many different skills including language learning and business administration.

For example, one application of hands-on learning is to bring students in contact with native speakers of languages that the students learn, so that the students can use foreign languages as part of natural interactions. This both makes the learning authentic and gives the students practical experience. Contacts are initiated in different ways: By inviting the speakers into the classroom for face-to-face conversations, with emails and videoconferencing, or by letting students participate in international events. For example, students at *HLW Rankweil vocational school* (Austria), regularly contribute to international events, such as sport events and fairs, so that they can meet and communicate with people who speak many different foreign languages.

A different recurrent initiative is that students run a small business at school, either producing and selling self-made products or working on problems from external customers. In such settings, students naturally gain experience in activities as marketing, accounting, and customer-service, but also in organisation, coordination and team work. For example, one of the cases describes how students establish a business in the virtual environment Second Life, where it is possible to develop and implement a business concept at very low costs. The additional advantage of a virtual business is that the students can interact online with international customers from all over the world. Another example comes from *Mypolonga primary school* in South Australia, which has a student-organised shop, in which the children sell self-made products and commissioned products from the local community to visitors and tourists. All classes are involved in business, craft and tourism aspects, and senior students along with a junior trainee operate the shop one day per week. Students rotate through a series of tasks in the shop and engage in numerous opportunities for authentic learning through oral and written language use, mathematics, art, craft and hospitality.

A last example comes from *Bendigo South East College* in Victoria, Australia, where 14- to 16-year-old students make experiences in planning, organisation, responsibility and independent learning, when they organise off-campus projects for their grade level. The yearly highlight is when students plan a city-trip for their class, including also aspects like travelling and accommodation. During the trip, the students conduct a week-long research project and collect survey and interview data.

Involving the larger environment

Authentic learning activities often involve aspects of the children’s direct environment, in order to make use of and foster their natural curiosity to explore the world around them and in order to accustom the students to the cultural and historical heritage of the place where they live. This is a topic in many cases, but very prominent in the several Finnish ILEs. For example, the Finnish *On the move!* project stimulates the learners’ to examine everyday settings from the perspective of natural sciences. Activities include investigations of air quality and noise measurements conducted in cooperation with relevant experts and authorities responsible for these issues. For the air quality project, students place a measurement device at a self-selected location in the neighbourhood of their school, communicate with a centre for natural science teaching for analysis, process the data and publish results in an interactive map on an online learning platform, where they engage in discussions of the results with both students from other schools and with a wide network of experts and authorities who facilitate the investigations. This initiative is also an example how learning outside of the regular classroom and school context can enrich students’ experiences when they use “all senses” for exploration, a principle that can also be used in urban areas with an architecturally oriented teaching model as in Finland XX. The students visit, observe and discuss specific buildings in their environment, which are integrated in classroom exercises, for example, when the students calculate the surface of the building in maths classes or discuss the historical function of the building in history classes.

A final performance for a “real” audience

Authentic learning often involves several rounds of review and revision toward a polished performance, which can evolve around an exhibition, a stage performance, a portfolio, etc. When students can present their work to a “real” audience, this shows them how their work can be a source of public learning and celebration (Barron & Darling-Hammond, 2010, *The Nature of Learning*, Chapter 9). Working towards a final performance also motivates students to achieve genuine mastery because “real” audiences demand coherent presentations and a high level of understanding to enable satisfactory explanations. Furthermore, presentations are also learning events in themselves as setting them up involves important skills like organising group efforts and thinking about how to communicate effectively with an audience.

One interesting example of how this principle can be put into practice is by means of film production. Students make films or animations, going through the complete process from idea generation, to planning, storyboarding, and scripting, to production and final presentation. At *Manchester primary school* in Victoria, Australia, for example, the students work throughout the year on short films, which are then presented to the public during a large film festival that brings together several schools in the area.

Interdisciplinary learning

There is a prominent shift away from subject-specific teaching towards more inter-disciplinary learning that links knowledge and skills from several subject areas. Learning activities are integrated under an overarching topic or activity, which the students approach from different angles related to multiple curriculum areas, often in collaboration with several teachers. This approach is often used for teaching subjects from technical sciences and natural sciences, but also to combine language studies, history or politics. One interesting example in this respect is *Lucijan Bratkovic Bratusa* primary school in Slovenia, where project weeks are organized around topics such as energy, forest and continental water, and housing problems. Cross-subject activities including field work, excursions, and lessons in

A special school in a special village

Fiskars primary school is located in a small village with many artisans and designers. In order to increase the students’ knowledge of Finnish culture and their understanding of special characteristics of the local culture, but also to develop the students’ cultural identity as part of the Finnish and European society, the school implements cross-curricular activities in cooperation with local artists. Each year, each class of students visits an art and handicraft workshop of a local artisan. When the students try out techniques like woodworking, paper making, or glassblowing, they also learn about the history and current function of these crafts, artistic professions and their cultural heritage. *Case No. FIN.007*

the school surroundings are coordinated by one teacher and carried out by a team of teachers. In the *Prirodni skola* in Prague, Czech Republic, students work on cross-curricular research projects every “project-Wednesday” and in other schools, overarching topics are used to integrate activities over the course of a period like six weeks (NOR.003) or school trimesters (CHE.BR.007).

The objective of interdisciplinary work is that the students no longer acquire isolated pieces of knowledge in different subjects, but instead are helped to integrate information into consistent knowledge structures and practice the flexible transfer of skills to new topics. What is innovative about these approaches is that learning activities are defined by the questions that the students work on and by the skills that the students are to acquire, rather than by the traditional (artificial) separation of content into different subject areas taught by different teachers. In the Canadian *Nanaimo Ladysmith School* in British Columbia, for example, the primary school curriculum and schedule are built around large-scale inquiries that blur traditional school subjects and schedules. Units are framed by an overarching inquiry question that the teachers formulate in collaboration, and that are designed to be meaningful and relevant, and that are accompanied by a clear set of learning intentions. Students are then helped to develop their own inquiry questions to delve deeply into areas of interest, for example.

Inquiry-based learning

During research or inquiry-based projects, students are encouraged to actively construct their knowledge while practicing skills like hypothesis generation, scientific inquiry, self-monitoring and (online) literary analysis. Like most activities in ILEs, they teach students both integrated, holistic factual knowledge and at the same time more general skills like problem solving, critical evaluation of information, and also effective cooperation in teams and self-regulation. For example, at *Matthew Moss High School* (England), student teams work one day per week on a research project. The teachers first introduce a challenge to the students, which can vary from launching an egg as high as possible and returning it to earth without breaking, responding to a natural disaster, to investigating family histories of migration. The students then gather information about the topic, write a research proposal, and - after approval by the teacher – conduct the research throughout the school year. In the process, they get the freedom to organise their own resourcing, while the teachers act as facilitators who present in-time lessons or suggest additional sources of knowledge.

Specific foci of content

New foci of content arise from global developments such as the increasing interest in ecological sustainability, the importance of intercultural and multi-language competences, and changes in ICT use. Many ILEs also see it as their responsibility to enable their learners to develop attitudes and values to actively participate in society and successfully choose and pursue a career. Finally, there is an emphasis on (meta-) cognitive competences with respect to the learning process itself in order to prepare students for self-regulated lifelong learning. These topics appear throughout many universe cases, but we present some selected examples per area of focus in the following.

Sustainability

We limit the discussion to three interesting cases. First, *Flaktveit School* in Bergen, Norway translates its focus on education for sustainable development into an innovative programme on waste disposal and waste handling, for which it cooperates with a waste management company. There are also other co-operation with a Green agency on water resources, as well as with a large company which shows the children the environmental issues large companies face. The objective of the programme is to educate the students to see their place in society and work towards a sustainable future. Second, *Neta'im Environmental School* in Israel also has an extensive programme on environmental issues. Students experience controlled consumption of school resources, such as paper, water, and electricity, and are introduced to recycling activities. The school also initiates activities with the community in which the students act as environmental ambassadors during festivals or marches with green subjects. Finally, Finnish schools that use the “Model Vihti” focus at the production of food. Nature-connected education in school gardens or via collaborations with local farms allow the students to experience how many steps are involved in the production of food by experiencing all parts of the production

process from the planning of the seasons, the growing of plants, gathering of yield to the processing of food. Products of the children's work are later used in everyday school life and the school also has excursions to the nearby forest, where children learn about topics like forestry, water systems, and climate change.

Social, intercultural, and language competences

Modern schools are expected to equip their students with the ability to act and communicate confidently and successfully in groups that are mixed in terms of ability, knowledge, culture, experiences, and language. All ILEs recognize that learning is social and that well-organised cooperative learning in diverse group constellations benefits students in many ways, but apart from this some of the ILEs also explicitly address social or language skills in interesting ways. For example, at the Czech *Zakladni skola Chrudim*, students can attend a wide range of seminars on social-emotional development, which have the purpose to build a well-functioning team with peers and teachers and to practice communicative and social skills. The focus of the seminars is on mutual knowledge of pupils and teachers, student confidence and knowledge of their individual differences, mutual respect, confidence and responsibility. There is also attention for effective verbal and non-verbal communication, and activities include role-plays and relaxation activities.

A different example comes from *OS Janka Padeznika Primary School* in Slovenia, where social competences are rewarded with fair-play awards. Every class regularly chooses their fair play student of the month, and in a final meeting the student council and the teacher assembly together pronounce the "fair play student of the school". The choice depends on values like friendship, respect, friendliness, behaviour towards students and personnel, consistence, and attitudes towards solving conflicts.

Social competence also includes that students are familiar with and show respect for the cultural heritage of their environment, and for traditions and cultures of others. Several ILEs address this objective, especially where Aboriginal place and culture are close. By inviting community members with expertise into classrooms, and treating local resources as part of the learning environment (e.g., CAN.BC.004, FIN.007), students are introduced to cultures and traditions.

Many ILEs in this project also have a strong focus on language learning, for example in workshops in which the students can learn the native language of other students at their school and that involve as well student parents (AUT.013, see the section on learner profiles for more information on heterogeneous student groups and parent classes). The Austrian vocational school *HLW Rankweil* also has a programme with a strong language focus. Students learn English, French, and either Spanish or Italian as foreign languages. Some of their courses are taught in English, and they can choose to take additional conversation classes in any foreign language. In addition, students are supported in organising a work-placement abroad, and they assist in international events, for example catering during sports events or fairs, which provide the students with an opportunity to practice languages. What is particularly interesting about the content that is taught at this school is that there are multilingual trainings, during which the students practice communication in multilingual situations, train to flexibly switch from one language to another, and learn to become aware of similarities and differences between languages.

The power of the arts

The Ohio Toledo School of Arts combines a college preparatory academic curriculum with an intense arts programme. The objective is that students acquire the self-motivation, discipline, creative problem solving, and concentration that is needed to excel in the arts and transfer these qualities to academic classes. The school uses artistic studios, rehearsal spaces, art galleries, and a theatre and employs both teachers and professional artists. Students gain business experiences through a social enterprise when they are booked as artists for community events.

Democratic citizenship

An original and far-reaching approach to the development of democratic attitudes can be found in the *Colegio Cardenal de Cracovia*, in Santiago, Chile. The whole school is organised around the topic of a “state-school”. Students have roles that correspond to different functions in a real government, for example, being a minister or administrative, and practice democratic decision-making processes on topics that are relevant to their every-day life at school (See for more information the green box). A different example is *Mypolonga* primary school in Australia where importance is placed on providing the students with opportunities to develop leadership skills. Student representatives participate in different school governing councils, and via these in some cases even in rural city councils. Other schools use assemblies or parliaments, in which (often elected) student representatives come together to express their opinion and to be involved in decision making processes at the level of the school (e.g., AUT.003, AUT.006, AUT.028, FIN.005, ESP.001). Finally, even classroom discussions during which students can make arguments in favour of a topic or activity that they would like to pursue, can be regarded as a democratic process during which students learn to engage in well-substantiated argumentations.

Colegio Cardenal de Cracovia – a “state-school”

This school is located in a very poor area. It is organised around the topic of a “state-school”, where classes represent communities that have a major, and communal administration and departments. The school has a constitution that was voted for by all students, and which includes behavioural rules that everyone must stick to. Student-ministers for culture, justice, health, building, and education work on topics corresponding to their discipline, and there are regular elections of the student school president and vice president. Elections involve strong campaigns. The school has a “nationality” that is awarded to those who get involved in the learning process at school, and its own “currency” that can function as incentives for the students who can exchange the money against the right to borrow toys and videos.

2. Changes in the way that content is chosen

There are two important trends in the way in which the content of learning and teaching is defined. The first trend is that content is increasingly personalized and adapted to the individual student’s needs, for example, when teachers design activities in such a way that all students work on the same topic but on different tasks, depending on the student’s level of development. The second trend is that students are increasingly allowed to participate in the choice of content areas to focus on. This can be achieved by means of classroom discussions and voting for topics, or on a more individual level during independent student work. All of these aspects importantly depend on the organisation of learning, and will therefore be discussed more extensively in the chapter on organisation of learning environments, in a section devoted to personalized and individualized learning.

CHAPTER 7: RETHINKING THE USE OF RESOURCES⁶

The compilation of innovative learning environments also features innovations in resources, including innovative forms and uses of resources, technology, and infrastructure, and other resources—pushing the boundaries of what we would traditionally deem a ‘resource’ for learning.

Technology-rich Innovative Learning Environments

A common feature of many innovative learning environments is the use of technology. Here, we must stress the distinction between the use of *innovative technology* and the use of *technology as an innovative vehicle for conventional learning*.

Use of ICT: Virtual Learning Environments

The use of technology to create virtual learning environments is a feature found in several innovative learning environments. On the most basic level, virtual learning environments provide a clear platform for developing and refining computer literacy skills—so crucial in the 21st century—through the daily use of ICT that they entail.

Furthermore, the presence of a virtual learning environment can serve the important purpose of increasing equitable access to education for potential students who might not otherwise have such an opportunity. At the *Escola Móvel* in Portugal - a distance learning initiative aimed initially at itinerant circus and fairground adolescents (aged 10-17) who were otherwise excluded—the aim is to give permanent access to a virtual, national- curriculum-oriented learning environment. The content is delivered through online, synchronous classes and includes both individual subjects and cross-curricular areas, personalized through an individual tutor. The virtual learning environment is complemented by four face-to-face weeks a year for each learner. Internet access to real-world contexts is valued as it helps students to understand and interact in response to real-life, authentic situations and challenges. Engagement and attainment indications have been extremely positive, and the learner focus has since been widened to include other ‘at-risk’ groups, including teenage mothers and older learners who have not previously succeeded in mainstream provision.

Individualized learning can also be effectively fostered and supported in virtual learning environments. Taking into consideration the needs and interests of various learners as individualized learning does, traditional learning environments may not always have the time, staff, or other resources to sustain individualized learning. Advantages of individualized learning can include that: many learner differences can be taken into account; learners can work at their own pace; different learning styles can be accommodated; learners have more control over what they learn; learners are engaged in active—not passive—learning; and it can be cost-effective for large numbers of learners. *The Open Access College Middle Years* programme in South Australia—that aims to provide those who are not able to attend regular schooling with the opportunity to continue their education—brings in the equity dimension. Here, personalized, virtual learning environment features individual learning plans are developed for all students, and on-going contact occurs between teachers and individual students. Interdisciplinary themes are developed based on student interests and resources are accessible for each student online to access in their own time.

⁶ This chapter has been prepared by Vanessa Shadoian-Gersing of the OECD/CERI staff.

In the *Internet Classroom* in Slovenia, the school also uses a virtual learning environment (“e-classroom”) to individualise student learning. Students work individually or in pairs on teacher-designed materials and tests in order to reach goals objectives of the official curriculum. The digital system allows teachers to keep track of when individual pupils have performed which activities in the e-classroom, and classrooms are open to parents who wish to observe the activities.

While many different configurations of innovative learning environments aim to foster creative and innovative forms of learning, virtual learning environments can provide a digital stage for students to play out these tendencies in an organic fashion. This can be accomplished due to the removal of many of the barriers often found in traditional brick-and-mortar classrooms—such as rigid application of the curriculum and lessons that are heavily teacher-directed. Through the use of non-traditional learning media, such as the creation of films and crossword puzzles, students are encouraged to learn and then demonstrate their own knowledge in creative and original ways, as seen in the *Internet Classroom* in Slovenia and the *Centro Integrado Jacint Verdaguer* in Spain (Barcelona-Catalonia).

Diverse other uses of educational space and infrastructure

Special classrooms

The general conception of a learning environment is often of a physical learning space—conjuring up images of modern types of infrastructure as well as of virtual learning environments, as explored above. Although the *innovative learning environment* as conceived by the OECD-CERI project is much broader than this element, it does include innovative uses of educational space and infrastructure as one of the sub-dimensions of analysis. At the *Lernwelt Volksschule NMS* in Bern, Switzerland—with a focus on students’ autonomous and independent work through three sorts of activities—the different rooms in the school have different rules, i.e., some require absolute silence, others allow whispering or talking during collaboration.

At the *John Monash Science School* in Clayton, Victoria (Australia), the physical learning environment allows for many innovations in learning. Students are almost exclusively taught in large groups with several teachers, and supported in small tutor groups and via close monitoring of student performance. The physical environment can be flexibly configured, and allows easy access to many ICT resources. There are virtually no walls between the different learning spaces, allowing students to learn in ways that best suit their own needs. The school has no bells or loudspeakers, and all communication is via electronic communication, wikis, and email.

In the *International Business College* in Hetzendorf, Austria, the learning space is also a physically open environment. This business-oriented secondary school uses a reform pedagogy and different forms of self-driven student learning with an emphasis on social interactions. The physically open learning spaces include a “business centre” with meeting desks, computers, et cetera, lending a sense of authenticity to the learning space.

Partnerships as Learning Resources

University collaboration

When learning environments partner with local universities, there can be tremendous advantages of drawing on university resources. The benefits are not all unidirectional, as innovative ideas and practices can also in turn percolate up to the university level. One type of advantage that innovative learning environments can derive from a partnership with a local university is that of research capacity. In the *Narrative Learning in Play Environments Centre* (Silmu), at the University of Oulu in Finland, this ‘research laboratory of play’ is part of a university research centre for developmental teaching. It has three functions: first, to conduct experimental research on children’s play, second, to educate student teachers, and third, as a creative play club for families with young children. Here, the learning environment of this early childhood education centre is enriched through the university’s

research on children's play, while in turn student teachers at the university are able to gain hands-on training at the play club. A different example of a school-based learning environment partnering with a university-based teacher education programme with bi-directional benefits is that of the *Adalbert Stifter Praxisschule*, PH Linz in Austria. This private secondary comprehensive school is a practice school in which innovative forms of learning are developed in cooperation with a university college of teacher education.

Certain innovative learning environments also draw on the *human* resources that a university partnership can provide. At the *Consejo Nacional de Alianzas Educativas* in Monterrey, Nuevo Leon, Mexico, the project focus is on improving academic achievements and reducing drop-out rates at schools in impoverished suburbs. One of the methods used to this end is that young professionals from local universities mentor students at risk of dropping-out (known as the "amigo mentor").

Parents and Communities

Parental and community involvement in learning environments can serve as a valuable, non-traditional resource for learning, and can take many forms. The connection of parents and communities to the learning environment can greatly help to foster knowledge transfer through the links to the real-world.

Parental involvement at school

At the *School and Work College of the "Living Together" Association* in Vienna, Austria, a selection of parents make the commitment to be actively involved in the everyday activities of the school in order to make it a place to both live and learn. Because parents become an integral element of the school life, students are able to share a part of their family life—no matter how diverse or different—with one another in a positive way, creating stronger families and a more confident youth culture surrounding family issues.

Similarly, at the *Lernwerkstatt im Wasserschloss Pottenbrunn* in Austria, parents contribute eighty hours of voluntary work each year to this parent-founded inclusive learning environment. This close cooperation also helps parents to closely understand the principles that underpin the school, in turn helping to ensure that they uphold the principles with their children when they are in the home environment, and can also contribute to students' motivational beliefs. At the *Discovery 1 and Unlimited Paenga Tawhiti* in Christchurch (New Zealand), the philosophy of the school is that everyone involved in the school community is both a learner and a teacher—including parents. Student, parents and learning advisors meet regularly and all take collective responsibility for supporting students' progress.

Parents can also serve as a learning resource to teachers, helping to introduce new ideas for their classrooms. In the *GTVS Europaschule* in Vienna, Austria, parents contribute not only to the planning and administration of classes and the parents' association, but also to a cultural café, where parents (especially those from a migration background) and teachers can meet once a month outside school to discuss relevant topics (e.g., the role of the native language, etc) and to form valuable social networks between representatives of different cultures. At the *Narrative learning in play environments* (Silmu) of the University of Oulu (Finland), the aim is to foster creative, independent thinking and communication in the children through joint narrative play and creative drama methods. Through the involvement of parents, student teachers also learn about the most effective forms of adult participation in children's play and how different forms of play support child development.

Community involvement

When learning environments formally incorporate the community as a learning resource, the resulting experiential learning opportunities can provide manifold benefits to learners, the learning environment, and the community as a whole. This type of approach can harness the benefits of pedagogies of engagement, pedagogies of empowerment, values initiatives, citizenship education programmes, and

community resource programmes (*The Nature of Learning: Using Research to Inspire Practice*, OECD 2010).

One such blended, innovative learning environment is found in the *Saturna Ecological Education Centre and Middle Years Shared Ecological Education Centre, Gulf Islands School District* in British Columbia, Canada. The learning in this remote community is focused strongly on how students learn, albeit learning aimed at a deep appreciation of other generations and of the natural environment. The Independent Directed Studies course sees each student working in a mentorship relationship with an adult in the community. Middle-years learners spend half their time outside the school building working on personally-designed small group projects. Students experience a great deal of inter-dependent, intergenerational learning, supported by ‘Connecting Generations’ – a database and system that allows young people and older members of the community to connect up for focused ‘cognitive apprenticeship’ opportunities, as well as for more general learning from one another.

A further goal of blended learning environments that draw upon community resources is often to encourage a sense of civic responsibility and community in itself, creating a virtuous circle. At the *Learning Houses, Suites and Landscapes/Multimedia Studio, Bentleigh West Primary* in Victoria (Australia), there is a strong belief that learning must be relevant, meaningful and applicable for all students to set goals, achieve their potential and be connected to their community. Teaching methods include explicit instruction, workshops, student conferences, inquiry based learning, and hands-on experiences. Environmental sustainability programs and established community partnerships provide a platform for active and engaging learning.

Innovative learning environments comprising this type of community involvement often feature a strong equity component. At the *Consejo Nacional de Alianzas Educativas* in Monterrey, Mexico, the project focus is on improving academic achievements and reducing drop-out rates at schools in impoverished suburbs by establishing contacts between students (age 12-15), parents, school staff and community experts from the social and private sectors. Characteristics include a centre for care of adolescents and their families built within the school and an empowerment programme to enable student mothers to generate sufficient income to prevent families from withdrawing their children.

In the *Wendouree West Community Learning Hub, Yuille Park Community College* in Victoria, Australia, the objective is to improve the social, economic and environmental circumstances of the community and to repair educational disadvantage by creating an environment that fosters positive interactions among generations and makes learning available to all community members. The school and broader community share facilities, including ICT-rich learning spaces. Teams of teachers use project based learning both for students and for life-long learners in the community.

CHAPTER 8: TECHNOLOGY-RICH INNOVATIVE LEARNING ENVIRONMENTS⁷

Introduction

Our rapidly changing world has posed the long-standing question to education:

“How can today’s schools be transformed so as to become environments of teaching and learning that makes individuals lifelong learners and prepare them for the 21st Century?”

The response to this question is the focus of the OECD project, *Innovative Learning Environments*, and has produced a sampling of the rich array of new visions for education around the world. As one might imagine, many learning environments have looked to technology in their efforts to redesign teaching and learning. While technology integration has long been a key area of concern in education, the intersection of technology with our rapidly transforming educational landscape is framing the nature of technology in education in profound, new ways. New and emerging technologies are provoking a re-conceptualization of teaching and learning, while also serving as catalysts for transformation and innovation.

Successfully preparing all learners with the skills and capacities for 21st century citizenship—global awareness, creativity, collaborative problem-solving, self-directed learning—is no small order, and many educational leaders are finding that the traditional forms of education that have evolved through the end of the last century are simply inadequate for achieving these goals. At the same time, while our outer world was transforming, considerable advances have been made in the learning sciences, forcing educators to reconsider how they approach learning, instruction, and the environments created to foster these. Finally, dramatic advances in educational technology have inspired powerful new ways for learners to engage with all kinds of content and activities in their own self-directed learning experiences. The juxtaposition of these three events creates a very interesting challenge and opportunity—a space in which to reconsider, re-imagine, and re-invent learning environments able to prepare and excel each individual for effective life-long learning.

The drive of technology for school change

While many, if not all, systems of education seek to at least improve and advance (and some even seek to radically transform), this does not necessarily mean one has to leverage technology to do so. However, there are several key drivers pushing technology as a key component for educational system change, and these serve as central reasons that educators and education stakeholders should consider the growing relevance and implications of technology and technology-based school innovations (OECD, 2010):

- Technology can perform several key functions in the change process, including opening up new opportunities that improve teaching and learning—particularly with the affordance of customization of learning to individual learner needs, which is highly supported by the learning sciences;
- The skills for an adult life include technological literacy, and people who do not acquire and master these competencies may suffer from a new form of the digital divide, which

⁷ This chapter has been prepared by Jennifer Groff, Consultant, Cambridge Mass. USA

will impact their capacity to effectively operate and thrive in the new knowledge economy;

- Technology is an integral part to accessing the higher-order competencies often referred to as 21st Century Skills, which are also necessary to be productive in today’s society.

The New Millennium Learners (NML) work of the OECD over the last several years has contributed to these foundational elements, by describing the fundamental nature of learners in today’s world. Increasingly “connected,” students today are constantly surrounded by a constellation of digital devices. New millennium learners’ lives are seen as highly dependent on technology up to the extent that their social and cultural practices would not be as they are if digital media were not available anytime, anywhere to them; this body of work also describes the educational implications the NML research, explaining that students are not only accessing, managing, creating and sharing knowledge in dramatically different ways as their teachers often do, but also have radically new expectations regarding what a quality learning experience should be. As a result, students are bringing attitudes, beliefs and perceptions to learning environments around their own learning experiences there, and the role that technology should play in it.

Technology Use in Education and the *New Digital Divide*

Of concern, however, the PISA survey found that the frequency of ICT use at home is not paralleled by use at school, and in most OECD countries, more than 80% of 15 year-olds use computers frequently yet a majority do not use them much in school (OECD, 2010a). While most schools are equipped with computers and internet access, this disparity between school and home use is immense, and suggests that the old digital divide has been replaced with a new one—those who can develop the appropriate competencies with ICT, often occurring outside of school. Much of this at-home use is oriented towards entertainment, suggesting there is an increasing role of schools to help learners engage with and leverage new technologies for *learning*. Exposure, access and fluency with ICT matters, as PISA analysis demonstrates once socio-economic background is accounted for (OECD, 2010a).

The Opportunity

The depth and breadth of technologies available today affords learning environments much diversity and opportunity for leveraging ICT as a through-line for educational change. Intersecting that with the incredible array of learning environments across the globe, we are left with a spectrum of examples of this—thereby giving us a complex picture of what technology-rich learning environments are, and could, be. The work of UNESCO’s Institute for Information Technology, which focused on ICT integration in education, is built on an assumptive model of the stages that schools engage with and move through in this work:

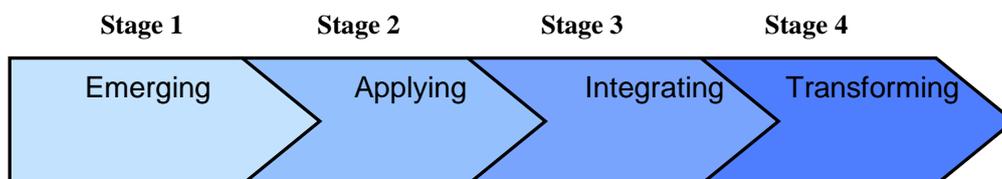


Figure 2. Stages of ICT Integration in Education. Source: UNESCO, 2003b.

These stages offer us a lens through which we can observe how ICT has leveraged incremental and deep change in learning environments.

Technology *evolving* learning environments

Meeting this challenge and opportunity for current schools operating in existing systems—that are inherently bounded by instituted policies and structures—can be quite difficult. For these schools that wish to make dramatic advances in practice, new technologies and innovations can be critical levers for small changes that can ultimately lead to bigger change. Some of the web-based innovations that have become quite pervasive in the larger digital culture of our world fit seamlessly into current curricular structures and programs, and are often free and easily accessible. What we describe as ‘first-order’ innovations are prevalent among many technology-rich learning environments, being implemented under the notion that by leveraging many of these tools together produces a dramatically different educational climate. Other technologies are more ‘disruptive innovations,’ appearing on the periphery of the educational landscape and are just beginning to see their full potential. These ‘second-order’ innovations are slowly gaining attention and traction in the field, and will likely see increased development and application over the next decade (see Figure 1).

First-Order Innovations	Second-Order Innovations
blogs, wikis	augmented reality (AR)
social networking sites	simulations
virtual learning environments (VLE)	digital games
laptops, netbooks and tablet PCs	console games
interactive whiteboards	remote-response systems
Web apps	mobile/handheld computing
digital cameras, scanners, projectors	programming applications
e-Learning	pico projectors
digital portfolios	electronic books

Figure 1. Common and emerging innovations of technology-rich Innovative Learning Environments

Many of these first-order innovations fall in the category of “Web 2.0” technologies—a collective term for the “social web” representing the online tools that facilitate collaboration, communication, and interactivity. These tools access many of the key “21st Century Skills” and represent many of the activities for learners outside of the school. As a result, these technologies make a natural on-ramp for evolving a learning environment. Yet even more critically, Web 2.0 technologies embody the perspective of many educational technologists and theorists that learning best takes place within technology-supported environments where learners individually and collaboratively consume and create content (Selwyn, 2010).

Evolving Educational Change: A la Carte Method

For traditional learning environments and educational systems, these innovations offer powerful tools to improve teaching and learning within an existing structure, where other instructional elements (such as curriculum, assessment, etc.), may not have the freedom to be altered considerably. While many schools are selecting at least several of these first order innovations to keep their practice evolving, some schools are integrating an array of these and more in an effort to become a digital learning environment. *Saltash.net Community School* (UK) is an example of one such school, which has gone so far to become digital that they changed the school’s actual name to match their website address. At Saltash.net, technology can be found everywhere:

- over 400 workstations, embedded with over 200 software applications
- 90 laptops and 40 netbooks, student-accessible on the school-wide wireless network

- interactive whiteboards
- media suite for video/audio production and editing
- integrated Moodle VLE
- school radio station

Saltash.net uses this technology to power student research projects, collaborations and inquiry projects with schools located internationally, and conduct learning both in and beyond the school boundaries. Schools like *Saltash.net*, *St. Paul's Bay Primary* (Malta), and *Crescent Girls' School* (Singapore) are just a few examples of countless learning environments that have embraced new technologies in such a holistic manner. These learning environments are weaving technology into the school, evolving the teaching and learning to provide more opportunities, via contemporary methods, at achieving 21st century learning aims. Successes and impacts at schools like these are feeding back into the larger systems in which they are situated, assisting in the further progression of that educational system and other learning environments within it.

As highlighted by research conducted at many schools such as these, success with integrating first-order and second-order innovations largely depended on the rigidity or flexibility of the school curriculum. In fact, many are finding the need to redesign curricula models that are less prescribed and driven more by learner needs using Web 2.0 technologies; all of this requires educators to expand their visions of pedagogy and learning (Selwyn, 2010).

Evolving Educational Change: Technology as Backbone

Other learning environments have latched on to one of these innovations and made the key catalyst in changing practice. A prime example of this approach is demonstrated by the many schools that have engaged in a 1-to-1 laptop initiative—where every learner in the school is given (or has daily access to) a laptop. In such learning environments, this certainly drastically changes what types of learning experiences are possible, and preferable. A prominent example of this is the US state of Maine's *Learning Technology Initiative*, which has been active for nearly a decade and garnered much attention in the west on the impact of ICT at this level of integration. This program has grown and evolved over that time, placing varying technologies in the individual hands of all learners in grades 7-12. The cost versus outcomes for such initiatives has been the focus of much debate, as is whether programs like this have really achieved the 4th stage, 'transformation,' and whether this serves as a strong example of *evolutional* or *transformational* change. Maine's initiative and other 1-to-1 programs are discussed more fully in Figure 3.

A very different and intriguing example of the impact of embracing one of these innovative technologies is the sweeping trend of console-gaming in Scottish schools. Scotland has long been known for its innovative practices and integrated curriculum, so while many of these Scottish schools were strong learning environments prior to adopting game-based learning (GBL), this new pedagogy has helped evolve these schools to digital, integrated and engaging 21st century learning environments. Operating on the belief that console games afford incredible pedagogical opportunities, Scotland's *Consolarium* is a centre that has supported GBL in more than 20 schools across the country. This government organization seeks to examine games for educational uses and supports teachers in their exploration of these technologies. Examples and uses of GBL vary widely—from 4 year olds learning care-taking and visio-spatial skills with the game EyePet—to using Guitar Hero as the engagement tool, around which a complex project is built where teams of 13-year-olds form 'bands' and manage everything from the bands logo to its touring schedule and budget. With such a strong, engaging and motivating storyline, teachers have been able to construct robust interdisciplinary modules where students are gaining digital literacies, collaborative problem-solving, creativity and many other skills, while interacting with the latest technologies.

Schools adopting game-based learning are finding increased engagement and motivation amongst students, greater connections in the curriculum and transfer of learning demonstrated by students, improvement in collaboration strategies with students, and dramatic increases in the quality and quantity of student writing—especially amongst boys. How can a video game do all that? According

to the experience of these schools, it comes the pedagogical approach applied with many of these games, where the game serves as the hook and storyline to connect the learning objectives and activities defined by the curriculum, (Groff, Howells & Cranmer, 2010). Games like Guitar Hero are used to set the stage, where students are placed in groups of four, or ‘bands’, and are charged with the making their band a success—everything from designing a band logo and first CD cover, to structuring a budget for the world tour and using online websites to arrange the travel required to make the tour happen. With the game as a thread line, teachers are reporting seemingly endless opportunities to construct and connect rich learning experiences that connect to the project objectives. Actual game-play time is intermixed throughout each school week, with less than 5% of class time consumed by this activity—yet that is enough motivation and engagement to have students taking classroom tasks home to continue their development, above and beyond class goals. Many schools that have piloted this pedagogy are so inspired by the success it is quickly becoming the lifeblood of the school, and has led the *Consolarium* to consider further ways to integrate and diffuse this technology.

Whether laptops or console games, a powerful technology combined with a strong pedagogy is a recipe for advanced teaching and learning—and the vast array of innovations and technologies available and continuing to emerge leaves the potential for endless possibilities for evolving education. However, as often understood by most educational technologists, the key is to put the horse before the cart, and understand the type of *learning experiences* and therefore pedagogies that are sought, following by asking the question as to what type of technology can enable that.

Learning environments using the *a la carte* method might generally find themselves in the first two stages, ‘emerging’ and ‘applying,’ although it is clear that schools profiled here have moved to the ‘integrating’ stage. However, systems that use *technology as backbone* for the work, more frequently need to engage at stage 3 – integrating – with practices generally present at stages 1 and 2 being lumped into the work.

Technology transforming schools

Innovative technologies not only have the potential to evolve pedagogical practice, but also completely transform entire learning environments. When technology is leveraged with a very strategic vision and change management plan, the results can be revolutionary. *Intermediate School 339* (USA) is one learning environment that has demonstrated this potential, transforming itself from some of the lowest performing schools in the region, to one of the most successful. A struggling school in the heart of New York City, *Intermediate School 339* is situated in a difficult community culture—faced low test scores, violence and gang behaviour in school. In 2005, only 9% of students were performing at adequate levels in mathematics. The school decided to infuse technology into teaching and learning by supplying every student with a laptop and implementing Google Docs as the main form of content management. With the laptops, students would complete homework online, manage their blogs, collaboratively manage data and use teacher-created online platforms to support project work. Interactive whiteboards in the classroom allow students to seamlessly share their work with the entire class. After 3 years, math scores have gone up to 62% and violence and behaviour issues have decreased dramatically. Students have reported increased motivation to do school work because the technology, and the work, is more stimulating—resulting in a demonstrated greater investment in their educational journey. *Intermediate School 339’s* success is leading the way for school change for other schools in the New York City area.

The innovative *Silverton Primary School* (Australia) has a similar story. Faced with countless challenges and low-performing students, this struggling learning environment decided to capitalize on the state-wide learning revolution led by the government that was bringing with it a massive infrastructure investment and embarked on a large-scale transformation initiative and along with it institute a comprehensive plan for change. Silverton garnered many of the aforementioned first-order innovations, but the vision didn’t just include technology. It envisioned, and subsequently engineered, a complete overhaul of every component of the learning environment—from classroom layout to teacher learning structures and support. Replacing traditional classrooms with flexible learning centres, students have access to digital music players, voice recorders, games consoles, digital cameras

and notepad computers. They are even charged with the task of running a 24-hour local FM radio station.

Yet what makes *Silverton Primary*'s transformation so dramatic is the change initiated in other critical areas of the learning environment. Along with a strategic teaching and learning transformation through new learning spaces, new technologies and new curricular approaches, it instituted a comprehensive teacher change and development scheme. This included enveloping new teachers in an intensive training program, to on-going and long-term programs to support all educators as they continue to improve and refine their practice. All staff members are involved in a formal "Critical Friends" program where observation of each other's teaching is an essential component—videotaping each other and meeting regularly with Teaching and Learning Coaches and ICT Peer Coaches for regular feedback. Teachers even partake in action research projects, in order to more deeply engage in their practice. Today, *Silverton Primary* is one of 12 global mentor schools in the *Microsoft Innovative Schools* program, where they mentor schools in Portugal, the Netherlands, Ireland, Sri Lanka, Malta and Israel through fortnightly online meetings. Programs such as these not only help ensure that *Silverton Primary*'s teachers are continually improving and refining their craft, but that they grow and evolve as the world they operate in does as well.

Such dramatic changes in so many areas of the learning environment wouldn't be possible without technology. In fact, technology can be used to structure innovations as well as innovating – practices and approaches to continually created and testing new methodologies and ways of doing things – into a learning environment, which is an incredibly powerful means for approaching transformation. The *Shady Hill School* in Cambridge, Massachusetts (USA) used a two-year technology-infusion project – injecting laptops, projectors and various other digital technologies into the classroom – to also infuse the practice of *innovating* into the campus. In the first year of this project as the new technology was rolling out across campus, 13 teachers were selected to participate in the "Tiger Team"—a rogue set of teachers scattered across the grade levels charged with creating and engaging with new ideas for teaching and learning, and vetting them via "innovation cycles" of testing, reviewing, refining, and disseminating—both good practices, and failures, with digital technologies. These teachers receive a great deal of support and training as they explore innovative practices, and the school rotates who participates on the Tiger Team each year—systematically developing innovative practices into the very heart of the learning environment. The school even created its own "teachers-only" space fully decked-out with new technologies and at least one tech-integration specialist at all times. Affectionately called The Garage, it was designed to be a free play space, where it was safe for all teachers to explore, mess up, create and learn with new technologies. These practices not only make places like *Silverton Primary* and *Shady Hill* Innovative Learning Environments, but also *continually* Innovating Learning Environments.

There are countless examples of schools, situated in challenging contexts, which have made leaps and bounds progress by becoming a tech-rich learning environment. When properly integrated and strategically tied together, technology time and again shows to be a meaningful and powerful way to engage and motivate students in the learning process, *as well as* a means of catalyzing strategic change in pedagogy and practice.

These cases also demonstrate the power of technology not only to change but also to *continually change* by structuring in the very nature of innovating as a collective system. While they may have started the process at Stage 1 (Emerging) or even Stage 2 (Applying), they have forged along in their journeys to arrive at Stage 3 (Integrating) and ultimately at Stage 4, *Transformation*. *Silverton Primary* best embodies this evolution amongst the stages, having gone from a challenging context with little student success, to testing new technologies to increase student engagement and learning, which ultimately triggered strategic modification of every element of the learning environment—from curriculum and time structures, to professional development. For this school, technology became the catalyst for transforming itself.

Reinventing learning environments

The examples thus far of leveraging technology to facilitate transformative change of existing learning environments are indeed inspirational. Yet what type of learning is possible beyond the boundaries of existing systems and policies? What is possible when existing paradigms and old frames of mind can be discarded, and potential new possibilities take their place? Going back to our original question, *How can today's schools be transformed so as to become environments of teaching and learning that makes individuals lifelong learners and prepare them for the 21st Century?*, it's clear that the answers to this question may not come from existing educational systems. In answering this question, educational innovators and social entrepreneurs are continuing to reinvent what 21st century learning might look like, as well as the learning environments to support it. For these reinvented learning environments, meeting this aim inherently means leveraging technology to do so. Unlike the cases presented thus far, the learning environments presented in this section did not move along the stages of ICT Integration to arrive at an innovation place, rather they took to the drawing boards and designed new environments, strategically, from the ground up.

Meeting Students Where They Are, Wherever They Are: Virtual Schools

With an ever-increasing number of struggling students, matched by the challenge of a growing number of students dropping out of school or unable to attend for various reasons, the state of Florida faced a significant challenge: how to provide appropriate learning environments for all learners, not just the mainstream. The agreed upon solution was to create a *virtual school* – one of the first in the world at that time – to be part of the public state-wide education system. Since its genesis in 1997, the *Florida Virtual School* (or FLVS) (USA) has grown tremendously, offering over 90 on-line courses to students ages 12-18, which are free to Florida middle and high school students. Priority is given to students who need expanded access to courses to meet their educational goals—such as home-schooled students as well as those at low-performing schools or those at schools with limited offerings. In the 2002-2003 school year, approximately 300,000 students took an online course through this platform (according to a review conducted by the consulting firm, Eduventures). FLVS's success has allowed the learning environment to expand its model, offering courses to those around the world for a tuition fee, and has inspired the creation of many similar online learning platforms, particularly in other US states. Yet with the success comes inherent challenges, including teacher training for online course facilitation, which often requires more individualized attention than is typically given in a traditional learning environment, as well as monitoring course quality—which can vary considerably in the diverse menu offered by FLVS.

While the on-line platform loses the social classroom component, learners gain tremendous flexibility in how to meet their learning goals—making the real success of the FLVS model that it allows students to *learn at any time, any place, any path, and any pace*. This flexibility is often found to be most successful with independent, motivated learners. Although individual learners tend to seek out these courses on their own, more and more schools in Florida and beyond are taking a *blended learning* approach—mixing traditional classroom learning with online courses to augment each learner's individual learning journey. Such an approach retains the countless benefits of a real-world learning institution, often felt to be a critical component to any community, while better serving the needs and goals of each individual learner.

The e-Classroom at *Primary School Škofja Loka-City* (Slovenia) is an excellent example of such blending learning for younger learners. The e-Classroom provides a virtual environment for more diverse activities and differentiated learning opportunities, connected to classroom study. It provides an additional vehicle for communicating with students, and amongst students themselves. This platform has assisted in helping learners acquire key competencies in numerous content areas as well as critical skills such as communication and self-initiative.

One of the strongest benefits of an online learning platform is reaching marginalized populations, such as teenage mothers, those who may be quick to exit school prematurely or those who have repeatedly failed completing compulsory education. *Escola Móvel* (Portugal) is a distance learning project that

provides learners with access to a learning environment that supports the national curriculum. With the opportunity presented by this new platform, *Escola Móvel* has also innovated in other ways as well—including the creation of new interdisciplinary pedagogies and compulsory tutoring periods, which allow for the personalization of curriculum, instruction and assessment, thereby increasing the students' likelihood of success. Virtual and blended learning models will become increasingly prevalent in education as educators seek to better individualize learning for all learners.

Building Learning, One Tile at a Time: LUMIAR Schools (Brazil)

Who needs teachers, classrooms or traditional curricula? Based on the success demonstrated thus far, *Lumiar Schools* don't. The founders of the Lumiar Institute came together to devise a new approach to education—one where students' innate capacity to learn is allowed to flourish, and students will develop the skills and capacities necessary for our knowledge society. After much planning, designing, and the creation of technological tools, the first Lumiar School in São Paulo was opened in 2002, built on this fundamental assumption: learning is the *individual* building and expanding of competencies and skills. Consequently, the "curriculum" is a Competency Matrix, which encompasses the learning expectations for all students. As students engage in various learning projects, the appropriate competencies are observed, assessed and documented in their Learning Portfolio, which is then used to help guide selection and adaption of future learning experiences for that learner.

There are no classrooms at Lumiar, just open spaces where student inquiry can take place. Various types of technologies, including interactive whiteboards and laptops, are the central tools in these learning spaces. Likewise, there are no teachers in the traditional sense—rather this role has been divided to two groups at Lumiar: Tutors and Masters. Tutors are the academic managers for the same group of students, year after year, to monitor and assist them in their work and development. Masters are employed short-term, are experts in the areas of research and study embarked upon by the students, and lead a specific project or unit of enquiry. The Project Database contains a growing set of learning projects to be facilitated by Masters—the vehicle for helping each student to cultivate his or her competencies.

Without traditional structures such as a formal curriculum and classrooms, how can teaching and learning be organized and managed over long periods of time? The answer lies in Lumiar's lifeblood technology—*Mosaic*. This complex learning platform developed in collaboration with Microsoft, connects the Competency Matrix, Project Database, and Learning Portfolio to assist in mapping the skills and competencies covered in the matrix over time for each learner. Such an integrated toolset has allowed Lumiar to become increasingly effective at personalising learning for all. As a result of this impact, the Lumiar approach has been well-received by the São Paulo community and the larger educational field. This preliminary success has led the Lumiar Institute to partner with two additional schools in the São Paulo area, with plans to continue expanding and developing the Mosaic model.

Taking Students Everywhere: THINK Global School (International)

How do you build a global citizen? *THINK Global School* (TGS) has an answer: you entrench them in rich learning experiences around the globe. TGS is a private high school that travels around the world, providing students with the opportunity to study in three different international cities each academic year. Students were selected from around the globe to attend this school, and developing global competencies such as curiosity, tolerance and resilience are the core aims. While TGS has coordinated a venue at a host school in each city to provide space for classroom study, the world is their classroom—where learning is cultivated by exploring the local culture, contexts, and challenges of each site. Therefore much learning will take place outside traditional classroom walls and occur directly "in the field." In designing TGS, it was clear that being mobile on both the micro and macro level meant no room for textbooks. Each learner is equipped with the latest MacBooks and iPhones to record, report and share experiences in real time via the TGS educational social networking program. Students will be able to access their content and learning materials anywhere, anytime. Like many professional workers in today's business world, these technologies will become extensions of their work and cognition—essential to completing their academic work. The integration of these tools

provides a seamless connected web of learning that has the potential to become an internalized extension of their cognitive journey around the world.

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These reinvented learning environments are just examples of the emerging new models of how learning and education can be achieved in the 21st century. In these examples, one or (often more) multiple facets of the system have been completely *reinvented* and *redesigned*. Assumptions that a certain element (such as curriculum or assessment) must ‘look’ a certain way are removed and instead the questions “what do we want to achieve?” followed by “how might we achieve it?” become the drivers for designing new learning environments. It’s clear that getting to the answers of the former question are unlikely without technology being involved in the answers to the latter.

Opportunities & challenges of evolving, transforming, and reinventing learning environments

Each of these approaches is very different and brings its own opportunities, benefits, costs and challenges to a given situation, and therefore each learning environment that seeks to make change will likely be better suited for one approach versus the others, depending on their current context, goals, vision for the future, etc.

Learning environments that seek to *evolve* by integrating or implementing new technologies and technology-based pedagogies with old ones usually find less resistance from the current system, as this is the least disruptive of the approaches. Since the professional staff in a given context generally has a range of aptitude and comfort level with new technologies and approaches, the evolution approach allows each professional member of the staff to find ‘on ramps’ to new technologies in a way that is easiest and most accessible to them. For example, the science teacher may feel most drawn to simulations that relate to her curriculum, while a primary teacher may personally use Web 2.0 technologies quite frequently, and therefore see how to easily integrate them into his classroom. While often more approachable for the organisation as a whole, in some instances this can become an ‘ad hoc’ endeavour where there is little strategy or synergy across the organisation in the leveraging of new technologies—unless other supports are put in place, such as a tech-integration teams who can coordinate the sharing of practices and overall strategy of the organisation.

With or without external supports and strategies, and whether or not a learning environment takes an *a la carte* approach by integrating new technologies and methodologies here and there, or a more systemic approach around one specific initiative such as game-based learning, the evolutionary approach is often very slow-moving and will take years to produce extensive change. Additionally, effectiveness of such approaches is often dictated by institutional factors, such as the rigidity or flexibility of the curriculum (Selwyn, 2010). As a result, many of these innovations conform to the shape of the existing system – many times at the detriment to their effectiveness – rather than helping to change the shape of the existing organisation. The research on one-to-one laptop programs has even demonstrated, depending on the approach and implementation, even sites where the primary goal and work is to redesign the other elements of the learning environment using the laptops as the lever and backbone of the work, the central organisational structures will not change (Bebell & Kay, 2010).

This, in part, pushes advocacy towards *transformative* or *reinvention* of learning environments—not only as a lever of deep change, but also to successfully integrate new technologies and 21st Century Skills. As described by Neil Selwyn in the recent OECD publication, *Inspired by Technology, Driven by Pedagogy*, “the education technology academic literature, at least, is increasingly featuring the promotion of reasoned arguments that all of the structural impediments and challenges to technology (*i.e.* school) must be removed in order to facilitate the realization of the digital transformation of education” (OECD, 2010, p. 29). Although not a universally-applying statement, the evidence from observing many learning environments’ attempts to *evolve* is that true effectiveness comes from coordinating and/or redesigning all of the parts of the infrastructure in concert together.

Learning environments that seek transformation will need a well thought-through approach to the process, garnering the resources (both human and technical) needed to support the school’s

advancement through the stages, that is, most importantly, underwritten by a clear and collectively-agreed-upon philosophy of how students do and will learn there. While no large-scale change project can be inherently planned from the beginning, what schools like *Silverton Primary* demonstrate is the creation of steadfast vision of what the learning environment might become, and an unwavering passion and commitment to do what it takes to see it through. Detailing this is beyond the scope of this chapter, yet we can underscore that *transformation* is possible, and while certainly hard work is required, such a goal is within reach for any learning environment.

What about *reinvention*? Is this relevant for existing learning environments? Schools like the *RSA Academy* (UK) show that it is. Formerly Willingsworth High School, the RSA Academy is an independent school sponsored by Britain's Royal Society of the Arts took over the school in the mid-late 2000s. After having spent the better part of a decade working on collectively redesigning what a new curriculum might look like that prepared today's young people with the competencies needed in the 21st century, they called this curricula "Opening Minds", and it became the life-force around which a school was to be designed. All the organisational structures of the school, such as scheduling and student grouping, supported the design of the curricula. In 2008, the new Academy opened in the building that was formerly a public secondary school with great success. Just three years later, the school opened its new building, designed fully to support the learning experiences shaped by the Opening Minds curriculum. As of date, student performance has been outstanding with 100% of the school's students achieving the highest level on their national exams (the GCSE).

The RSA Academy is just one example of what is possible by holistically and cohesively redesigning all of the elements that interact to create a learning environment, and the outcomes of the school demonstrate that it was well worth the time and effort.

The Opportunity Cost of the Investment

Undoubtedly, technology often implies a significant investment, both financial as well as in human capital. Although there is a general recognition that ICT is pervasive in our world, and therefore of use to some degree to students, there is still considerable debate amongst various education stakeholders and policy-makers as to the need and degree of investment of ICT in education, and the value of the return on that investment. While the learning environment examples presented may feel like outliers of the mainstream and more than what is possible/likely for most schools, rather they are holistic depictions of the implications of ICT observed across many learning environments as illustrated by the research.

Numerous far-reaching analyses of the impact of ICT in education have demonstrated significant positive outcomes on teaching practices, leadership and school organisation. The PILOT program in Norway is one such example. This four-year research study involving over 120 primary and secondary schools showed that the schools handled the implementation of ICT in very different ways, and numerous positive outcomes manifested, including increased writing activities and competencies with ICT, and ease of transition between school levels (for full discussion of the outcomes, see Erstad 2009). This has, however, been one of the more robust studies of the impact of ICT in education, and the lack of coherent knowledge base around this has been a central argument in the debate about ICT (Kikis, Scheuermann & Villalba, 2009). Likewise, connections between home and school ICT use and student performance on items like the PISA are complex and undefined. Many have attributed this to the complexities of the dynamics in the system and the need for more and better methodologies and indicators (Trucano, 2005).

INDIVIDUAL ACCESS TO TECHNOLOGY: A LOOK AT 1-TO-1 PROGRAMS

Many have understood the need for individual use and adoption of technology in learning environments, and “one-to-one” initiatives – where each student has access to a laptop, tablet, etc. – have become a popular approach in the past decade. As the name might suggest, they are expensive and intensive to create, deploy, manage and effectively leverage for increased student learning. However, the results on their effectiveness have been mixed.

Some positive effects demonstrated have been more engaged learners, observing a decrease in disciplinary problems, increased technology skills, as well as improved writing and math scores (Shapley et al. 2009). Yet, for example, it is difficult to differentiate whether these improved scores came from the use of the technology in teaching and learning, or from the advanced teacher training that was instituted with the program—or both. Additionally, some large-scale evaluations have shown disappointing results. For example, five years into the *state of Maine’s laptop initiative* (the largest in the United States), showed little effect on student achievement in general discipline areas such as reading; however, the evaluators note that the metrics used did not measure the “21st Century Skills” that the initiative espouses to promote (Silvernail & Gritter, 2007). Evaluations from other large-scale initiatives in the US demonstrate mixed results, noting some improvement in various areas of each of the sites. These conflicting results leave researchers timid to wholeheartedly endorse large investments in ICT in education, and they reinforce the notion that these programs are only as effective as the system that is implementing it. In fact, one evaluation explained, “It is impossible to overstate the power of individual teachers in the success or failure of 1:1 computing” (Bebell & Kay, 2010, p. 47). So, like many other technologies and technology-initiatives before one-to-one programs, it is much less about the technology and much more about how it is used. Therefore, the conclusions on one-to-one initiatives are framed well by Bryan Goodwin (2011, p. 79): “Rather than being a cure-all or silver bullet, one-to-one laptop programs may simply amplify what’s already occurring—for better or worse.”

Figure 2. The insights gained from 1-to-1 initiatives.

Additional analyses of extensive investments in ICT in education like those of 1-to-1 programs described in Figure 3 are certainly “cloudy” in their implications. However, this literature does in fact co-exist with the aforementioned findings of other ICT initiatives, along with a considerable array of other research studies (more often qualitative) that ICT can in fact improve children’s knowledge, skills and competencies (Blamire, 2009). In fact, an in-depth analysis of the available knowledge base of ICT in education has shown that attainment improves only if certain pedagogical conditions are met (Kulik, 2003)—which supports the findings described in Figure 3: technology by itself is not a magic bullet. ICT is often a catalyst for change but does not itself determine the direction for change (Kikis, Scheuermann & Villalba, 2009). Dubbed the ‘student productivity paradox’ (Peslak, 2005; Hikmet, Taylor & Davis, 2008), it is the observation that technology can be used for a variety of purposes in education, yet whether that is linked to educational performance or not depends on the improvements associated with changes in methodology, which require appropriate technical and pedagogical support (OECD, 2010a).

This reinforces the notion that the philosophy of learning and pedagogical approaches truly embodied by a learning environment at its core is what ultimately impacts student learning; however, technology has demonstrated its ability to leverage powerful learning methodologies in ways that are much more difficult, or impossible, without it. This is evidenced countless times by the cases presented here (see Figure 4).

What Technology brings to the Table: Richer, Deeper, *New* learning

The research discussed here explains that when designed and integrated properly, ICT can be a critical vehicle for accessing what we know to be the keys to deep learning, and the payoffs come from

performing new functions and experiences that are reflected in transformations of processes (OECD, 2010a). The aforementioned examples of tech-rich learning environments have demonstrated how the appropriate design and leveraging of technology has impacted multiple dimensions of learning, teaching and practices in education:

Engagement and Motivation. Set foot inside any one of these tech-rich learning environments and the engagement level of students is obvious. There is extensive evidence that ICT increases motivation, confidence and engagement (Blamire, 2009). For students, the technologies listed in Figure 1 are exciting and stimulating in their own right—but even more so when appropriately linked with their own innate curiosities. Schools like *Silverton Primary* and *Intermediate School 339* cite this as one of the core reasons student achievement has risen, and student violence and disruptive behaviour has decreased. The impact of game-based learning in Scotland has demonstrated the same outcome of dramatically increased engagement and motivation—illustrated by the large extent that students’ work on academic projects outside of school time, often above and beyond what was required. Several students involved in this game-based learning initiative even noted the curious effect of decreased game play at home, explaining that playing games at home has become less enjoyable than what they do in school because it lacks the collaborative project associated with the school game play—such as accurately plotting the band’s budget to ensure success in the *Guitar Hero* project, or understanding exactly “what was the fish we came across” while playing *Endless Ocean*⁸ in class (Groff, Howells & Cranmer, 2010).

Technology is of course innately eye-catching to most individuals; however it is especially so to young minds, particularly since these young minds have only known a digital world. In other words, it’s engaging because it’s what they know, and therefore if much of their *modus operandi* in school is not digitally-based, it can be considerably challenging for learners to stay engaged. To them, there is no world without digital technologies. So it is no wonder then that students’ engagement and motivation flowers if they suddenly have ubiquitous, or even semi-ubiquitous, access to digital technologies in their daily life as a learner.

Student-driven learning and Inquiry. While technology alone may be engaging and motivating, deep and lasting learning certainly requires more than just exposing students to it. The way learning experiences are structured with technology is the key, and clearly it is what the Scottish students were referencing when they described the level of enjoyment of game-play in classroom versus at home. Dubbed “authentic” learning, student-driven inquiry is seen as being able to engage learners more deeply on more complex tasks than other types of pedagogy. More and more research is not only demonstrating that student-inquiry leads to lasting learning and higher performance, but it is the pedagogy necessary to access 21st century skills like collaborative problem-solving and critical thinking (Barron & Darling Hammond, 2010). Such pedagogies are often also referred to as *project- or problem-based learning*. While technology is certainly not mandatory in order to access this kind of pedagogy, it most certainly helps, and in three distinct ways: *tools*, *means*, and *mechanism*:

Tools. When conducting a student-driven, inquiry-based project, technology can provide the tools necessary to complete the investigation. Digital cameras and video recorders can collect real-time data, while laptops can offer easy access to online searches and mobile computing. The available toolkit of digital technologies to be used in this way will continue to grow and better facilitate this pedagogy.

Means. Technology can also be the means of inquiry-based learning—providing a collaborative working space or mechanism for progressing the work over time—as individual learners, groups of learners, and collectively as a whole class. A Virtual Learning Environment (or VLE) is an excellent example of this. An online space where students can organize their own learning and work, they can also collaborate with others around a problem or project and collectively grow the knowledge and outputs that define a true ‘community of learners.’ This is of course the goal of

⁸ *Endless Ocean* is a video game for the Nintendo Wii where the player takes on the role of a scuba diver, progressively exploring various aspects of ocean life as the player becomes more experienced at scuba diving.

blended learning environments, where online platforms are purposefully created to augment the real-world learning experience. Likewise, the *THINK Global School* is an excellent example of how technology can be used to provide the tools and means for accessing student-driven enquiry. The endowed Macbooks and iPhones given to each student will be their learning tools in the “field” as well as the classroom, and the school-created social networking and collaboration platform will be the vehicle through which the learning is managed over time and space as the school travels around the globe.

Mechanism. Finally, technology can be the mechanism upon which inquiry-based learning is built—creating the on-ramp to the problem or project itself. In the example of game-based learning supported by the *Consolarium* in Scotland, the game is most often not inquiry-based at all, but provides the storyline or context upon which the project and inquiry are structured. Augmented reality games, online simulations and many other technologies provide similar mechanisms for structuring inquiry-based learning in a very engaging, and relevant, way.

Interactivity and Collaboration. Tech-rich learning environments also demonstrate the increased interaction with technology itself as well as other learners, and the increased collaboration in the learning process afforded by some digital technologies and pedagogies. Students working in teams to explore an interactive on-line simulation or co-construct a wiki of terms covered in the current lesson is a long way from the learning from books that occurs with learners seated in rows; and this type of collaborative learning and construction is a central skill considered critical for the 21st century. It is akin to what is framed as the much coveted ‘cooperative learning’—structured team learning that allows for individual inquiry that is synergistically connected to collaborative learning tasks, which produces deep, meaningful learning for all students (Slavin, 2010). This type of pedagogy is increasingly well-documented, and is viewed as a powerful strategy for increasing student achievement—particularly with 21st century skills and capacities.

Good teaching and learning can produce this type of interactivity and collaboration with less digital “technologies” but the vast and ever-growing possibilities created by current digital technologies makes creating this type of study even more accessible to teachers and learners. Interestingly, many of the teachers involved in the Scottish *GBL* initiative had received training on cooperative learning several years prior to using console-games in the classroom, reporting that the game worked excellently for that pedagogy and that marrying the two was a large part of the initiative’s success. As our examples of tech-rich ILEs demonstrate, *combining documented learning theory and effective pedagogies with powerful digital technologies is a powerful recipe for success.*

Personalisation and Flexibility. The essence of personalisation has been described as *the system conforming to the learner, rather than the learner to the system* (Green *et al*, 2005). Learning environments that are oriented towards personalisation are “highly sensitive to what the different students within it already know and can do, and actively builds on this sensitivity and knowledge – that is, it is highly adapted to individual differences *and* gives tailored and detailed feedback that both challenges the quick learners and supports those facing difficulties” (Istance & Dumont, 2010, p. 250). As most learning environments have experienced, this is a very challenging goal. Yet from a learning sciences perspective, it makes a profound difference, and we should be reminded that learners are already making personalized learning environments for themselves in their lives outside of school, through the use of digital technologies (Green *et al*, 2005). The proliferation of existing digital technologies, and the prospect of what could be created, provides outstanding possibilities for personalising education—be it with audio playback of a learner’s tone and pronunciation that can be played back on a portable MP3 player as a he or she continues to improve their verbal reading skills, or a customized set of simulations for a given learner, based on their performance on an online questionnaire designed to test their existing conceptions of science concepts. Likewise, this personalisation effect is also possible in the area of assessments, which can also be more sophisticated as a result new advances in ICT-based assessments (Blamire, 2009).

The potential is immense, yet we are reminded of two caveats: one, investment in ICT does not directly and automatically correlate to personalised learning; and two, the infusion of technology into

a learning environment can reinforce existing inequities in a given system (Green et al, 2005). Those notwithstanding, digital technologies offer a vast array of means for engaging with, and continuing to engage with, learning experiences. In learning environments where a menu of digital technologies is made available and is properly supported by teachers and learning facilitators, the classroom becomes a flexible learning environment that is able to adapt and conform to the needs, goals and motivations of each student. No technology can replace a teacher but digital technologies offer tremendous tools to help teachers do their jobs in a more effective and personalised way.

Innovating. The day when education no longer needs to *reframe – redesign – reinvent* itself is certainly not on the horizon; and indeed, that day may never come, as no organization remains successful when it stops learning, growing and innovating. Being an innovative organisation means much more than acquiring the latest technologies or trying a new approach. It means systematically structuring in programs and practices that promote healthy change, and new and improved approaches and the on-going creative and productive advancement of both individuals and the organisation as a whole. Strategic ‘innovating’ practices include implementing an “innovation cycle” where new ideas are generated, implemented, tested and the knowledge is disseminated (including through “enabling champions”), and changing professional development programs from receiving knowledge through a workshop format to creating knowledge through professional enquiry and research. For existing learning environments that seek to become 21st learning environments, integrating such practices and programs offer the most promising route to transformation (Sutch, Rudd & Facer, 2008). Technology can help facilitate innovating at the local context by bringing new ideas to educators, documenting and sharing practices, and connecting with other schools and professionals around the globe.

Digital Learning. Even if all of these benefits to leveraging technology-rich instruction do not materialise, there is another fundamental reason to pursue developing a technology-rich learning environment: *we live in a digital world.* The digital transformation is an unending tidal wave continuing to change how we work, communicate, play and conduct our daily lives. Not only is this the world our learners are currently immersed in, it will continue to progress and the world that is their future will be digital in ways we can’t even begin to imagine. Learning environments today must be at least partially digital, not only to provide students with access to the tools and ways of operating that are infused in our world, but also to engage them in modes of learning that mirror their personal activity. The pedagogies and learning experiences described thus far connect with numerous cognitive competencies and capacities, but also with digital literacy—helping to develop critical skills to engaging with, consuming and producing digital media (Hobbs, 2010).

THE OPPORTUNITY OF ICT: EXPERIENCES ONLY POSSIBLE WITH NEW TECHNOLOGIES

The benefits of ICT-driven education outlined in this paper – *engagement & motivation, student-driven learning & inquiry, interactivity & collaboration, personalisation & flexibility*, and *innovating* – are all enabled and enhanced with ICT. They are of course possible without ICT—you can still engage and motivate, personalise learning and facilitate collaboration, without any technology at all. However, at scale, technology greatly increases our opportunity and capacity for these outcomes. Yet, what affordances and opportunities are only possible through technology? Some we have identified include:

Specific & Alternate Experiences – Some learning experiences are just impossible (or nearly so) without technology. For example, with new advancements in simulation technology, every student can have the chance to conduct the dissection of a pig heart—something that would be very difficult if even possible for every school to conduct in reality. Or, students could investigate the spill of an unknown substance on MIT’s campus, as is created by the augmented reality game *Environmental Detectives*. Online immersive world’s such *The River City Project* allow students to virtually time travel and interact with avatars from a different era in order to solve a problem.

Distant Communication, Connection & Collaboration – Before, student groups were largely confined to those within proximity—those in your school or local community, or perhaps another classroom on the other side of the globe with whom you were a pen pal. Now, however, schools can easily connect to share information and collaborate via free tools like Skype. A student interested in studying the migration patterns of a certain bird may have been confined to personal study before; today they can join an online affinity group and easily get mentorship from the world’s top expert in this area. New technologies create connections and collaborations that before would not have been possible.

Mobility – Education generally consisted of going to where the learning is; but today, you can take the learning with you. Schools like THINK Global were unimaginable just 10 years ago. New technologies are mobile, and free the learner from being constrained to traditional learning environments—as also evidenced by augmented reality, where digital information arrives on mobile phones to students who are in a real-world environment outside of school.

Access – Along the lines of mobility, ICT now brings access to education for certain populations that before would not have been possible—such as those in far remote places or confined to their home for medical reasons.

Figure 4. The learning possibilities only enabled by technology.

Conclusions

The trajectory chosen by any system will need to be designed and adapted for the unique context, goals and visions of that system. While the future is always uncertain, systems of education can find confidence in their generated pathway if it steers towards what we know to be effective learning from evidence from the learning sciences. This research is the foundation of the OECD Innovative Learning Environments (ILE) project, which looked at the intersection of our robust advancements in the learning sciences and the needs and demands (both current and projected) of the 21st century, and has generated ‘principles’ for designing effective learning environments based on this research. These principles are outlined in ILE project’s foundational reader, *The Nature of Learning* (2010):

- The learning environment recognises the learners as its core participants, encourages their active engagement and develops in them an understanding of their own activity as learners.

- The learning environment is founded on the social nature of learning and actively encourages well-organised co-operative learning.
- The learning professionals within the learning environment are highly attuned to the learners' motivations and the key role of emotions in achievement.
- The learning environment is accurately sensitive to the individual differences among the learners in it, including their prior knowledge.
- The learning environment devises programmes that demand hard work and challenge from all without excessive overload.
- The learning environment operates with clarity of expectations and deploys assessment strategies consistent with these expectations; there is a strong emphasis on formative feedback to support learning.
- The learning environment strongly promotes “horizontal connectedness” across areas of knowledge and subjects as well as to the community and the wider world.

One may note that there is no mention of technology in these principles—since of course it is not a requisite for deep learning. However, as demonstrated by the examples in this chapter, technology may be just a vehicle—but it is a powerful one. And it is a vehicle that is central to our work and personal lives, as well as society in general. As a vehicle, technology can not only act as a lever for systemic change in the design of learning environment, it also impacts teaching and learning at the micro level by creating powerfully different learning experiences. Therefore, the *content* that is delivered via this vehicle is tremendously important. Also known as digital learning resources (DLR), content materials such as simulations, animations and digital textbooks have made incredible strides in the last several decades.

However, we need further development of and benchmarking for Digital Learning Resources (DLR) and their impact on learning (Johannessen, 2009). DLRs fall in an intersection between technology, pedagogy, and the private sector, and must be explored, developed and studied in a voracious way in order to fully realize the potential of digital technology for the very individualized cognitive act of learning. In this way, DLR shines an important light on the discourse about technology in education:

We can no longer continue to speak about technology in education in general terms. It is clear that ICT has a central role in our lives and also our learning. We must get more specific, exploring how different technologies and resources make significant gains in key areas that have thus far demonstrating pedagogical challenges. We must seek to understand how technology and DLRs can make a significant impact on advancing learners in areas that often prove to be chasms or barriers in their developmental pathway.

In its simplest terms, we live in a digital world, where many of our students are ‘connected’ a majority of the time. This raises many questions, concerns, and unknowns that should matter to both policymakers and educators—all of them stemming from the fact that education has the responsibility to equip young people with the necessary skills and values that will allow them to cope with the challenges that connectedness is currently posing to them. The imperative for discussion and exploration around key issues such as learners’ diversity, digital literacy, the new digital divides, the blurring boundaries between formal and informal learning, and the use of technology for monitoring and assessing learning must take priority in our work.

Where do you start? You get started. There is no perfect storm coming that will make it definitively clear the path to forge ahead, and we cannot wait for the barriers and challenges to this work to be removed. In reality, there is no perfect method that’s right for all, or even just one, learning environment. There will always be barriers, there will always be failures. The key is to always be on the alert for those barriers and plan for them as best you can, to embrace failures and use them as

learning opportunities to recalibrate, and engage your learners on the journey of created digital, technology-rich learning environments.

CHAPTER 9: THE NATURE OF LEARNING IN THE ILE CASE STUDIES⁹

Introduction

Over recent years, there has been an increased interest in and attention to how people learn both in educational policy as well as in educational research. Empirical evidence about how new information is processed, how skills and knowledge are acquired, how motivation and emotion shape the learning process or how people differ in the way they learn has grown enormously (Bransford, Brown & Cocking, 2000; Sawyer, 2006). Based on the belief that learning research can be used to inform educational policy and practice, the “Innovative Learning Environments” project (ILE) of the OECD Centre for Educational research and Innovation (CERI) produced the volume *The Nature of Learning: Using Research to Inspire Practice* (Dumont, Istance & Benavides, 2010). In this volume, leading educational researchers and learning specialists were invited to review relevant research findings on how people learn and to present these findings in an understandable and accessible way. The volume concludes with a synthesis of the main findings, drawing all into seven key transversal “principles” which can guide the design of learning environments for the 21st century.

While the volume makes an important contribution to build bridges between research on the one hand and policy and practice on the other hand and lays the foundation to understand how people learn, the content provided is – by the nature of the enterprise – theoretical and relatively abstract. In order to make the findings from *The Nature of Learning* truly useful for the design of learning environments, it is necessary to take them one step further and break them down to what it means for students and teachers on a daily basis. The Inventory cases from the participating countries of the OECD/CERI Innovative Learning Environments project have been chosen because they aim to foster in learners “adaptive competence”, i.e. the capability to apply knowledge and skills flexibly and creatively in a variety of different contexts (De Corte, 2010) using innovative practices. They provide a rich database to study how the theoretical findings from *The Nature of Learning* may look like and be put into practice in real educational settings.

The aim of the present chapter thus is to analyse the inventory cases through the eyes of the “learning principles” synthesized in the final chapter of *The Nature of Learning*. The “learning principles” summarize the rich vein of knowledge provided in the individual chapters in *The Nature of Learning* in a more holistic and accessible way and can be understood as transversal conclusions from research on learning. In the following, each principle will first be presented and explained and then related to the practices in the inventory cases (Two of the seven principles identified in *The Nature of Learning* will be collapsed for this chapter, because they correspond to similar practices).

The Learning Principles in the Inventory Cases

Learner Centredness

<p>The learning environment recognises the learners as its core participants, encourages their active engagement, and develops in them an understanding of their own activity as learners</p>

⁹ This draft chapter has been prepared by Hanna Dumont, Tuebingen University, Germany.

This principle reflects the finding from research on learning that knowledge is not just passively absorbed but actively constructed by the learner. This implies that it is important for a learning environment to actively engage each student in the learning process and make them “self-regulated learners”, meaning that learners develop an understanding of their own activity as learners. Learners should be able to monitor, evaluate and optimise their own learning process and regulate their emotions and motivations accordingly. Making learners responsible for their own learning activity also has fundamental consequences for the role of teachers. In a learning environment that encourages students to be self-regulated learners, teachers support the each student in his or her learning process but do not determine it.

This “learner centredness” is one of the main characteristics of the Inventory cases. In all of these learning environments, students are accountable for planning, organising and monitoring their own learning process. They are encouraged to develop their own learning goals and they learn how to evaluate what they have already accomplished and what still needs to be done. Accordingly, students work individually or in small groups on different tasks for large periods of the day and ask the teacher for help if necessary. Teachers support and advice students in this process, but they only provide guidance if needed – depending on the student’s ability to plan their own work program. Usually, some of the younger students need more help and support for this planning and goal setting activity. In any case, task and assignments are developed by the teacher and each student together. There are no pre-developed units of work for all students or a “chalk and talk teaching format” as one of the students of *the Institut Beatenberg* in Switzerland phrased it. Only sometimes, teachers serve as the source of new information and learning content is introduced by the teacher. This is, however, only the case for content which students cannot discover by themselves or in a short period of time, such as basic concepts in mathematics or reading. Such periods of direct instruction by the teacher are usually not given to all students at the same time, but to small groups of students who of the same competence level in one subject.

This role of teachers is underlined by the fact that teachers are explicitly called “learning coaches” or “learning advisors” in many of the Inventory cases. At the *Anim8tors program of the Mount Waverley Primary school* in Victoria, Australia, where a lot of new technologies are used and students are often more familiar with these technologies, teachers are even considered as “co-learners” and are sometimes taught by students.

The *ImPULS-Schule Schmiedefeld* in Thuringia, Germany, is a good and vivid example of a learner-centred learning environment. Students are seen as “discoverers of their own world” and are thus largely involved in the conception and development of their learning activities. With the help of individual learning diaries, students plan daily and weekly learning aims at the beginning of each day. At the same time, they reflect about what they have learned the day before. Similarly, at the end of each week, the whole learning progress of the week is reflected and the next week will be planned. This process is also determined by each student’s “learning contract”, which includes learning aims for the whole year that the teacher and the student agreed on. Moreover, students work with the help of “competence checklists” that specify what specific competencies in one subject, such as mathematics, have been achieved. Whereas teachers provide the students with obligatory topics and corresponding learning materials such as worksheets, each student can freely choose the order of the topics and the learning material with the appropriate difficulty level. By applying self-tests and using the checklists mentioned above, students monitor the quality of their learning results. If a student is not happy with the result, he or she can choose additional learning materials and repeat the self-test.

In the *Australian Science and Mathematics School*, this self-regulated learning process of students is supported by a virtual learning environment. The curriculum is available online in virtual classrooms that can be accessed 24 hours a day by students, teachers and even parents. There is an area for every topic which includes learning materials, assessment plans and other resources such as wiki blog discussions. Moreover, each learner can assess and view their learning progress electronically. Similar practices, with and without support of new technologies, can be found in many of the other Inventory cases. Interestingly, in the *Europaschule Linz* in Austria, teachers reported that students are even able

and willing to work when not teacher is present and the need for teacher control is greatly reduced through learner-centred practices.

Social Nature of Learning

The learning environment is founded on the social nature of learning and actively encourages well-organised co-operative learning.

Research on learning has revealed that knowledge construction is not just an individual activity, but always occurs throughout processes of interaction, negotiation and co-operation with others. When taking the “social nature of learning” into account, learning environments can be enormously beneficial for achievement as well as for behavioural and affective outcomes. Students can be used as instructional resources for one another in well-organised and structured co-operative group work. Moreover, to be able to co-operate, to communicate, to take responsibility for others and to follow social rules are valuable outcomes in its own right and need to be fostered in students.

All of the Inventory cases encourage their students to collaborate and communicate intensely with each other. Often this is supported by new technologies which provide helpful tools for student interactions, such as discussion boards, blogs, forums, chat-rooms and messaging. At the *Kkofja Loka Primary School* in Slovenia, students have access to “e-classrooms”, virtual learning environments for managing learning content which provide platforms for collaboration and communication among students. No matter if new technologies are used or not, students at the same competence level can either work on similar assignments together or more experienced students can serve as tutors for less experienced students. In the latter case, it is, however, important that the tutors don’t do all the work and that “tutorship is really an advisory exercise among [the students], not solving each other’s problems” as the pedagogical advisor of the *Netzahualcoyotl School* in Mexico pointed out. The mixed-age groups, which can be found in many Inventory cases, are seen as offering excellent conditions for social learning, because older students “learn by teaching” and learn how to take responsibility for others. As pointed out by researchers who visited the *Gesamtschule Lindental* in Switzerland, the “natural hierarchy” among older and younger students is deliberately used to relieve the teachers of part of their workload. With respect to the culture of mutual helping in mixed-age groups, the researchers who studied the *Jenaplan-Schule* in Thuringia, Germany, came to the conclusions that it is “absolutely normal [for students] to acknowledge their different strengths alongside each other”.

In addition to co-operative forms of learning, many other social activities are carried out in the Inventory cases that are aimed at fostering students’ social skills. At the *Rodica Primary School* in Slovenia, for instance, students participate in voluntary activities such as helping nursery school teachers or helping in schools for children with special needs. At the *Instituto Escuela Jacint Verdaguer* in Spain, a formal mentoring system among students was set up which brings together students who would normally not have contact with each other. Moreover, in many Inventory cases students and teachers get together on a regular basis to discuss interpersonal problems. At the *Gesamtschule Lindental* in Switzerland, for instance, a weekly class meeting is held every Friday where reconcile their differences, agree on social rules within the class express thanks to each other. In accordance with deliberately fostering social skills and competencies, often, students are also given corresponding feedback. At the *Europaschule Linz* in Austria, for instance, students are provided with feedback on seven criteria: “us able to cooperate”, “is able to communicate”, “shows reliability and sense of responsibility”, “is able to deal with criticism”, “abides by rules agreed on”, and “handles his/her own and other’s property carefully”.

Responsiveness to Motivations and Emotions

The learning professionals within the learning environment are highly attuned to the learners’ motivations and the key role of emotions in achievement.

Since the cognitive, emotional and motivational dimensions of learning are inextricably entwined, learning cannot be understood as a purely cognitive activity. Accordingly, teachers need to be aware of and responsive to students' emotions and motivations in order for successful learning to happen. Students are more motivated to work hard and engage in learning, when the content they are learning is meaningful and interesting to them, when they feel competent to do what is expected of them and when they experience positive emotions during learning activities. Moreover, learners themselves need to become attuned to their own emotions and motivation if they are to become self-regulated learners.

By placing students at the centre of learning as practiced in the Inventory cases, students' interests and needs are naturally taken into account. Since students plan their own learning activities, they have more degrees of freedom to choose tasks and assignments that align with their interests than if the teacher determined the same learning activity for all students. Besides this implicit way of responding to students' interests, students are deliberately involved in the decision making process about what topics will be treated in depth. At the *Institut Beatenberg* in Switzerland, for instance, each student can choose his or her "key topic of the week". Moreover, most Inventory cases provide students with the opportunity to choose between a range of electives and extra-curricular activities. This is also the case at the *Lobdeburgschule* in Thuringia, Germany, where a large number of activities, such as school magazine, French, building music instruments, baking and cooking, creative play, dancing and ball games are available to students. Taken together, in all of these learning environments, students are placed "at the centre of learning by finding out first what their passions, interests and needs are" as stated by the *Unlimited Paenga Tawhiti School* in New Zealand.

The way the inventory cases respond to students' motivations and emotions is not only by taking into account their interests. They also place particular importance on making students feel confident about their skills and abilities. This is achieved by concentrating on qualities and resources of each student rather than on deficits and weaknesses. Students are taught to learn from their mistakes and not be afraid of them. The fact that many Inventory cases do not use a grading system and instead provide students with individualised verbal feedback discourages competition among students and puts the focus on the achievement of each student. In doing so, even slow learners learn that they are achieving and making progress. Teachers also celebrate each student's progress as a sign of personal success. At the *Jenaplan-Schule* in Thuringia, Germany, the act of celebration has even been institutionalised. Every Friday at noon, the week's learning results are celebrated with the whole school.

Another key feature of the Inventory cases which relates to students' motivations and emotions is the emphasis that is placed on good student-teacher relationships. Often, small groups of students are assigned to one teacher who is not only responsible for students' academic development, but also for their general well-being and functions as an attachment figure. The "*Itinerant Pedagogical Advisor*" at the Netzahualcoyotl School, which belongs to a particularly disadvantaged community in Mexico, is a good example of such an attachment figure. The itinerant pedagogical advisor, who alternates activities across two communitarian schools throughout the school year, serves as a teaching-learning facilitator and is a support to the regular teacher. By spending time with students in class, in their families and in the playground, the advisor gets to know their interests, their strengths and their potential problems and uses the individual knowledge of the students to come up with activities but also to address some of the family issues that may be affecting student's academic performance.

Last but not least, interesting practices can be found in the Inventory cases with respect to teaching students to become aware of their own emotions and motivations – a prerequisite for becoming self-regulated learners. In this regard, a particularly relevant example is the project "*Chiamale emozioni*" (Call them emotions) which takes place in the Italian-speaking region of Switzerland, Ticino, and aims at increasing teachers' skills in fostering students' socio-emotional competencies. In one activity of the project, students are to discover and identify their fundamental emotions – referring to the seven basic emotions fear, sadness, anger, joy, surprise, disgust and contempt. With the help of pictures portraying other children, students had to speak about the depicted emotion and try to tell a personal story related

to it. In many Inventory cases, students are taught how to deal with emotions associated with failure and disappointment and how to recognise and express their feelings.

Sensitivity to Individual Differences

The learning environment is acutely sensitive to the individual differences among the learners in it, including their prior knowledge.
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The learning environment devises programmes that demand hard work and challenge from all without excessive overload.
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Students differ in many ways regarding their abilities, competencies, motivations and emotions as well as their linguistic, cultural and social background. Hence, a big challenge for all learning environments is to be sensitive to these individual differences and understand the different backgrounds and starting points that students bring with them. Teachers need to be able to adapt learning activities to these individual differences and preferences. This is particular true for the differences that exist with respect to students' prior knowledge. Research on learning has shown that a fundamental characteristic of all human learning is that people try to make sense of new information by linking it to what they already know. Prior knowledge thus substantially influences the learning process and is one of the most important differences that need to be taken into account by teachers. This is further underlined by the finding that students should be sufficiently challenged to reach just above their existing level and capacity for successful learning to happen. Put in other words, the learning environment should demand hard work and challenge while avoiding overload.

Being sensitive to students' individual differences is one – if not the – most distinguishing features of the Inventory cases. Individual differences are not seen as a problem as in places that aim to form homogenous learning groups through streaming or tracking, but instead as enrichment. Indeed, in a number of the Inventory cases, heterogeneity among students is deliberately established through mixed-ability and mixed-age grouping. Furthermore, students with disabilities, special needs or behavioural problems are integrated and recognised in terms of their own gifts and talents. As already described above, there are no pre-developed units of work for all students and instead, teachers prepare individualized tasks and assignments for students taking into account their prior knowledge. This results in students doing something different from each other for large parts of the school day, often in designated time frames such as “open learning periods”. To facilitate these periods of individualized learning, teachers and students often agree on a personal “learning guidelines”.

At the *John Monash School* in Victoria, Australia, for instance, an “individual learning plan” is developed for each student which helps students to find their pathway through the range of curriculum offerings. Similarly, at the *Quality eLearning Centre and Enquiry Zone* also in Victoria, Australia, each student has a “learning matrix” which lists essential learning elements taken from the State's learning standards and gives students the opportunity to report what they have already accomplished. Some schools also make use of new technologies such as an online curriculum to support the individualization of learning content.

Use of assessment

The learning environment operates with clarity of expectations and deploys assessment strategies consistent with these expectations; there is strong emphasis on formative feedback to support learning.
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Research on learning has shown that assessment strategies have very large implications for students' learning process. It should be clear what is expected from learners – which assessments function to do - and assessments should be consistent with the learning objectives, so that students know what they are doing and why they are doing it. Moreover, students need regular and meaningful feedback in order to be able to learn successfully. At the same time, teachers need to assess students' progress on a regular basis in order to be able to adapt the learning materials to their needs. In general, assessment can be seen as the bridge between teaching and learning.

In the ILE cases, it is clear how much value and emphasis is placed on the process, rather than the product, of learning. Assessments are seen as the beginning of a new learning process and not as its end. Often, assessments take the form of informal, regular conversations between teachers and students about students' learning activities. However, there are also more formalised assessment strategies in most of the available Inventory cases – in some cases in the form of computer-assisted assessments. One very common strategy is the use of “portfolios” that document students' learning progress. Portfolios provide much more detailed feedback than a grading system and may contain essays, tests or other documents that show students' achievements in different subject areas. Usually, portfolios also include students' self-assessments. Portfolios are individualized by nature and therefore support each student according to his or her individual abilities.

At the *Institut Beatenberg* in Switzerland, students actually have three different types of portfolios: a “collection portfolio” that simply collects all evidence of learning of one school year, a “learning portfolio” that students use to portray one piece of work for each week and a “presentation portfolio” that contains a student's best pieces of work. In many cases, portfolios are presented to other students and parents at the end of the year or term. In doing so, students are taught how to present their work in front of an audience and respond to external feedback. In the case of a programme coordinated by the *Center for Studies Design at Monterrey (CEDIM)* in Mexico, students present the projects they have been working on in front of enterprises and public or private institution – a means through which the assessment becomes much more authentic and meaningful to students. In general, teachers are not the only person who assesses students' academic performance and self-assessments and peer-assessments are very common. Another way in which the assessment strategies applied in many Inventory cases differs from “regular” schools are the learning outcomes that are evaluated. Not only cognitive outcomes are relevant, but also social and self-regulatory skills.

Horizontal Connectedness

The learning environment strongly promotes “horizontal connectedness” across areas of knowledge and subjects as well as to the community and the wider world.

Being able to make links across different areas of knowledge and different subjects is one of the key competencies that students need for working environments of the 21st century. Therefore, learning environments need to promote “horizontal connectedness”, meaning that students need to be taught how to integrate pieces of knowledge into larger frameworks in order to transfer this knowledge to new situations and use it across different contexts. This kind of “deep learning” is enhanced through the use of authentic and meaningful real-life problems – often called “inquiry-based” or “problem-based” learning. The community and the wider world therefore provide a raft of opportunities and sources for learning. To put in other words, what goes on in formal learning environments should be connected to students' informal learning environments. This also implies involving and working in tandem with the homes of students.

Most of the Inventory cases do not arrange their curriculum according to separate subjects but organise it around specific real-world problems that tap into several subjects at once. At the *John Monash School* in Victoria, Australia, for instance, students focused on climate change in one semester. They

learned about its natural scientific basics, but also discussed the social effects as well as the ethical dimensions of this world-wide problem. At the *Scuola Professionale Artigianale e Industrial* in Switzerland, “mediation and conflicts” was one topic that was studied. A number of different activities were carried out to deal with this issue: students shared and talked about personal conflicts, they discussed phenomena of terrorism, they learned to make a distinction between reality and the ways people perceive it, they were taught about the concept of mediation and even performed a mediation session in the conflict between Israel and Palestine on stage. Through such learning activities, students learn in an interdisciplinary way and how to apply different subject matter to issues of practical relevance.

In many Inventory cases, these forms of “inquiry-based” or “problem-based” learning are carried out in co-operation with universities and vocational training centres, the local business world as well as institutions and localities of the community such as libraries, museums, theatres and sports clubs. An interesting example for how the surrounding community of a school can be involved in the learning activities of students provides the Elementary School in *Fiskars*, Finland. Fiskars is a small village which has a 300-year-old history in ironworks and today is known as a centre of Finnish art and design, with more than one hundred artisans, designers and artists living in the village permanently. At *Fiskars Elementary School*, students regularly participate in workshops such as paper making, woodworks, visual arts or ceramics that are taught by the artisans living and working in the village. The content and goals of the workshops are directly linked to the school curriculum by various pre- and post activities and workshop preparations carried out by teachers.

A similar enterprise called *Culture Path Programme* is undertaken by the city of Kuopio in Finland for all elementary schools of the city. In this program, students follow one “path” for each grade level, such as the “library path” or the “music path”. As part of the paths, students visit at least one local cultural institution or other cultural destination outside the school environment during the school year. These field trips are accompanied by various pre- and post-learning activities at school and each path is planned according to the requirements and the curriculum for the corresponding grade level.

Hence, as in these two examples, the whole community is seen as a campus for learning. The wider world also becomes more and more integrated into students’ everyday lives through collaborations with schools from other countries – often with the help of online communication. International projects are seen as a way to teach students’ tolerance for other cultures and to overcome prejudices people from other countries.

In general, the innovative cases demonstrate substantial emphasis on intensive co-operation with the homes of students; as mentioned, the development of individual learning plans for students as well as the assessment of their achievements is often carried out in close collaboration with parents. Moreover, parents are encouraged to become actively involved in the school life for instance through helping with the design of learning materials or taking care of the school building and outdoor facilities. Teacher-parent workshops and parent meetings are held on a regular basis in most Inventory cases. It is interesting is that in some Inventory cases, parents themselves are considered learners and can participate in learning activities at the school.

At the *Europäische Volksschule Dr. Leopold Zechner*, for instance, Turkish-speaking mothers have the option of attending German classes together with their children. At the *Lobdeburgschule* in Thuringia, Germany, parents get support from the social workers of the school regarding questions about education and life. The *CEIP Andalucía School* in Spain, which belongs to a very disadvantaged neighbourhood, organizes a “Mothers’ School”, which is a combination of a dressmaking workshop and a literary discussion. A group of mothers gather to learn about sewing – an activity which is both useful for them and for the school, as the curtains of the school’s assembly hall were made by them – and share their experiences regarding the education of their children or other issues. At the *Lok Sin Tong Leung Wong Wai Fong Memorial School* in Hong Kong, parents are encouraged to come to the school’s library together with their children in order to establish a reading culture. Also, parents who don’t live in Hong Kong and cannot visit the school can access the online learning environments and

see what their children are doing at school. Therefore, a number of interesting and inspiring practices with respect to the involvement of parents can be observed in the Inventory cases.

Conclusions

In summary, the learning activities and practices which can be found in the Inventory cases are in line with the findings from research on learning. The cases show how the learning principles can be put into practice in real educational settings. It is important to note that many of the practices of the Inventory cases that were described in the present chapter address several principles at the same time. This can be nicely seen with regard to the use of assessments. In most Inventory cases, students monitor and assess their own learning process and their accomplishments (principle “learner centredness”). Assessments are highly individualized (principle “sensitivity to individual differences”) and are thus much more motivating than if a student were only compared to the achievements of his or her classmates (principle “responsiveness to motivations and emotions”). Often, peers (principle “the social nature of learning”), parents and external people (principle “horizontal connectedness”) are involved in the assessment strategies. This example also shows that the principles themselves are highly interrelated and that “all the principles should be present in a learning environment for it to be judged truly effective” (Istance & Dumont, 2010, p. 326) as was stated in *The Nature of Learning*.

By looking at the available Inventory cases as a whole, there are several other features of these learning environments that stand out which are closely related to the implementation of the learning principles: The use of space and time, teacher collaboration and the commitment to learning and professional development.

The Use of Space and Time

Many of the practices in the Inventory cases go hand in hand with a more open and flexible use of space and time. The rooms in the Inventory cases do not resemble the normal “classrooms” with rows of desks facing the front of the room. In many Inventory cases, the walls between rooms have been removed in order to create more common and open spaces and the furniture is arranged in different configurations that correspond to the learning activities. In some cases, students’ desks are grouped; in others each student has their own working space. In general, students are encouraged to design and arrange their classrooms in a way that suits them the most. They are also free to learn in other places of the whole school such as the hallways or outdoor areas. Researchers who visited the Inventory cases noticed that students are frequently moving around during working phases. In terms of timing, the usual sequence of 45- or 60-minute lessons for separate subjects does not exist and the day is often structured around different working phases such as “individual learning time” or “project work”.

Teacher collaboration and commitment to learning

A high degree of collaboration can be found among the teachers of the Inventory cases. This is most visible in the practice of team-teaching. Teachers work collectively to plan and implement the curriculum. In many Inventory cases, there are even two teachers in the classroom together to help, guide and supervise students. This permits them to be more responsive to individual students and cater to their needs. The intensive collaboration between teachers also encourages them to try out new ways to teach, because teachers receive support from their colleagues which produces feelings of safety. In this regard, one teacher at the *Mount Waverley Primary School* in Victoria, Australia, said that “it would have been difficult to change things so quickly without the team of teachers agreeing to change their pedagogies and practices”. This is very much in line with what Resnick, Spillane, Goldman and Rangel (2010) in *The Nature of Learning* mean when they talk about the need to develop and support “professional learning communities” for teachers.

The high degree of teacher collaboration is strongly related to another feature: their commitment to professional development. The cases see themselves as “learning organizations” meaning that their pedagogies and practices are continuously evaluated and developed further. This is done with the help of students, who are encouraged to give feedback and evaluate their teachers, as well as parents and

external evaluators. At the *CEIP Andulucia School* in Spain, for instance, teachers, school staff, volunteers, families, and students all collected their dreams for the school. The dreams were then put up in the school hall and served as the starting point for the school development process. Part of the on-going further development of the cases is due to their strong commitment to professional development of teachers. On the one hand, teachers attend professional development workshops on a regular basis. On the other hand, informal professional development takes place through trying out new approaches, videotaping themselves and discussing and evaluating their practices. This feature of the Inventory cases strongly reflects the emphasis that was placed on teacher professional development by the different authors of *The Nature of Learning*. All authors stressed that these new and innovative forms of teaching and learning demand high levels of professional knowledge and skills by teachers. That this is not always easy and takes time, was nicely illustrated by one of the teachers of the *Anim8tors program at the Mount Waverley Primary School* in Victoria, Australia: "...as teachers (...) one of our biggest downfalls is we are control freaks. We like to know what we are doing and to control the kinds and this is one really good program where we have to let go a little bit and let the kids explore".

This chapter suggests that the learning principles are already put successfully into practice in many learning environments around the world. Naturally, they are not realised in the same way and are adapted to the local context. However, considering that the cases came from a number of different countries and contexts, there are many similarities. Not only does this serve as a confirmation of the theoretical findings coming from learning research, first and foremost, the Inventory cases can serve as encouragement and inspiration for other learning environments around the world that want to make change at the level of teaching and learning happen.

REFERENCES

- Barron, B. & Darling Hammond, L. (2010). *Prospects and challenges for inquiry-based approaches to learning*. In (eds), *The Nature of Learning: Using Research to Inspire Practice*. OECD: Paris, France.
- Bebell, D., & Kay, R. (2010). One to one computing: A summary of the quantitative results from the Berkshire Wireless Learning Initiative. *Journal of Technology, Learning, and Assessment*, 9(2) [Online journal]. Retrieved from <http://escholarship.bc.edu/cgi/viewcontent.cgi?article=1222&context=jtla>
- Blamire, R. (2009). ICT impact data at primary school level: the STEPS approach. In Scheuermann, F., & Pedro, F. (eds.), *Assessing the effects of ICT in education*, 199-211. European Union/OECD: France.
- Erstad, O. (2009). Addressing the complexity of impact—a multilevel approach towards ICT in education. In Scheuermann, F., & Pedro, F. (eds.), *Assessing the effects of ICT in education*, 21-38. European Union/OECD: France.
- Evans, R. (2000): *The Human Side of School Change: Reform, Resistance and the Real-Life Problems of Innovation*. San Francisco: Jossey-Bass.
- Fullan, M. G. (1993). *The complexity of the change process*. In *Change forces: Probing the depth of educational reform*, pp. 19-41. Falmer Press.
- Goodwin, B. (2011). One-to-one laptop programs are no silver bullet. *Educational Leadership*, 68(5), 78-79.
- Green, H., Facer, K., Rudd, T., Dillon, P., & Humphreys, P. (2005). *Personalisation and Digital Technologies*. A Futurelab report.
- Groff, J., Howells, C., & Cranmer, S. (2010). *The Impact of Games in the Classroom: Evidence From Schools in Scotland*. Futurelab: Bristol, UK.
- Groff, J. & Mouza, C. (2008). A framework for addressing challenges to classroom technology use. *Association for the Advancement of Computing in Education (AACE) Journal*, 16(1), 21-46.
- Hikmet, N., Taylor, E., & Davis, C. (2008). The student productivity paradox: Technology mediated learning in schools. *Communications of the ACM*, 51(9), 128-131.
- Hobbs, R. (2010). *Digital and Media Literacy: A Plan of Action*. The Aspen Institute & The Knight Foundation.
- Ipsos Mori (2008). *Great Expectations of ICT: How Higher Education Institutions Are Measuring Up*.

- London: Joint Information Systems Committee (JISC).
- Istance, D. & Dumont, H. (2010). Future directions of learning environments. In OECD, *The Nature of Learning: Using Research to Inspire Practice*. OECD: Paris, France.
- Johannessen, O. (2009). In search of the sustainable knowledge base: multi-channel and multi-method. In Scheuermann, F., & Pedro, F. (eds.), *Assessing the effects of ICT in education*, 13-20. European Union/OECD: France.
- Kikis, K., Scheuermann, F., & Villalba, E. (2009). A framework for understanding and evaluating the impact for information and communication technologies in education. In Scheuermann, F., & Pedro, F. (eds.), *Assessing the effects of ICT in education*, 69-82. European Union/OECD: France.
- Kulik, J. (2003). *The Effects of Using Instructional Technology in Elementary and Secondary Schools: What Controlled Evaluation Studies Say*. SRI International: Arlington, VA.
- Langridge, J. (2003). The Backyard Blitz Syndrome: The emerging student culture in Australian Higher Education. *Transformations*, 7.n.s.
- Littlejohn, A., Margaryan, A., & Vojt, G. (2010). Exploring students' use of ICT and expectations of learning methods. *Electronic Journal of e-Learning (IJEL)*, 8(1), PAGES NEEDED.
- Morgan, J., Williamson, B., Lee, T., & Facer, K. (2008). *Enquiring Minds*. Futurelab: Bristol, UK.
- OECD & Joint Research Centre- European Commission (2010). *Assessing the effects of ICT in education: Indicators, criteria and benchmarks for international comparisons*. Joint Research Centre- European Commission: Luxembourg.
- OECD (2011). *PISA 2009 Results: Students On Line: Digital Technologies and Performance (Vol. VI)*. OECD: Paris, France.
- OECD (2010a). *Are the New Millennium Learners Making the Grade? Technology Use and Educational Performance in PISA 2006*. OECD: Paris, France.
- OECD (2010b). *Inspired by Technology, Driven by Pedagogy: A systemic approach to technology-based school innovations*. OECD: Paris, France.
- OECD (2010c). *The Nature of Learning: Using Research to Inspire Practice*. OECD: Paris, France.
- OECD (2008). *Innovating to Learn, Learning to Innovate*. OECD: Paris, France.
- OECD (2006a). *Demand-sensitive schooling. Evidence and issues*. Paris: OECD
- OECD (2006b). *ICT and Learning: Supporting Out-of-School Youth and Adults*. OECD: Paris, France.
- Pedro, F. (YEAR). *New millennium learners in higher education: Evidence and policy implications*.

- Peslak, A. (2005). The educational productivity paradox: Studying the effects of increased IT expenditures in educational institutions. *Communications of the ACM*, 48(10), 111-114.
- Selwyn, N. (2010). Web 2.0 and the school of the future, today. In, OECD (eds.), *Inspired by Technology, Driven by Pedagogy: A systemic approach to technology-based school innovations*. OECD: Paris, France.
- Shapley, K., Sheehan, D., Sturges, K., Caranikas-Walker, F., Huntsberger, B., & Maloney, C. (2009). *Evaluation of the Texas Technology Immersion Pilot: Final outcomes for a four-year study (2004–05 to 2007–08)*. Austin: Texas Center for Educational Research.
- Silvernail, D. L., & Gritter, A. K. (2007). *Maine's middle school laptop program: Creating better writers*. Portland: Center for Education Policy, Applied Research, and Evaluation, University of Southern Maine.
- Slavin, R. (2010). Co-operative learning: What makes groupwork work? In (eds.), *The Nature of Learning: Using Research to Inspire Practice*. OECD: Paris, France.
- Sutch, D., Rudd, T., & Facer, K. (2008). *Promoting Transformative Innovation in Schools*. A Futurelab handbook.
- Trucano, M. (2005). *Knowledge maps: ICT in education*. Washington, DC: infoDev/World Bank.
- UNESCO (2003a). *Developing and using indicators of ICT use in education*.
- UNESCO (2003b). *Towards policies for integrating information and communication technologies into education*.
- Zitter, I., & Hoeve, A. (2011). *Hybrid and well-designed: Two guiding perspectives on the road to learning environments in the 21st century*. National Centre for Expertise in Vocational and Training. ECBO: Netherlands.