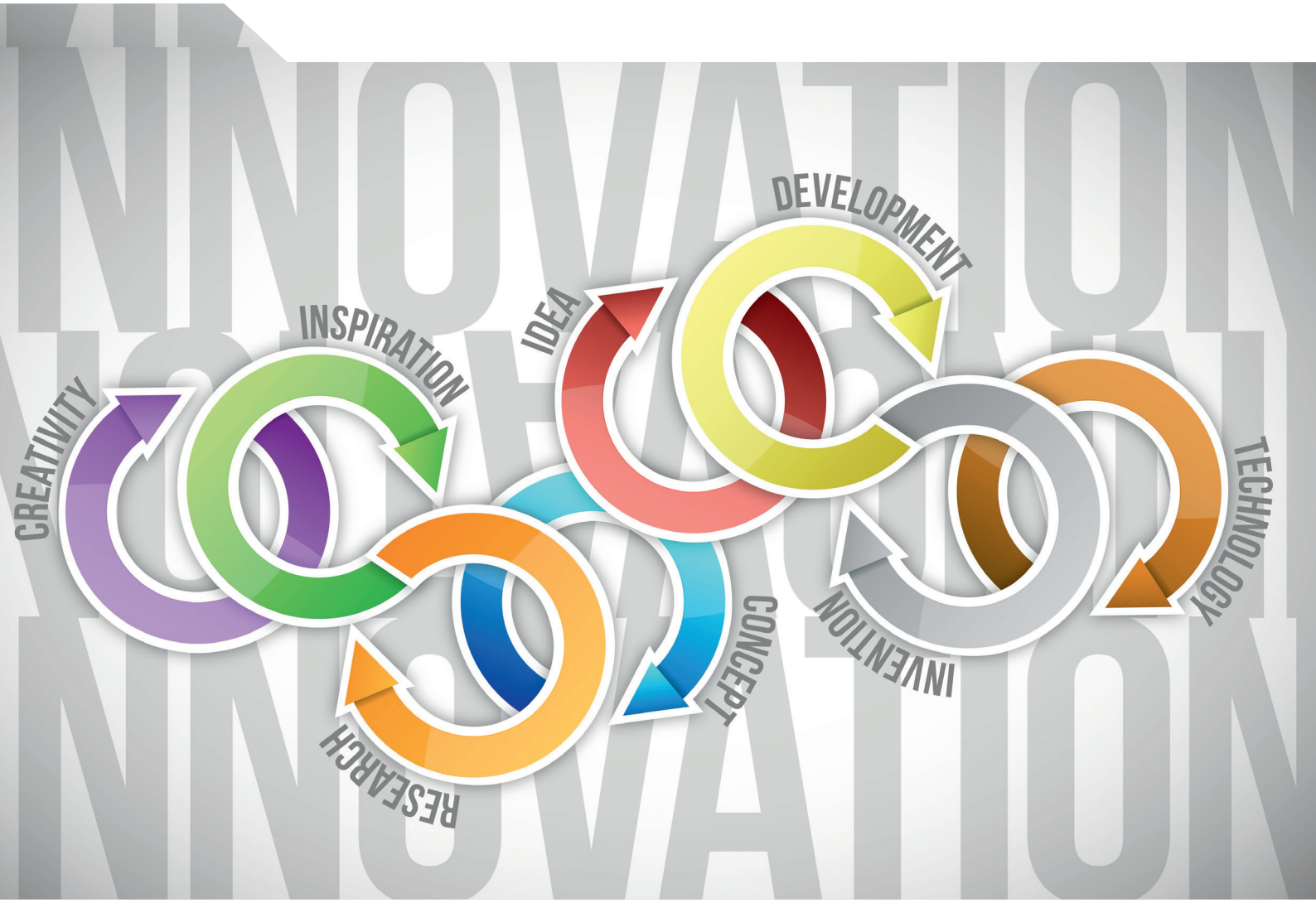
Education Innovation and Research

Schools at the crossroads of innovation in cities and regions



Centre for Educational Research and Innovation

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Educational Research and Innovation

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BETTER POLICIES FOR BETTER LIVES

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Foreword

In the past couple of years we have seen an increasing number of arguments and appeals for innovation in our education systems. Most of them focus on internal components of education systems: teachers, pedagogies, curricula, school organisation, leadership etc. The implicit assumption is that education systems have to generate the energy and capacity for innovation internally, and the fact that schools and education system generally seem to be unable to do so is seen as one of their biggest failures. Very few accounts of innovation in education have looked at the broader context and the external relations of schools as drivers of innovation. The outside world is mostly seen as generating the rationales and urgency for innovating schools, such as technological change or societal complexity and diversity. This report argues that we need to see schools as networking institutions and part of encompassing ecosystems of learning and innovation. It is only by conceptualising schools as part of broader ecosystems that we can understand and foster change and innovation.

Schools cannot be left alone to make the difficult process of transformation, but need support not only from policies, but also from other actors and stakeholders. Ecological thinking in education has advanced the notion of learning and innovation ecosystems that encompass not only educational institutions and non-formal learning environments, but also broader communities, social organisations, industry and business. At the same time a more critical approach to globalisation and internationalisation has engendered a renewed interest in locality, the local and regional context in which schools also operate.

This report is produced as a background document for the 3rd Global Education Industry Summit, jointly organised by the OECD, the European Commission and the Government of Luxembourg on 25-26 September 2017 in Luxembourg. The Global Education Industry Summits bring together governments and leaders from the global industry, with the aim of identifying the best policies and practices to foster innovation in education. Two successful events in Helsinki (2015) and Jerusalem (2016) have provided the groundwork for this third edition, which focuses on "Schools at the Crossroads of Innovation in Cities and Regions".

The report was prepared by Dirk Van Damme, head of the OECD Centre for Educational Research and Innovation (CERI), compiling analyses from recent OECD/CERI publications on innovation, innovation in education and technology-based innovation. In particular, the report draws on the outcomes of different recent CERI projects, notably CERI's Innovative Learning Environments, Innovation Strategy for Education and Training, and Governing Complex Education Systems projects, as well as on other work by the OECD Directorate for Education and Skills.

The main sources for this report are the following OECD publications: What Schools for the Future? *(2001)*, Cities and Regions in the New Learning Economy *(2001)*, Learning to Innovate: Learning Regions *(2002)*, Working Out Change: Systemic Innovation in Vocational Education and Training *(2009)*, Innovative Workplaces: Making Better Use of Skills within Organisations *(2010)*, Inspired by Technology, Driven by Pedagogy: A Systemic Approach to Technology-Based School Innovations *(2010)*, Learning for Job: Synthesis Report of the OECD Reviews of Vocational Education and Training *(2010)*, Measuring Innovation: A New

Perspective *(2010)*, The OECD Innovation Strategy: Getting a Head Start on Tomorrow *(2010)*, Regions and Innovation Policy *(2010)*, Innovative Learning Environments *(2013)*, OECD Skills Outlook 2013: First Results from the Survey of Adult Skills *(2013)*, Regions and Innovation: Collaborating across Borders *(2013)*, Leadership for 21st Century Learning *(2013)*, Measuring Innovation in Education: A New Perspective *(2014)*, OECD Regional Outlook 2014: Regions and Cities: Where Policies and People Meet *(2014)*, Education Policy Outlook 2015: Making Reforms Happen *(2015)*, Schooling Redesigned: Towards Innovative Learning Systems *(2015)*, Skills for Social Progress: The Power of Social and Emotional Skills *(2015)*, The Innovation Imperative: Contributing to Productivity, Growth and Well-Being *(2015)*, Schools for 21st-Century Learners: Strong Leaders, Confident Teachers, Innovative Approaches *(2015)*, Students, Computers and Learning: Making the Connection *(2015)*, Education at a Glance 2016: OECD Indicators *(2016)*, Innovating Education and Educating for Innovation: The Power of Digital Technologies and Skills *(2016)*, PISA 2015 Results (Volume I): Excellence and Equity in Education (2016), PISA 2015 Results (Volume II): Policies and Practices for Successful Schools *(2016)*, Education at a Glance 2017: OECD Indicators *(2017)*, The Funding of School Education: Connecting Resources and Learning *(2017)*, The OECD Handbook for Innovative Learning Environments *(2017)*, Engaging Employers in Apprenticeship Opportunities: Making It Happen Locally *(2017)*, as well as several OECD Education Working Papers (*www.oecd-ilibrary.org/education/oecd-education-working-papers_19939019*). External research papers and resources have been referred to in the text.

It is recommended that this report is read together with the background report for the 2nd Global Education Industry Summit in 2016, Innovating Education and Educating for Innovation: The Power of Digital Technologies and Skills*, which focused on digitalisation and digital skills and their impact on educational innovation.*

The following colleagues provided suggestions and resources for the report: Anthony Mackay, Michael Stevenson, David Istance and Stephan Vincent-Lancrin. Rachel Linden, with the assistance of Raven Gaddy and Madeleine Gereke, co-ordinated the production of the report.

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Executive summary

This background report for the 3rd Global Education Industry Summit examines the role of schools within a broader ecosystem of innovation and learning. These summits bring together ministers and high-level education officials with representatives of industry and business, specifically the growing education industry, to discuss innovation in education and how policy makers and industry leaders can jointly contribute towards fostering it.

Many people do not see education as one of contemporary society's more innovative sectors. While this perception is not entirely accurate – much innovation is indeed happening in schools and education systems around the world – there is a powerful case for driving innovation forward and scaling up innovative approaches. The "innovation imperative" for education is driven by the rapidly changing technological, economic and social conditions of the early 21st century and the resulting need to meet the demand for new skills. At the same time technology provides opportunities to improve effectiveness and productivity in learning, opportunities that have not yet been sufficiently exploited. Despite many efforts, pioneering initiatives around the world, well-intentioned government policies, and initiatives from business and industry, innovation still is not a systemic feature of education.

As in other sectors, ecological approaches to innovation in education have increased awareness that schools cannot do it alone. While there are examples of innovative approaches in schools, they are rather isolated from the surrounding social and economic environment. **Sustainable and systemic forms of innovation have more chance in open environments, in "ecosystems" of learning and innovation**. The idea that effective and high-quality education requires seclusion in both time and space, which might have been effective in the early days of public education, should now be abandoned. Opening up schools to their local economies and communities now seems to be part of creating the right kind of environment for innovation to happen. As in other sectors, openness becomes a condition for sustainable innovation. New governance arrangements giving stakeholders more legitimacy to play an active role, and more horizontal forms of accountability, can help create such ecosystems.

This recognition of the importance of ecosystems coincides with a growing awareness that **innovation in general is happening predominantly at the regional and local level**. The regional level really matters for innovation through the proximity, networking and partnerships which are increasingly important for creating the conditions for innovation to happen. Human capital plays a significant role in successful innovation, so schools, non-formal and informal learning opportunities – and skills systems in general – are an idispensable part of the innovation ecosystem.

Recent OECD/CERI work on innovative learning environments, based on extensive case studies, has improved our knowledge and understanding of innovation in schools. Innovative schools rethink and reorganise some or all components of their "pedagogical

core": learners, educators, content and resources. In many cases, this means rethinking the organisational patterns forming the backbone of most schools today: the lone teacher; the separate classroom, each with its own teacher; the familiar timetable and bureaucratic units; and traditional approaches to teaching and classroom organisation. Innovation in schools also requires them to become real "learning organisations" themselves by developing and sharing a vision centred on the learning of all students; creating and supporting continuous learning opportunities for all staff; promoting team learning and collaboration among all staff; establishing a culture of inquiry, innovation and exploration; embedding systems for collecting and exchanging knowledge and learning; learning with and from the external environment and broader learning system; and modelling and growing learning leadership.

Technology can be a very powerful tool for innovation, and it is difficult to see innovation happening in schools without the smart use of technology. Yet, a supply-driven and hardware-focused approach to technology does not help, and may even be counterproductive. The mere presence of technology is not by itself enough for innovation. Going digital may only reproduce traditional methods and pedagogies in a different form. Recent evidence from the PISA 2015 science assessment found a rapid increase in the availiblity of computers in schools, but with mixed effects on students' science proficiency.

The relationships between schools and their regional and local environment runs in two directions. **Schools can play a very important role in driving progress and well-being in their own communities**. Innovative schools open up to their communities and engage in various kinds of partnerships with regional and local stakeholders. In today's societies schools are not the sole providers of learning, but learning environments become multidimensional. Schools have every incentive to strengthen their horizontal connections. Serving the community through extracurricular activities or service-learning also improves conditions for learners themselves. Students develop the skills for lifelong volunteering and social engagement. In developing their horizontal connections, schools become networking organisations, strongly embedded in learning ecosystems.

In the other direction, **regional economies and local communities can do a lot to support schools**. Businesses can offer cost-sharing arrangements or opportunities for learning, such as workplace learning, internships and apprenticeships. Engaging employers more effectively can support the quality and relevance of learning, and can also drive innovation. The benefits are often mutual. Obviously, engaging businesses in ecosystems of learning and innovation is more likely to be effective if they themselves put learning at the centre of their culture, and become "learning organisations ". Employers are showing increasing interest in educational reform, especially in modernising curricula to make them future-proof and better adjusted to current and future skills needs. Engaging employers in education is a sensitive issue in many countries, but there are clear benefits for schools when critically important stakeholders such as business and industry take a more active role in the broader ecosystem of innovation and learning.

Opening up schools to their environment, developing real ecosystems of change and innovation, and promoting a more active role for stakeholders and communities seem to be critically important steps in the process of innovation in education. The regional and local dimension is very important: learning cities and regions create an environment where innovative schools will flourish and learners get the best possible opportunities to acquire the skills that matter.

Chapter 1

Innovation, education and learning: An ecosystems approach

This chapter provides a general introduction to the theme of the 3rd Global Education Industry Summit. It considers the need for innovation in education to raise productivity and efficiency, increase equity, and improve outcomes overall, and how best to define and measure innovation in the sector. Given the complexity of modern learning systems, which now extend well beyond schools, it introduces new ways to think about whole-of-system change and an ecosystems approach to education, learning and innovation. It discusses the relevance of the local and regional dimension, including learning cities and regions, to developing innovation. Finally it considers the changing demands for skills in the 21st century and the critical need to include the voice of employers and industry in any discussion on innovation in education.

Introduction

Throughout the various levels of formal education, schools provide a myriad of opportunities to individuals and communities. Learning takes place everywhere and any time, but schools offer an institutionalised space and time for rich and powerful learning, supported by professional teachers. In the past schools were considered to only be able to fulfil their role by separating learners from their environment and by closing off learning into well-regulated but secluded settings. In recent years however, boundaries between schools and the surrounding environment have opened up: parents, stakeholders and local communities are more actively engaging with schools – and schools are also progressively connecting with the local community and regional economy, including business, industry and social profit organisations. In many ways, schools are becoming networking organisations, partners and allies in regional innovation, while at the same time benefitting from their networking to innovate every aspect of their own existence.

The mutually beneficial relationships between schools and their environments underpin an ecological vision of learning and schooling ("learning ecosystems") while at the same time positioning schools within broader ecologies of local and regional innovation ("innovation ecosystems"). These two dimensions should not be seen as distinct from one another: schools are at the crossroads of innovation. After all, isn't learning about changing yourself, your community, your environment? And doesn't innovation involve a great deal of individual and collective learning to do differently and do better?

An ecosystems approach to learning and innovation is fundamental to understanding how different actors can work together to improve outcomes, with the help of enabling forces such as technology harnessed in such a way that it accelerates, enlarges and amplifies learning and innovation.

This chapter provides a general introduction to the theme of the 3rd Global Education Industry Summit, *Schools at the Crossroads of Innovation in Cities and Regions*. It discusses the rationales for innovating education, how to define and measure innovation in education, the complexity of modern education systems and the need to think in new ways about whole-of-system change and an ecosystems approach to education, learning and innovation. Next, it discusses the relevance of the local and regional dimension in discussing innovation in education and learning. It concludes by stressing the critical importance of the voice of employers and industry in the context of innovation in education.

Why innovating education?

The innovation imperative

In the last few decades, innovation in general has been increasingly regarded as a crucial factor in maintaining competitiveness in a globalised economy. Innovation can breathe new life into slowing stagnant markets, and act as a mechanism to enhance any organisation's ability to adapt to changing environments. Both policies and theories on innovation have

mainly focused on the business sector (Lekhi, 2007). Businesses need to innovate in order to keep up with their competition by introducing new products or services, improving the efficiency of their production processes and organisational arrangements, or enhancing the marketing of their activities in order to guarantee their survival.

Much more recently, policy interest has extended this "innovation imperative" from private organisations to the provision of public services. Although public services, including education, tend neither to operate within competitive markets nor have the same incentives to innovate as businesses do (Lekhi, 2007), there are important arguments to push for innovation in education to maximise the value of public investment. Several recent national innovation strategies include provisions for more innovation in the public sector (such as Australia, Finland, the Netherlands, Norway and the United Kingdom). Demographic pressures, burgeoning demand for government services, higher public expectations and ever-tighter fiscal constraints mean that the public sector needs innovative solutions to enhance productivity, contain costs and boost public satisfaction.

Innovation in the public sector in general, and in education in particular, could be a major driver for significant welfare gains. Governments provide a large number of services in OECD countries and these services account for a considerable share of national income. Government expenditure in OECD countries represents about 48% of gross domestic product (GDP) on average, and in some cases corresponds to more than half of national GDP. Education is a major component of government services: in 2013, public expenditure on educational institutions accounted for 5.2% of national income on average for OECD countries (OECD, 2016a). Innovations to improve the effectiveness and efficiency of such a large share of government spending could yield important benefits.

Why innovation in education matters

How could innovation add value in the case of education? First of all, educational innovations can improve learning outcomes and the quality of education provision. For example, changes in the educational system or in teaching methods can help customise the educational process. New trends in personalised learning rely heavily on new ways of organising schools and the use of information and communications technology (ICT).

Second, education is perceived in most countries as a means of enhancing equity and equality. Innovations could help enhance equity in the access to and use of education, as well as equality in learning outcomes.

Third, public organisations are often under as much pressure as businesses to improve efficiency, minimise costs and maximise their "bang for the buck". Mulgan and Albury (2003) argue that there has been a tendency for costs in all public services to rise faster than those in the rest of the economy, and education is no exception. While this could be attributed to Baumol's "cost disease", inherent to any public-service provision which faces ever-rising labour costs and limited scope for transformative productivity gains, this may also be due to a lack of innovation (Foray and Raffo, 2012). Innovation, then, could stimulate more efficient provision of these services.

Finally, education should remain relevant in the face of rapid changes to society and the national economy. The education sector should therefore introduce the changes it needs to adapt to societal needs. For example, education systems need to adopt teaching, learning or organisational practices that have been identified as helping to foster "skills for innovation". The results from the Programme for International Student Assessment (PISA), as well as the

Trends in International Mathematics and Science Study (TIMSS), Progress in International Reading Literacy Study (PIRLS) and the OECD Survey on Adult Skills point to the need for innovation to improve results in literacy, numeracy and scientific literacy in many countries.

The innovation imperative in education

Innovation in education is a highly contentious issue. Talking to education ministers one quickly gets the impression that education systems in general are very reluctant to innovate, and that there is strong resistance to change among teachers. Education is sometimes perceived as one of the most conservative social systems and public policy fields. But talking to teachers gives one the opposite impression – that there are too many changes imposed on them without much consultation or the necessary preconditions for successfully implementing change. In some countries, innovative change has been implemented without the care and diligence needed or appropriate prior testing, experimentation and evaluation.

This controversy should not deter us from looking to the facts. And the facts clearly demonstrate that education systems are running up against very serious problems which, if left untouched, could result in serious risks not only for education itself but also for future economic growth, social progress and well-being. Since the mid-20th century, education systems have expanded enormously and human populations have never been more highly educated than today. Emerging economies and developing countries are now also relentlessly expanding their education systems, seeing education as an indispensable ingredient of modernisation and progress. Indeed, the benefits to individuals and societies of ever more education remain very impressive. Yet, although many policy makers may consider the continued expansion in numbers as the best route forward, a closer look into the data reveals that this may as well lead us into difficulties.

The problem education is facing is mainly one of productivity and efficiency. Here, efficiency means the balance between resources invested and the outcomes in terms of students' performance and equity. Over the past decades ever more resources have been invested in education. Looking just at school education, the average expenditure per student across OECD countries increased by no less than 17% between 2005 and 2013 in constant prices (OECD, 2016a). But over roughly the same period, the PISA data from the 2003 and 2015 assessments show no significant improvement in test scores. Instead, in most countries the percentage of top performers has declined. And, while the PISA data show some progress in equity, huge gaps remain in equality of opportunity and education outcomes between various social groups (OECD, 2016b).

The problem of productivity and efficiency in education is even more striking when education is compared with other public policy sectors, which have realised enormous productivity gains in past decades. In sectors such as health, technology has been a major driver of increased productivity and efficiency with much improved outcomes even if costs have also gone up. Many observers wonder why enormous advances in technology have not yet led to similar improvements in education. Governments have invested a lot in bringing technology, mainly ICT, into schools. But it has not yet been possible to associate increased availability and use of computers in schools with improvements in learning outcomes.

These developments create an intense pressure for reform. In many quarters, this is seen as a need to modernise and innovate bureaucratic school systems in their methods, content, etc. Added to this are severe pressures on public spending which put the spotlight on perceived inefficiencies.

The pressure often takes the form of favouring "learning" over "education", and signals a readiness to disrupt accepted institutional arrangements as too slow to change, too inward-looking and too detached from the rapid economic shifts taking place globally and locally. It is an argument for radical overhaul of learning environments at scale, including, in the language of the OECD schooling scenarios (OECD, 2001a), "de-schooling".

This represents a very different starting point for innovation from the long-standing educational/progressive desire to realise more holistic educational opportunities and promote individual development. On this view, the problem is not that educational institutions are too detached from the economy but that they are too close, and have been drawn to narrow their curricula and instil only superficial knowledge and not deep understanding. The charge is also that education systems are profoundly inequitable, far too driven by the social and economic function of sorting and selecting, and thus not organised for the optimisation of learning. In the language of the OECD schooling scenarios, this is an argument for "re-schooling".

These two critiques, the economic and the educational, may thus seem poles apart. But in other respects, they come closely into alignment and increase the pressure to innovate because such divergent starting points lead to the same basic conclusion. The critics of either colour may point to supporting evidence in the large numbers of young people who are disengaged from learning by the time they reach their teenage years. Both might insist that radical overhaul is needed, not minor improvements. Both call for innovation and the urgency of enhancing the power of schools and other places to generate learning. Both may say that systemic change is needed, not isolated innovation here and there. Indeed, what may look at first sight to be divergent critiques may turn out to be convergence around different points of emphasis.

Another key constituency are teachers, who work in complex, knowledge-intensive situations and yet in most countries feel that they have an ambiguous status with insufficient recognition of their professionalism. They may respond by retreating into defensive mode and seeking to protect an understanding of professional autonomy as the right of individual teachers to be left undisturbed in their own classrooms. Innovating learning environments with collaborative definitions of professionalism and the strong engagement of all partners (and most especially young people themselves) offers a far more promising route for enhancing the attractiveness of teaching than such backward-looking definitions of professionalism.

The differences between the critiques and constituencies notwithstanding, they coalesce around the urgent need to innovate the fundamentals of schooling. If schools are to make serious progress towards 21st century skills development, or towards holistic education, or to be highly attractive contemporary professional working environments, it will mean radical changes to core habits and practices in most schools and systems, where those habits are the residues of the predictability and control practices that resemble little of what a learning organisation is now understood to be (OECD, 2010b). It means addressing the low visibility of teachers' work and their isolation in highly fragmented classroom arrangements and the low levels of engagement of too many of the main players (especially students).

In moving away from excessively bureaucratic models, the growing understanding of complexity highlights the impoverishment of mechanical policy metaphors and the assumption of central policy omnipotence within well-defined and controllable "systems".

These fit badly into a world of multiple actors, in which global and local players are influential as are non-formal players and activity. Digital connection has transformed communication and boundaries. More organic metaphors and models might seem messy and unpredictable, but ecosystems and complexity have become the nature of the contemporary world. We cannot keep faith with old models simply because they are neater.

This book argues that innovation in education – as in all sectors of the economy and society – is imperative to bring about qualitative changes, in contrast to the mere quantitative expansion that we have seen so far. This will lead to more efficiency and improved outcomes in quality and equity of learning opportunities.

Defining and measuring innovation in education

Definitions

Although the terms are often used interchangeably, it is important to distinguish innovation from reform and change (Figure 1.1). Most of the literature defines innovation as the implementation not just of new ideas, knowledge and practices but also of improved ideas, knowledge and practices. Innovation is thus different from reform or change, which do not necessarily mean the application of something new, nor do they imply the application of improved ideas or knowledge.

Huerta Melchor (2008) suggests that reform is only one way of producing change; it implies a special approach to problem solving. Sometimes changes in organisations are key parts of a reform but other reforms may produce little or no change. Change may be an intended or unintended phenomenon, whereas reform is a structured and conscious process of producing change, no matter its extent. Reforms can occur in political, economic, social and administrative domains and contain ideas about problems and solutions and are typically understood as initiatives driven from the top of a system or organisation.

Figure 1.1. **Comparing innovation, reform and change**

	Innovation	Reform	Change
Definition	Implementation of improved ideas, knowledge and practices	Structured and conscious process of producing change	Transformation or alteration that may be an intended or unintended phenomenon
Key characteristics	Implies novelty and brings benefits	Produces change (though in some cases only little or none)	Is historical, contextual and processual
Types	Process, product, marketing and organisational Also: incremental, radical and systemic form	Radical, incremental or systemic	Differentiated by pace (continuous or episodic) and scope (convergent or radical)

Source: Cerna (2014) "Innovation, governance and reform in education", *www.oecd.org/edu/ceri/CERI%20Conference%20Background%20Paper_formatted.pdf*.

Many definitions of innovation are used in different contexts and disciplines although for statistical purposes, the most widely accepted definition of innovation comes from the Oslo Manual (OECD/Eurostat, 2005). This defines innovation as "the implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations". In this definition, implementation refers to the introduction of a product to the market, or the actual use of processes, marketing methods and organisational methods.

This definition has been widely applied to the private sector and can also be applied to education with small modifications. Educational organisations such as schools, universities, training centres, or education publishers could introduce 1) new products and services, such as a new syllabus, textbook or educational resource; 2) new processes for delivering their services, such as the use of ICT in e-learning services; 3) new ways of organising their activities, such as ICT to communicate with students and parents; or 4) new marketing techniques, such as differential pricing of postgraduate courses. These new practices are intended to improve the provision of education in one way or another, and therefore should be regarded as improvements.

However, the notion of "improvement" in many public services, including education, can be elusive and the use of this definition has been challenged. The perception of improvement depends on the perspective of the stakeholders, who may wear several hats: consumer, citizen, employer and taxpayer. Assessing the success of companies in the private sector by profit, sales or growth is widely accepted: ultimately they have a single bottom line which prevails over any other objectives. By contrast, whether public organisations stay in business or close is usually a political decision rather than a market sanction. Public organisations are assessed on multiple objectives, such as increased quality, equity, coverage and efficiency, which are less commensurable and can even conflict with each other.

As a result, improvements in education can be perceived differently depending on which objective is examined or on the point of view of the observer. Moreover, cultural values, social policies and political goals can mean countries prioritise these objectives differently. Priorities can also change over time as circumstances and citizens' expectations change. This has consequences for the validity and limitations of the indicators that need to be gathered. Ideally, innovation indicators in the education sector should be linked to specific social and educational objectives such as learning outcomes, cost efficiency, equity or public satisfaction. Innovation should also be measured at different levels and, where no objective measurement can be made, according to different stakeholders' perspectives.

Innovation in education: The measurement challenge

The measurement of innovation and its effectiveness in the public sector – and in education in particular – is in its infancy. Recent work in the framework of the Innovation Strategy project of the OECD's Centre for Educational Research and Innovation (CERI), reported in *Measuring Innovation in Education* (OECD, 2014a) provides new measures of the readiness of education to innovate. *Measuring Innovation in Education* is a pioneering attempt to provide indicators based on existing international datasets. It aims to provide education policy makers with an estimated order of magnitude of innovation and change in education. It offers two broad approaches to measuring innovation in education: 1) assessing the perceptions of recent tertiary graduates, including those working in education, about innovation in their workplace; and 2) analysing organisational changes through teacher-student surveys.

Box 1.1 provides the key findings of the first measurement approach. Contrary to common belief, the results suggest that there is a fair level of innovation in the education sector, both in absolute terms and relative to other sectors. Box 1.2 summarises the key findings of the second approach focusing on measuring organisational changes.

Box 1.1. **Key findings of the 2014 edition of *Measuring Innovation in Education (1)***

The first approach – asking graduates to assess the "level" of innovation – is subjective but it provides information on the perceived level of innovation by sector. Based on two surveys covering 19 European countries – the 2005 Research into Employment and Professional Flexibility (REFLEX) and the 2008 Higher Education as a Generator of Strategic Competences (HEGESCO) – the project developed a measure of innovation in education compared with other professional sectors. These surveys defined innovation as the introduction of "new or significantly improved products, processes, organisation or marketing methods". They asked tertiary graduates, five years after they graduated: "How would you characterise the extent of innovation in your organisation or your workplace?" in reference to three types of innovation identified in the Oslo Manual (OECD/Eurostat, 2005): 1) products or services (such as new syllabuses, textbooks or educational resources); 2) technology, tools or instruments (new processes for delivering services such as use of ICT in e-learning services, new learning-management systems, new on-line courses, or new pedagogic tools, such as maps, anatomy models, e-labs); and 3) knowledge or methods (such as new pedagogies, new administrative management systems for admissions or other formalities, or the use of ICT to communicate with students and parents). On a scale of 1 (very low) to 5 (very high), "high innovation" corresponded to scores of 4 and 5. The indicators presented below capture innovation as a significant change in key practices. Here are some key findings:

- Contrary to common belief, there is a fair level of innovation in the education sector, both relative to other sectors of society and in absolute terms. Seventy percent of graduates employed in the education sector consider their establishments as highly innovative, on a par with the economy average (69%).
- Within education, innovation intensity is greatest in higher education, with secondary and primary education approximately equal.
- Compared to other sectors, knowledge and method innovation is above average in education, product and service innovation is below average, and technology innovation is at the average sectoral level.
- Education is at or below average in terms of the speed of adoption of innovation: 38% of graduates reported that their educational establishment was mostly at the forefront in adopting innovations, new knowledge or methods (against 41% on average in the economy).
- Higher education stands out in terms of speed of adopting innovation, above the economy average, and well above the rate in primary and secondary education.
- The education sector has significantly higher levels of innovation than the public administration on all our indicators and is at least as innovative as the health sector on each measure.

An update is currently in preparation, in view of a 2018 edition of *Measuring Innovation in Education* (Vincent-Lancrin et al., 2017). The update will present a range of new indicators based on an approximation of the traditional innovation definition. It captures innovation as a significant change in some key practices in educational establishments by drawing on the PISA, TIMSS and PIRLS databases. The repeated cross-sectional nature of these studies makes it possible to map trends over time. These indicators are therefore based on the

analysis of responses to questions that have been asked in at least two waves of the study in order to identify changes in professional practices or in classroom or school resources. Box 1.3 provides an example of measured innovation in classroom pedagogical practices, using PISA 2009 and 2015 data and Box 1.4 gives an example of innovative change in school infrastructure, namely the availability of laptops and notebooks in schools.

Box 1.2. **Key findings of the 2014 edition of *Measuring Innovation in Education (2)***

The second approach that has been used to improve the measurement of innovation in the public (and business) sector is based on surveys of organisational change. These surveys typically measure the dissemination of specific innovations in the economy, for example computers or organisational practices. Part II of *Measuring Innovation in Education: A New Perspective* (OECD, 2014a) applied the working definition of innovation as the implementation of a new or significantly changed process, practice, organisational or marketing method observed at the education system level through micro-data collected within schools. The emphasis is particularly placed on change in practices. Some of the key findings are as follows:

- There have been large increases in innovative pedagogic practices across all countries covered in areas such as relating lessons to real-life, higher-order skills, data and text interpretation, and personalisation of teaching.
- In their pedagogic practice, teachers have innovated in their use of assessments and in the accessibility and use of support resources for instruction.
- Educational organisations have innovated in the areas of special education, creation of professional learning communities for teachers, evaluation and analytics, and relationship building with external stakeholders, such as parents.
- In general, countries with greater levels of innovation have seen increases in certain educational outcomes, including higher (and improving) 8th grade mathematics performance, more equitable learning outcomes across ability and more satisfied teachers.
- Innovative educational systems generally have higher expenditure than non-innovative systems; however, their students are no more satisfied than those in less innovative systems.
- Overall, innovation has been higher with regards to classroom practices than school practices between 2000 and 2011.

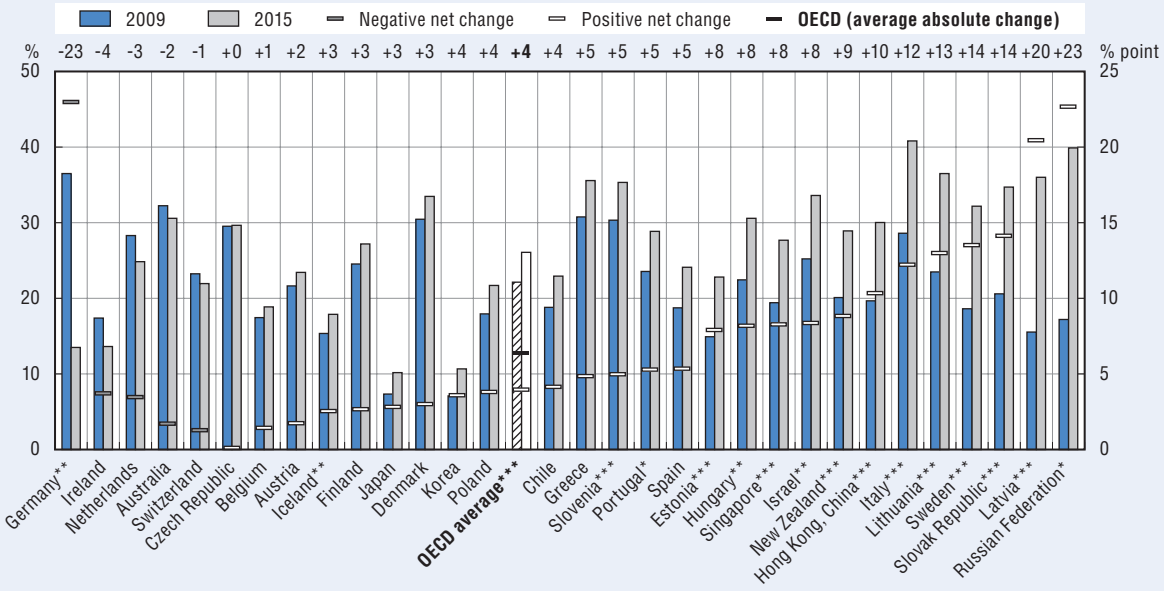
Box 1.3. **Example of innovation in classroom pedagogical practices: Using computer simulations for learning**

One of the virtues of using computers for learning lies in the power of simulations: they allow students to practise and to become experts without the real-life consequences of failures. Playing simulations (or learning in simulated environments) is thus one of the good uses of computers for learning, and an interesting pedagogical practice to follow – although it will typically have to be supplemented by other practices.

Among the countries surveyed, most have seen an increase in this practice. At the level of OECD, there has been a net increase of 4 percentage points. Positive and negative changes across all countries average 6 percentage points in an absolute sense which is associated with an effect size of 0.15. The effect size here is quite small. In all countries less than 50% reported playing computerised simulations in school. In 2015, the levels ranged from about 40% in the Russian Federation and Italy down to only about 10% in Japan and Korea.

Box 1.3. **Example of innovation in classroom pedagogical practices: Using computer simulations for learning** *(cont.)*

Percentage of 15-year-old students who played simulations at school on computers at least once or twice a month, as reported by the students



***= change significant at the 0.01 level; **= change significant at the 0.05 level; *= change significant at 0.1 level
Source: Authors' calculations based on PISA 2009 and 2015 (Vincent-Lancrin et al., 2017).

Germany registered a substantial decline in the prevalence of this practice, by 23 percentage points. The Russian Federation on the other hand saw an increase of the same amount, followed closely by Latvia which recorded an increase of 20 percentage points.

Source: Vincent-Lancrin et al. (2017), "Measuring Innovation in Education: Towards a 2018 edition".

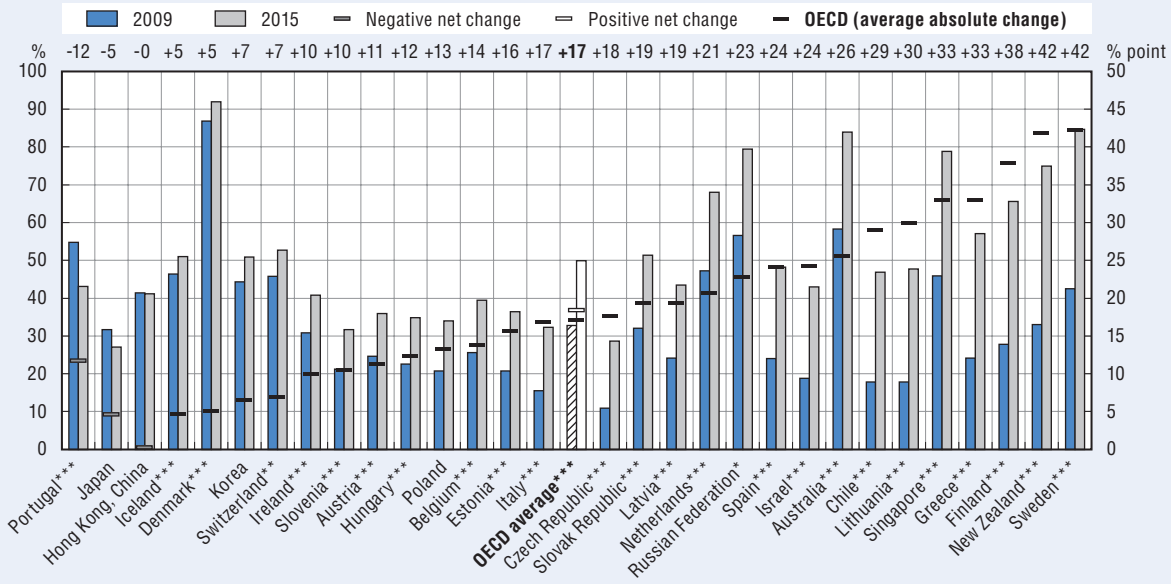
Box 1.4. **Example of innovation in school infrastructure: Availability of laptops or notebooks in schools**

Digital technologies have reached schools through the availability of computers, and technology is now increasingly seen as "mobile" thanks to the availability of portable devices. While the availability of desktop computers has fallen over the past years, digitalisation is reflected by the availability of other forms of computers: laptops (or notebooks) are some of them. To produce good results, these devices need to support good pedagogical practices.

The overall picture is improving: most countries have experienced a rise in the percentage of students with access to computers at school. At the OECD level, the increase has been of an order of 17 percentage points. On average, countries have seen a positive or negative change of a magnitude of 18 percentage points. The corresponding effect size is around 0.4 which is not negligible at all. The levels achieved ranged from 92% in Denmark to 27% in Japan in 2015.

Box 1.4. **Example of innovation in school infrastructure: Availability of laptops or notebooks in schools** *(cont.)*

Percentage of students with access to portable laptops or notebooks for use at school, as reported by the students



***= change significant at the 0.01 level; **= change significant at the 0.05 level; *= change significant at 0.1 level
Source: Authors' calculations based on PISA 2009 and 2015 (Vincent-Lancrin et al., 2017).

Of the countries surveyed, only Portugal and Japan saw a fall, of 12 and 5 percentage points respectively. This is in sharp contrast to New Zealand and Sweden, both of which recorded an increase of 42 percentage points, followed closely by Finland at 38 percentage points, between 2009 and 2015.

Source: Vincent-Lancrin et al. (2017), "Measuring Innovation in Education: Towards a 2018 edition".

Complex learning and innovation ecosystems

Rethinking systems

With the focus on learning systems and innovation, many conventional frameworks for conceptualising change are inadequate by themselves. One conventional assumption is that governments set policy, which then descends in a vertical implementation line through local government, together with implementation/support agencies, through to school principals and into the classroom. "Learning" and "education" are taken as synonymous with formal schooling. Auxiliary organisations, such as education publishers, examination boards and teacher-training organisations are seen as extensions to arrangements set by governments. Such a framework of understanding has become increasingly inadequate. A perennial challenge for policy is that it is notoriously impotent at changing behaviour in teaching and learning. Learning systems extend well beyond schools. Innovation means looking beyond the conventional partners and structures.

This official, top-down conception has been turned upside down and stretched sideways by a number of factors including the penetration of digital technologies and the extent of global connection, the entry of new learning providers, the interest of employers in the outcomes of schooling and the expertise in learning in other sectors (e.g. in the creative

sector), and the extent of networking. We need models that embrace the horizontal as well as the vertical, the non-formal as well as the formal, the unsponsored collaboration as well as the regulated. It is not about neglecting schools and their organising systems but rather integrating them into more comprehensive concepts and systems.

All this entails that we should be thinking of learning ecosystems – interdependent combinations of different species of providers and organisations playing different roles, in differing relationships with learners over time and in varying proportions. This also means that there is not one system but many, not a "system level" but a complex series of interlocking systems. And change is about much more than policy, if policy is seen as directed change from the education authorities: this is only one of many sources of transformation.

Governing complex systems

In order to grasp system-level innovation in education, we need to have a better sense of its complexity. Traditional approaches, which often focus on questions of top-down versus bottom-up initiatives or levels of decentralisation, are too narrow to effectively address the rapidly evolving and sprawling ecosystems that are modern educational systems (Snyder, 2013). Recent OECD/CERI work in the Governing Complex Education Systems project (Box 1.5) has advanced our understanding of the complexity in contemporary education systems (Burns and Köster, 2016; Burns, Köster and Fuster, 2016). Education systems definitely qualify as complex: they are not explained by the properties of their components, but rather by the interaction between the various components; non-linearity and feedback loops are critically important features; the system operates on multiple timescales and multiple levels simultaneously.

Box 1.5. **The Governing Complex Education Systems (GCES) project**

Launched in 2011, the OECD/CERI Governing Complex Education Systems project had the following three goals:

- Establish the state of research and evidence on governance of education systems and use of knowledge, and contribute to the knowledge base in the field.
- Explore current practices in OECD member countries through a series of thematic workshops, working papers and case studies.

Build an international network of policy makers and researchers with expertise in this area.

To this end, the project organised a series of thematic conferences to build an international network and bring together relevant stakeholders from policy, research and practice. It produced a range of working papers exploring the conceptual issues around modern governance challenges. A series of case studies from Flanders (Belgium), Germany, the Netherlands, Norway, Poland and Sweden provided an empirical investigation of key issues in multilevel education governance.

The project's work culminated in two volumes: *Governing Education in a Complex World* (Burns and Köster, 2016), which provides an analytical overview and exploration of key themes through invited chapters by leading international researchers and the OECD Secretariat, and *Education Governance in Action: Lessons from Case Studies* (Burns, Köster and Fuster, 2016), which compares and integrates the findings of the six case studies carried out over the course of the GCES project.

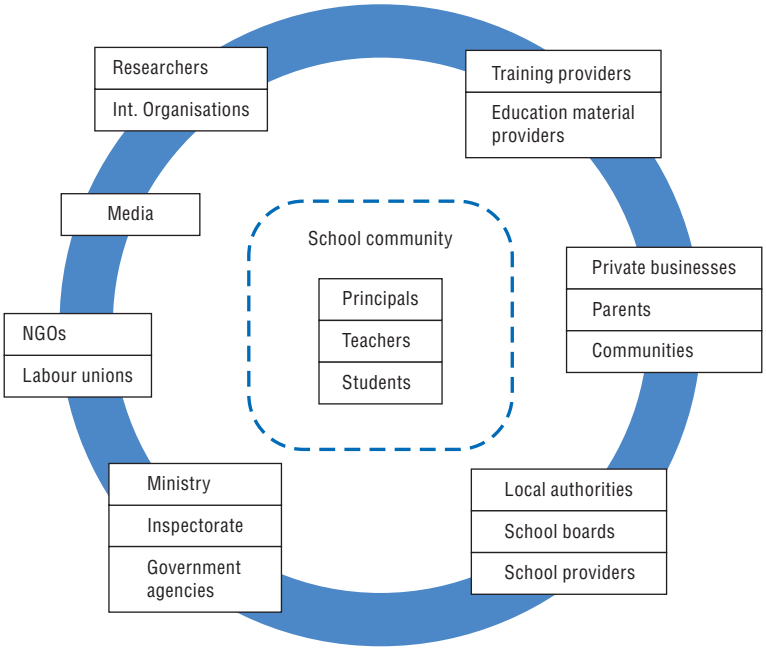
More information on GCES, including a full list of papers and conferences, can be found at www.oecd.org/edu/ceri/gces.htm.

Source: Burns, Köster and Fuster (2016), *Education Governance in Action: Lessons from Case Studies*, http://dx.doi.org/10.1787/9789264262829-en.

Education systems are complex in at least the following dimensions:

- They are multilevel systems (local, regional, national, international) and aligning these levels is a major challenge, particularly in those most decentralised.
- Reflecting our societies, they are increasingly diverse – both in demographic terms (of students, teachers and communities) as well as the values and identities we ascribe to ourselves and expect our education systems to deliver.
- They contain a growing number of stakeholders (see Figure 1.2) who are increasingly vocal about their wants and desires, not only for themselves and their children, but for the systems as a whole.
- Education is a field in which we hold strong *a priori* beliefs, strongly tied both to our identities and our experiences. Not only do we expect education to deliver the kinds of citizens we desire, everyone has taken part in education in some form or another. In doing so they have often formed strong personal opinions about what works and what does not, and these opinions may not be aligned with research findings.

Figure 1.2. **Potential stakeholders in education**



Source: Burns and Köster (2016), *Governing Education in a Complex World*, http://dx.doi.org/10.1787/9789264255364-en.

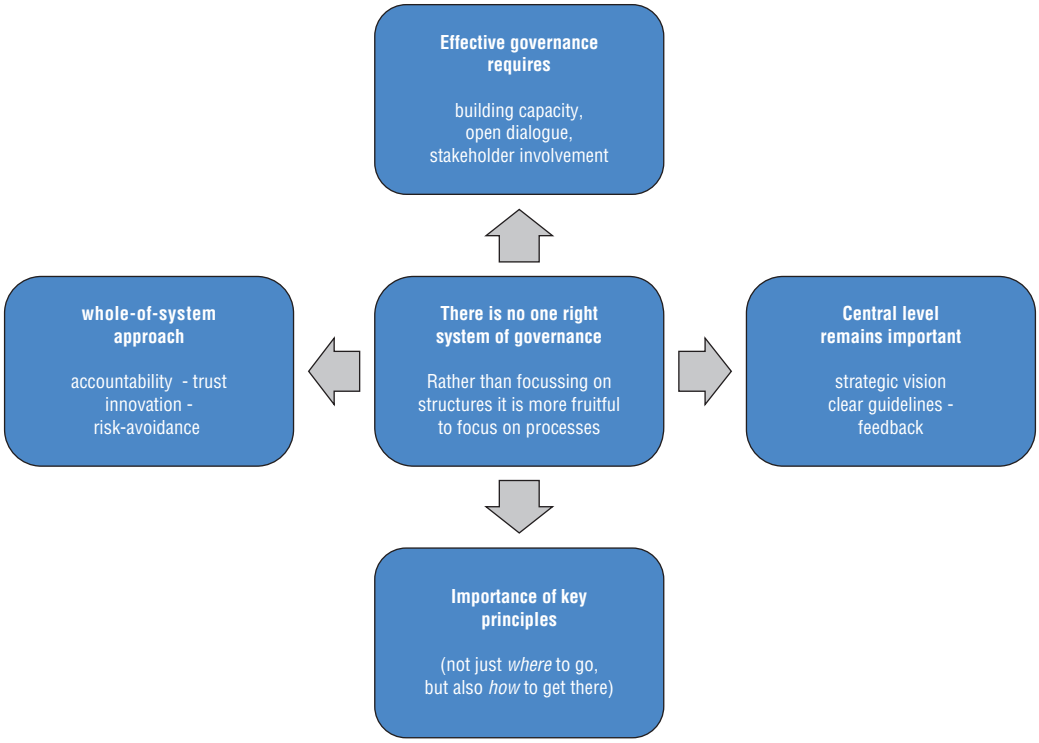
Understanding complexity in education systems has important implications for governing education, including steering innovation, change and reform. Five key principles, resulting from the OECD/CERI work on Governing Complex Education Systems, have to be taken into account (see Figure 1.3):

1. **There is no one right system of governance**. Almost all governance structures can be successful in education under the right conditions. Successful systems range from fully centralised to almost completely decentralised; some delegate great autonomy to lower levels, in others the central level holds the key to crucial decisions. The number of levels, and the power at each level, is not what makes or breaks a good system. Rather, it is the strength of the alignment, the involvement of actors, and the processes involved in

governance and reform. While structures take up a lot of space in the discussion about successful governance, it is more fruitful to focus on processes.

2. **A whole-of-system approach is essential**. Education systems must resolve tensions between potentially conflicting forces such as accountability and trust, innovation and risk avoidance, and consensus building and making difficult choices. Finding the right balance (or, perhaps more accurately, the right combination of mutually reinforcing dynamics, for example designed to strengthen both accountability and trust), will depend on the context and history of the system, as well as the ambitions and expectations for its future. A whole-of-system approach also works to align roles and responsibilities across the system, improving efficiency as well as reducing potential overlaps or conflict.
3. **Effective governance works through building capacity, open dialogue and stakeholder involvement**. However it is not rudderless: involvement of a broader range of stakeholders only works when there is a strategic vision and set of processes to harness their ideas and input.
4. Even in decentralised systems, the **national or state level remains very important for triggering and steering education reform**. The central level most often provides the system-wide vision needed to enable effective delivery of reform as well as equitable access and outcomes for students. It can also be instrumental in developing clear guidelines and goals, and providing feedback on the progress on those goals, the building blocks of any successful governance and reform process.

Figure 1.3. **Principles of governing complex education systems**



Source: Burns and Köster (2016), *Governing Education in a Complex World*, http://dx.doi.org/10.1787/9789264255364-en.

5. There is a need to develop **key principles for system governance**: not just agreement on where to go, but how to get there. The key principles must be built on whole-of-system thinking and work to align the different actors and levels. Examples of goals include

reducing the drop-out rate and improving student attainment. Examples of key principles underlying the governance and decision making used to achieve those goals would be having a system that is open, inclusive, positive and informed by the evidence.

Whole-of-system approach to innovation

It is clear that the design of innovation in educations requires a whole-of-system approach, which takes into account the complexity of the system and the interdependence of the constituent actors, components and forces. According to this approach, innovation is not a linear process performed within a single organisation, but a process involving a network of actors. Successful innovation requires, in addition to bright ideas, a system of innovation that involves a combination of activities and many inter-related actors who generate and use knowledge and information (OECD, 2009).

Michael Fullan (2009, 2010, 2011) and Ben Levin (2012), inspired by successful educational reform in Ontario (Canada), have conceptualised whole-of-system reform in education, conveying the message that reform and innovation need to be comprehensive, coherent and cohesive, taking into account all levels and actors. According to Levin (2012), an effective, system-wide change strategy requires the following elements:

1. a small number of ambitious yet achievable and well-grounded goals, publicly stated
2. a positive stance on improving all schools and success for all students
3. an emphasis on capacity building and a focus on results
4. multi-level engagement with strong leadership and a "guiding coalition"
5. continuous learning through innovation and effective use of research and data
6. a focus on key strategies while also managing other interests and issues
7. effective use of resources
8. a strong implementation effort to support the change process.

In a recent paper based on extensive historical research into successful and less successful educational reforms in the United States, Cohen and Mehta (2017) formulated some key conditions for success of system-wide reform and innovation. Contrary to many views, they conclude that there have been many system-wide reforms in the history of education in the United States, even ones that differed fundamentally from the mainstream. While it is true that the "grammar" of schooling has remained quite similar over time, what happens within that grammar has changed quite significantly. Yet, more daring and radical pedagogical innovations have been difficult to realise across the system and have only happened within "niches" or subsystems. Some reforms that failed in the mainstream succeeded in niches and continued to influence the system from within those niches through dynamic interaction between the system and the niches. According to the authors at least five characteristics are responsible for the success of educational reforms (see Box 1.6).

Ecosystems of learning and innovation

The preceding analysis of innovation in terms of systems, niches, relationships between reforms and their environment, and the internal and external conditions for success suggests an ecological approach to innovation. Increased awareness of the complexity of education systems, their multilevel characteristics, and the evolving number and relevance of stakeholders has also modified the perception of schools and, more broadly, learning environments in general. Instead of being seen as settings secluded in space and time, schools are now increasingly seen as open systems, horizontally connected to their environments and vertically engaged

in complex arrangements of trust, policy dialogue and various mechanisms of accountability. Schools are knots and hubs in networks of interactions with various actors and stakeholders in their environments. And schools are by no means passive recipients of external pressures and forces, but are actively engaging in interactions with actors in the local economy and community.

Box 1.6. **Characteristics of successful educational reforms**

"Our analysis suggests that there are at least five characteristics of successful educational reforms. First, some offered solutions to problems that the people who worked in or around education knew that they had and wanted to solve; they met felt needs for the people who would implement them. Second, some offered solutions that illuminated a real problem that educators had not been aware of or could not figure out how to solve, but they embraced the reform once they saw or believed that it would help; these reforms illuminated a problem of practice and offered a solution. Third, some reforms succeeded because they satisfied demands that arose from the political, economic, or social circumstances of schooling; these reforms worked because there was strong popular pressure on and/or in educational organisations or governments to accomplish some educational purpose. Fourth, in each of these cases, reforms also either offered the educational tools, materials, and practical guidance educators needed to put the reform into practice, or they helped educators to capitalise on existing tools, materials, and guidance. Less difficult reforms required less capacity building while more ambitious reforms required more. Fifth, in a locally controlled and democratically governed system of schooling successful reforms have been roughly consistent with the values of the educators, parents, and students they affected, though this worked differently in system-wide than niche versions."

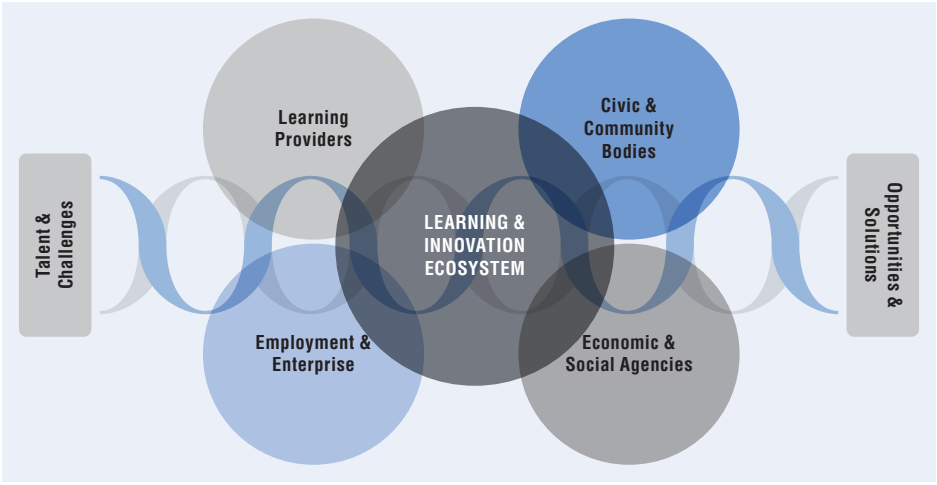
Source: Cohen and Mehta (2017), "Why reform sometimes succeeds: Understanding the conditions that produce reforms that last", http://journals.sagepub.com/doi/abs/10.3102/0002831217700078.

Environmental thinking about schools has obviously been informed and influenced by ecological approaches to human and social development. Bronfenbrenner (1979) developed the concept of a human ecological system where he proposed that human development (particularly child development) has been influenced by factors operating at different "systems levels" within a broad ecological structure, in which each level exerts reciprocal influences on the others (Hodgson and Spours, 2015, 2016). His seminal work developed into a more comprehensive and widely applicable theory of ecological development of social systems that has been inspirational in a number of fields including education. In this ecological approach, schools and learning environments are conceptualised through their relationships with their environment, not as simply defined by local government, but by the organic activities of the various social partners. These activities include the activities of learners, the decisions of teachers and education professionals in the organisation of education provision, and the way networks of employers and wider social partners interact with schools, teachers and learners (Hogdson and Spours, 2016). In the same vein Buchanan, Anderson and Power (2017) discuss skill ecosystems as a concept putting skills development in context. Skills are developed and put to use in particular economic, social and administrative environments. Skills policies thus benefit from seeing skills in a broader framework of interaction.

Similarly, George Siemens (2003) described a learning ecology as an open system, dynamic and interdependent, diverse, structured but partially self-organising, adaptive, and fragile. Figure 1.4 schematises the roles that learning and innovation ecosystems can play in the local context to turn talents and challenges into opportunities and solutions through the engagement and interaction between learning providers in educational institutions and other settings, employers and enterprises, economic and social agencies, and various civic and community

bodies. An important characteristic of learning and innovation ecosystems is that of shared value: each partner makes a specific contribution to talent development and innovation, creating defined benefits for the community and for itself (Stevenson and Edwards, 2015). This schema is particularly helpful in thinking about the role of schools in learning and innovation ecosystems.

Figure 1.4. **Learning and innovation ecosystem**



Source: Stevenson and Boxall (2015), *Communities of Talent: Universities in Local Learning and Innovation Ecosystems*, www.paconsulting.com/insights/how-can-local-learning-partnerships-overcome-our-national-skills-deficit/.

The local and regional dimension of learning and innovation ecosystems

Local and regional levels matter for innovation

In principle, ecosystems for learning and innovation are not bound by geography, especially in an age in which digital communication has facilitated networking and interaction across greater geographical distance. But there is a growing understanding that the local and the regional dimension of innovation matters. This has been acknowledged for innovation policies in general (OECD, 2011). Three trends seem to contribute to the growing role of regions. First, the paradigm shift in regional development policies favours strategies based on the mobilisation of regional assets for growth, bringing innovation to the core of regional development agendas. Diversity across regions and their increased political autonomy have opened up new possibilities for developing regional innovation. Second, there is a growing recognition of the regional dimension in national innovation strategies in harnessing localised assets and improving the impact of policies. The increased relevance of networks and connectivity for innovation also reinforces the importance of regional innovation systems.

A third trend can be added to this: an increased recognition of the costs and losses associated with relentless globalisation. While globalisation undoubtedly has contributed to better living standards in many parts of the world, and has fostered the exchange of ideas, research findings and innovative potential, especially in research and innovation, the naïve expectation that open trade would favour everyone has been refuted. In many OECD countries it has contributed to a stagnation or decline of living standards in some places and increasing levels of inequality.

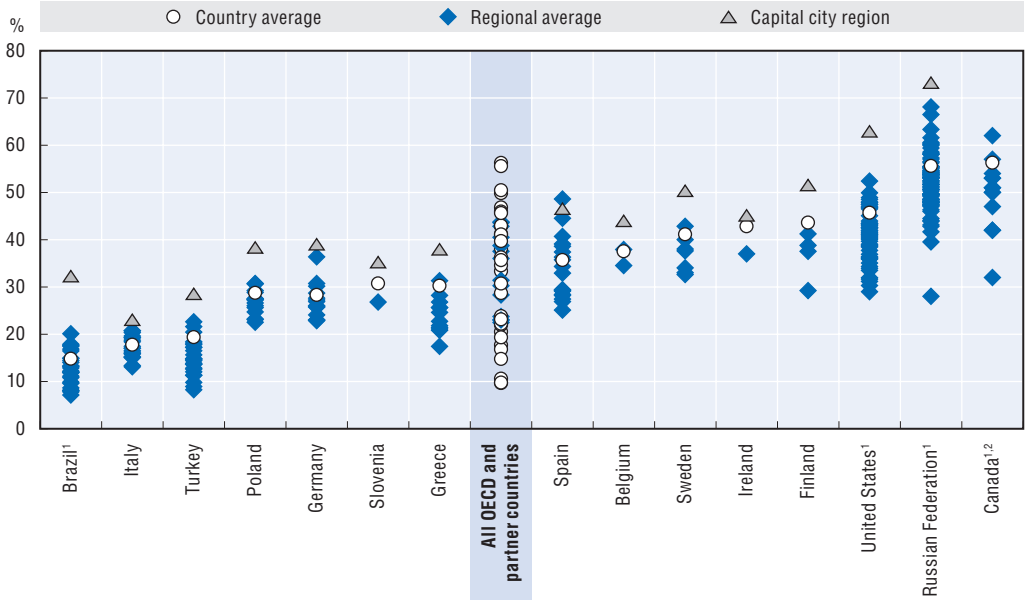
As a consequence, regions – and increasingly also cities – are now seen as a very important level for developing innovation, not only through and with the traditional innovation instruments of science, research and technology, but also through education, skills and learning ecosystems. An ecosystem approach at local and regional level, focusing on education and skills, addressing

skills shortages and mismatches, involving all education and learning providers together with economic and social partners, can be a powerful tool for revitalising local communities.

Human capital, regional development and innovation

The significance of the regional level is best illustrated by looking at some indicators of human capital and economic development at the regional level. *Education at a Glance 2017* (OECD, 2017) published an interesting overview of regional variation in tertiary educational attainment levels in a number of countries (Figure 1.5). The variation around the national average is considerable and it is interesting to see that the attainment levels in the capital city region, where most of the policy makers live and the education ministry is located, deviate significantly from the country average and most of the other regions. These findings underpin the argument that regions need appropriate education and skills policies and that learning and innovation ecosystems should be seen as local and regional.

Figure 1.5. **Regional differences in educational attainment: Percentage of 25-64 year-olds with tertiary education, by subnational regions (2016)**



Note: The country average is the weighted average of the regions for 25-64 year-olds. "All OECD and partner countries" refers to the country averages shown in OECD (2017), TableA1.1.

1. Year of reference 2015.

2. The province of Ontario has been presented as a regular region because the capital Ottawa is a comparatively small urban centre in the province of Ontario.

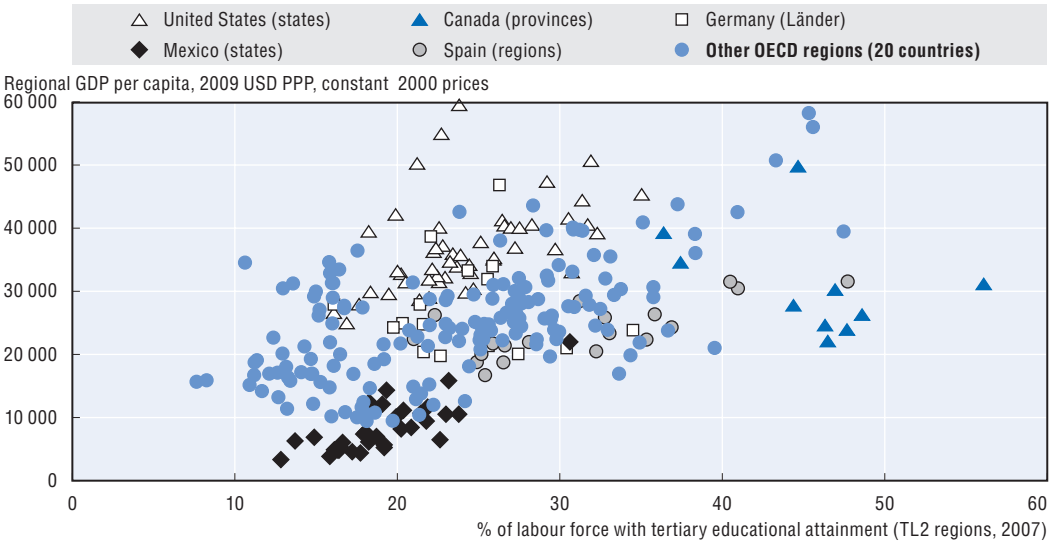
Countries are ranked in asscending order of the percentage of 25-64 year-olds with tertiary education (country average).

Source: OECD (2017), *Education at a Glance 2017: OECD Indicators*, http://dx.doi.org/10.1787/eag-2017-en.

StatLink http://dx.doi.org/10.1787/888933556995

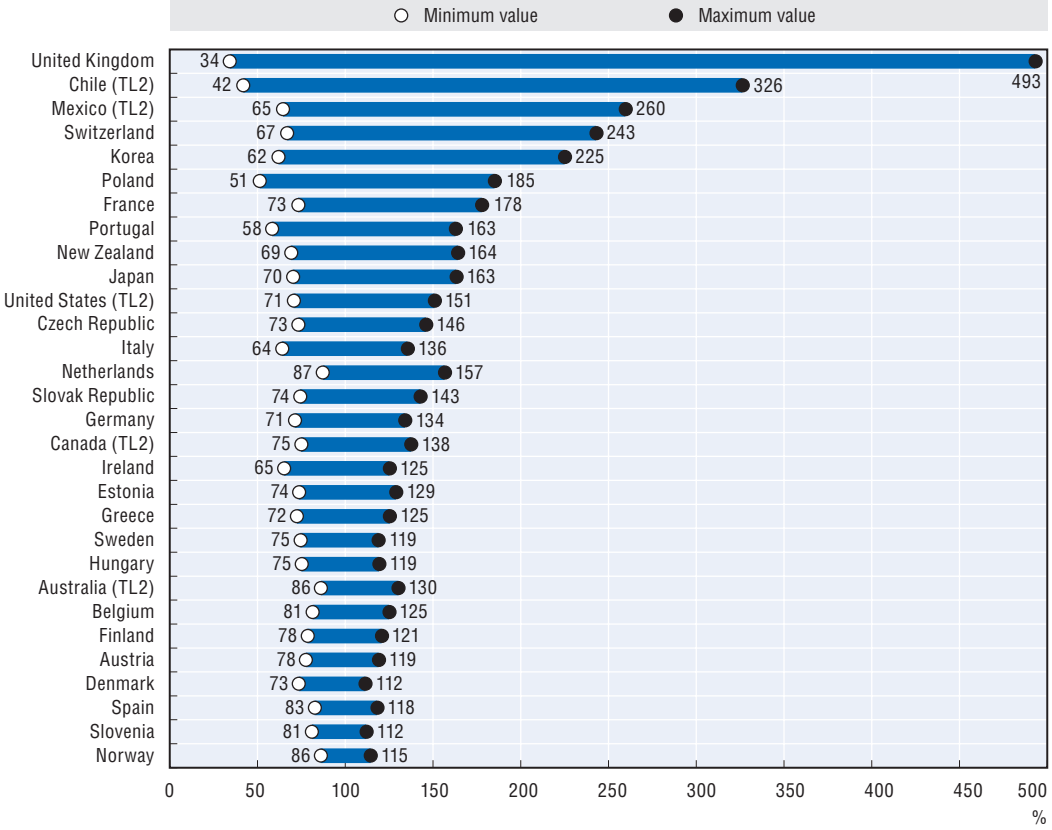
As a consequence, regions display different levels of productivity and different levels of economic performance. As Figure 1.6 demonstrates, the economic output of a region, as measured by GDP per capita, is associated with tertiary educational attainment. The inter-regional differences in labour productivity in 2010, as measured by GDP per worker, partly explain these different growth patterns. For example, in Norway (the country with the least disparities), the inter-regional range is between 86% and 115% of the national average. Inter-regional variations in productivity are much higher in the United Kingdom, Chile, Mexico, Switzerland, Korea and Poland (Figure 1.7) where the GDP per worker in the leading region was more than twice the national average (OECD, 2014b).

Figure 1.6. **GDP per capita and tertiary educational attainment in regions**



Source: OECD (2011), *Regions and Innovation Policy, OECD Reviews of Regional Innovation*, http://dx.doi.org/10.1787/9789264097803-en Figure 1.4.

Figure 1.7. **Differences in regional productivity levels. GDP per worker as a % of national average, 2010**



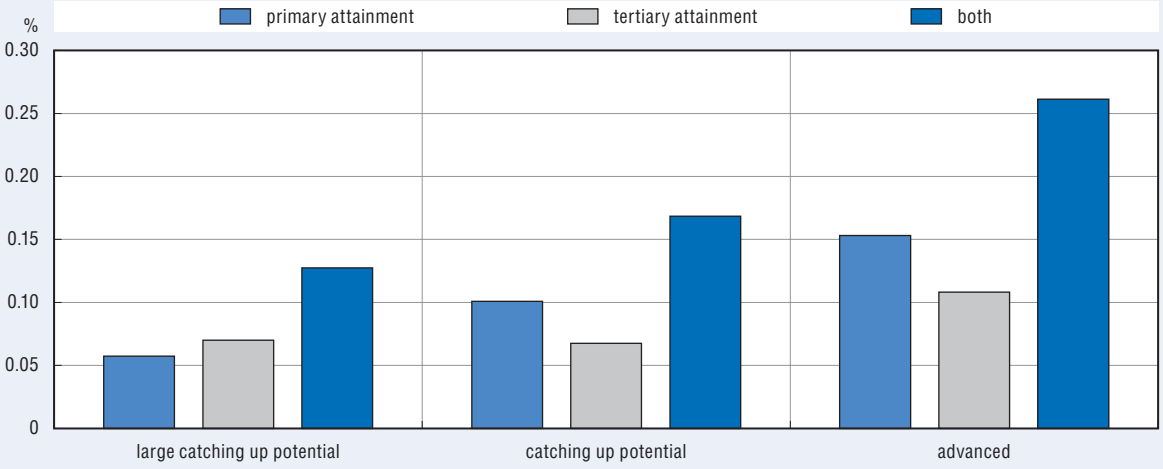
Source: OECD (2014b), *OECD Regional Outlook 2014: Regions and Cities: Where Policies and People Meet*, http://dx.doi.org/10.1787/9789264201415-en.

StatLink http://dx.doi.org/10.1787/888933106420

Despite the variation across all types of regions, labour productivity is key, fostering growth in successful regions but also acting as a bottleneck in less successful regions. Because human capital is important for productivity, it too is a core growth driver, but it is the share of low-skilled workers that appears to matter most (Box 1.7). Many policies focus on attracting high-skilled workers to a region and increasing tertiary education rates. However, a high share of workers with no more than a primary education generally acts as a drag on growth that exceeds the potential boost associated with a higher share of workers with a college education. As the low-skilled are often less mobile, locally tailored solutions may help improve their employment opportunities and individual well-being, as well as removing one of the bottlenecks to regional growth more generally.

Box 1.7. **Impact of human capital on growth in regions**

The OECD Promoting Growth in All Regions work included an analysis of the impact on regional GDP per capita growth when human capital stock in the regions is increased by 10%. This was simulated by increasing and decreasing the stock of high and low-skilled workers – measured by primary and tertiary attainment rates – in the labour force by 10%. The results, reflected in the figure below, suggest that a 10% improvement in primary and tertiary attainment could increase annual per capita growth rates on average in advanced regions by one-quarter (0.26) of a percentage point; in CUP regions by 0.17 percentage points and in LCUP regions by 0.13 percentage points.



Source: OECD (2014b), *OECD Regional Outlook 2014: Regions and Cities: Where Policies and People Meet*, http://dx.doi.org/10.1787/9789264201415-en.
StatLink http://dx.doi.org/10.1787/888933106439.

It is no surprise then that indicators of human capital correlate highly with overall innovation and economic performance. In the EU, the Regional Innovation Scoreboard 2017 found that regions that are innovation leaders have a score of 132 for the indicator on tertiary-educated populations, strong innovators score 98, moderate innovators score 83 and modest innovators score 87. For the indicator on lifelong learning, regions that are innovation leaders score 163, whereas the scores are 129 for strong innovators, 78 for moderate innovators and 30 for modest innovators (European Commission, 2017). At a regional level, human capital and skills clearly make a difference to economic performance and innovation.

Recent OECD work on innovation has increasingly focused on the regional level (OECD, 2011, 2014b). In line with the general approach of the OECD Innovation Strategy (see Box 1.8),

which has expanded its focus from pure research and technology development support towards innovation-related activities, regional innovation analysis is now looking at opening the black box of regional innovation. What are the underlying factors determining spatial knowledge agglomeration (Luc Soete, in OECD, 2011)? Even in an age of globalisation and digital communication technologies, proximity (see Box 1.9) seems to play a role in the complex learning and innovation ecosystems in which knowledge is created and circulated. Education, learning and skills systems play a pivotal role in determining regional strengths and weaknesses for innovation and the nature of relationships and networks. Educational institutions and other learning environments, including but not confined to universities, colleges and vocational training institutions, produce human capital and skills, but can also be the settings where collaboration and exchange of knowledge and other intangible assets can happen and where the benefits of various forms of proximity can be reaped. That is how they can create the learning and innovation ecosystems needed for regional innovation.

Box 1.8. **Selected key findings from the OECD Innovation Strategy**

The OECD Innovation Strategy capitalises on the experience in measuring innovation in OECD member countries and highlights a series of key issues for improving existing metrics:

- **Intangible assets**: innovation results from a range of complementary assets beyond research and development (R&D), such as software, human capital and new organisational structures. Investment in these intangible assets is rising and overtaking investment in physical capital (machinery and equipment) in countries such as Finland, Sweden and the United States.
- **Innovation goes beyond R&D**: innovation embraces a range of complementary assets that go beyond R&D, such as software, human capital and new organisational structures. Firms may introduce new products on the market without engaging in R&D. For example, in Australia and Norway the propensity to introduce new-to-market product innovation is similar whether or not firms perform R&D.
- **Mixed modes of innovation**: firm-level innovation data reveal complementary strategies. Terms such as "technological" or "non-technological" innovation are simplifications and to some extent misleading. Most innovative firms introduce both product and process innovations, as well as marketing or organisational innovations. This is true for firms in both manufacturing and services. There are, of course, differences by sector and firm size. For instance, a larger share of firms in services than in manufacturing introduce only marketing or organisational innovation.
- **Collaboration and networks are essential**: firms that collaborate on innovation spend more on innovation than those that do not. This suggests that collaboration is likely to be undertaken to extend the scope of a project or to complement firms' competences more than to save on costs. In most countries, collaboration with foreign partners is at least as important as domestic co-operation. Collaboration is used in innovation processes whether firms perform a lot of R&D, a little R&D or no R&D at all. In this respect, policies that stimulate collaboration and network initiatives will have an impact on the entire spectrum of innovative firms. Increasing collaboration is also observed in the sciences. Production of scientific knowledge is increasingly shifting from individuals to groups, from single to multiple institutions and from national to international arenas.
- **Convergence of scientific fields and multidisciplinary/interdisciplinary research**: using "science maps", there is evidence that innovations are increasingly achieved through the convergence of scientific fields and technologies. For example, nanoscience research has arisen from the interaction of physics and chemistry and is interdisciplinary in character. Environmental research is one example of multidisciplinary research. This requires creating spaces for interaction and cross-fertilisation of different knowledge domains.

Source: OECD (2011), *Regions and Innovation Policy* , http://dx.doi.org/10.1787/9789264097803-en.

Box 1.9. **What is meant by the term "proximity" for innovation collaboration?**

Geographical proximity is only one of several kinds of proximity that can be relevant for collaboration in innovation. Boschma (2005) has identified five forms of proximity:

- **Cognitive proximity**: Actors need cognitive proximity in terms of a shared knowledge base in order to communicate, understand, absorb and process new information successfully. Too little cognitive distance means a lack of sources of novelty. It increases the risk of lock-in or undesirable spill-overs to competitors. Too much cognitive distance hampers communication and leads to misunderstanding and limited potentials for interactive learning.
- **Organisational proximity**: A certain degree of organisational proximity is needed to control uncertainty and opportunism in knowledge creation within and between organisations. Too little organisational proximity goes along with a lack of control, increasing the danger of opportunism. Too much organisational proximity may be detrimental to interactive learning due to lock-in and a lack of flexibility.
- **Social proximity**: Social proximity may stimulate interactive learning due to trust and commitment. Too little social proximity may be harmful for interactive learning and innovation due to a lack of trust and commitment. Too much social proximity may also be detrimental to interactive learning due to lock-in and an underestimated risk of opportunism.
- **Institutional proximity**: Institutional proximity is an enabling factor, providing stable conditions for interactive learning to take place effectively. Too much institutional proximity is unfavourable for new ideas and innovations due to institutional lock-in (obstructing awareness of new possibilities) and inertia (impeding the required institutional readjustments). Too little institutional proximity is detrimental to collective action and innovation due to weak formal institutions and a lack of social cohesion and common values.
- **Geographic proximity**: This is the spatial or physical distance between economic actors, both in its absolute and relative meaning. Short distances literally bring people together, favour information contacts and facilitate the exchange of tacit knowledge. The larger the distance between agents, the less the intensity of these positive externalities, and the more difficult it becomes to transfer tacit knowledge. This may even be true for the use of, and spread of, codified knowledge. There can also be disadvantages to too much geographic proximity as it can lead to lock-in.

Source: OECD (2013), *Regions and Innovation: Collaborating across Borders*, http://dx.doi.org/10.1787/9789264205307-en.

Learning cities and regions

Some years ago, the terms "learning cities" and "learning regions" were coined and the United Nations Educational, Scientific and Cultural Organization (UNESCO) and others have undertaken initiatives to promote them, in order to draw attention to the potential of learning in local and regional development and innovation. OECD/CERI work (OECD, 2001b, 2002; Larsen, 1999) on learning cities, drawing on a number of case studies, has delineated the relationships between processes of individual and organisational learning and other forms of economic activity that provide the basis for sustainable economic growth.

There is no single definition of a learning city or region, though the concept draws on theories about innovation and systems that promote innovation. What learning cities and regions have in common is an explicit commitment to placing innovation and learning at the centre of development. All seek to sustain economic activity through various combinations of lifelong learning, innovation and creative uses of information and communication technologies.

The term "learning" in "learning cities" covers both individual and institutional learning. Individual learning refers to the acquisition of knowledge, skills and understanding by individual people, whether formally or informally. It often refers to lifelong learning,

not just initial schooling and training. By learning, individuals benefit through improved wages and employment opportunities, while society benefits by having a more flexible and technologically up-to-date workforce.

However, lifelong learning is only part of what is needed to build a learning city or region. Being able to deal with a global and international economy is important too. That means other strategies are required to make regions competitive. The challenge is to link individual learning to a wider environment in which institutions also are aware of the need to innovate and learn, and are capable of doing so. Networking and partnerships are key ingredients, since collective learning and robustness depend on a continuous exchange and flow of information about products, processes and work organisation. The links usually happen between organisations which have long-standing relationships based on stability and trust, but also between towns, cities and regions themselves.

The changes occurring in the shift from an industrial economic base to a knowledge-based one form a pattern. A study of places identifying themselves as learning cities or learning regions turns up several common elements. The first is that they have a clear, sustained commitment on the part of all partners – whether public authorities, private enterprises, education and research institutions, civic organisations or key individuals – to place learning and knowledge dissemination at the centre of development. In fact, the sense of common purpose, identity and trust between the various actors act as a driving force in cultivating shared values and networks within the city. This can be described as social capital and it is vital to making learning cities work.

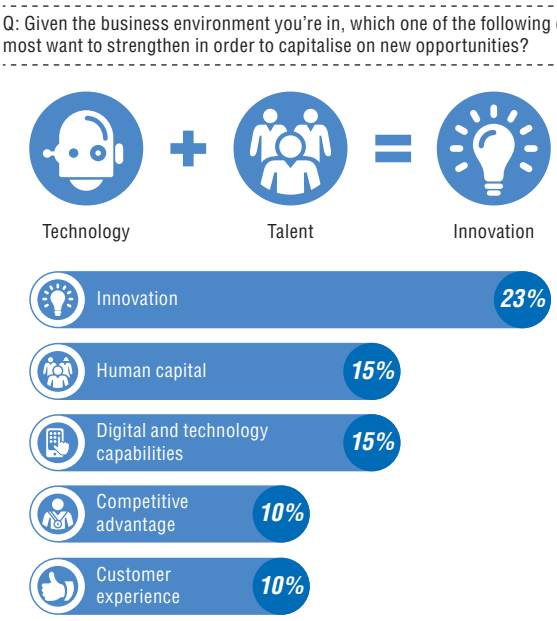
Another common feature of learning cities is their determination to create globally competitive, knowledge-intensive industrial and service activities and to base their work on the local capacity for learning, innovation and change. Lifelong learning lies at the heart of their formal and informal training at all ages and levels, as do the objectives of social cohesiveness and sustainability, which are central parts of the development of any learning city or region. Despite certain common features, case studies show that each city or region has put together its own particular mix. Like any good recipe, both the quantities and ingredients have been adapted to suit what is available locally. They have taken their different socio-economic circumstances into account, reflecting the specificity of history, culture and circumstance. What are some of the different strategies and how has each city or region built its own model of development and change? Cutting-edge information and communication technologies may be important, but the ability to internalise learning strategies that promote innovation, interaction and exchange across all sectors of society are even more so. In each case, the goal is to be competitive in a global marketplace through learning and innovation and to tool up for the new century.

The voice of the industry on innovation in education is key

A recent global survey of chief executive officers (CEOs) by PwC on what keeps them awake at night showed that they are prioritising innovation, human capital and digital technologies as prime areas for capitalising on new opportunities (see Figure 1.8; PwC, 2017). They see that globalisation, digitalisation and other developments are rapidly changing the demand for skills, but they also experience how hard it is to find those skills that cannot yet be performed by machines (see Figure 1.9; PwC, 2017). Despite digital technologies CEOs still need people. Only 16% planned to cut their company's headcount over the next 12 months – and only one-quarter of those say it is primarily because of technology. Conversely, 52% plan to hire more employees, although there are significant differences depending on how confident CEOs feel

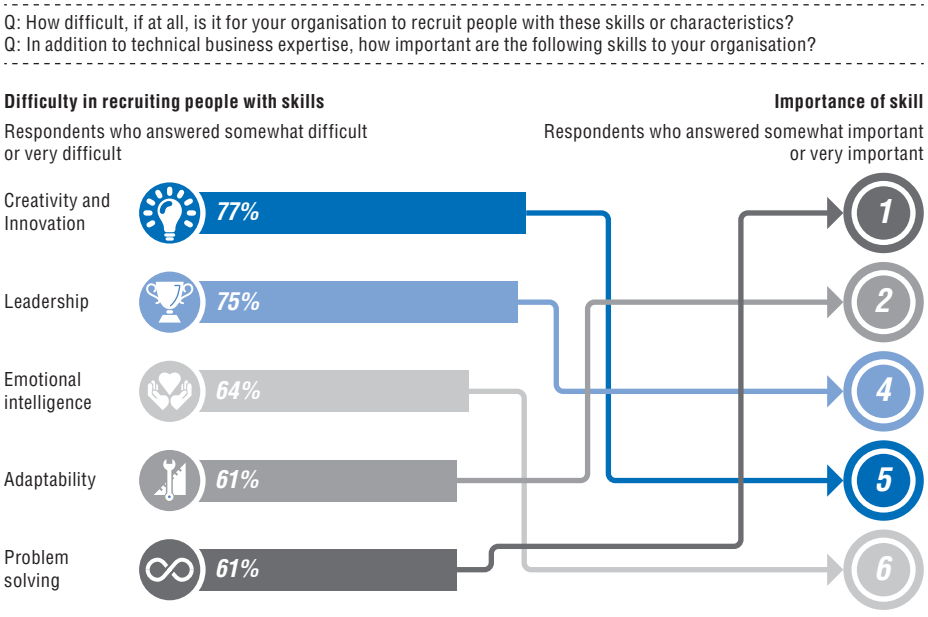
about their company's growth prospects. Clearly, CEOs see the value of marrying technology with uniquely human capabilities. The skills they consider most important are those that cannot be replicated by machines. In fact, they are precisely the qualities required to stimulate innovation – the area CEOs most want to strengthen to capitalise on new opportunities.

Figure 1.8. **CEOs' focus on innovation, human capital and digitalisation**



Source: PwC (2017), *20th Global CEO Survey*, www.pwc.com/gx/en/ceo-agenda/ceosurvey/2017/gx.html.

Figure 1.9. **The hardest skills to find are those that cannot be performed by machines**



Source: PwC (2017), *20th Global CEO Survey*, www.pwc.com/gx/en/ceo-agenda/ceosurvey/2017/gx.html.

Some jobs will vanish. Others will remain, but their nature will change. Computers far outstrip humans when it comes to analysing vast quantities of raw data, for example. But they lack the intuition, empathy and creativity required to make sense of that data. The intersection between man and machine can generate more value for business than either alone. It can also make many jobs more interesting and more purposeful.

The challenge is getting to that point: 77% of CEOs are concerned that key skills shortages could impair their company's growth. And they say it is the soft skills they value most that are hardest to find. Creative, innovative leaders with emotional intelligence are in very short supply. If anything, indeed, they are even thinner on the ground than they were in 2008, when PWC asked a similar question, whereas people with technological skills are more plentiful than before.

Such statements are very important and need to be taken seriously by the educational community. They express a sense of urgency on the need for system-wide reform of education and skills systems. The educational community traditionally has a rather hostile stance towards employers and the business and industry community at large, suspecting them of narrow economic views, neglect for the broader humanistic and non-economic goals of education, and outright selfish interests. Misperceptions also go the other way round, with employers losing trust in the capacity of schools and education systems to foster skills relevant to the labour market and to adopt a vision for education and learning adapted to the challenges and opportunities of the 21st century world. Therefore, it is critically important that any vision on innovating education includes the voices of employers and business and establishes a platform for both parties to enter the dialogue.

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Chapter 2

Innovative schools

This chapter looks at the characteristics of innovative schools. Drawing on the findings of the Innovative Learning Environment (ILE) project, it uses case studies to illustrate how schools can innovate by regrouping the four elements of the pedagogical core: learners (who?), educators (with whom?), content (what?) and resources (with what?) to rethink how traditional schools work. It then considers schools as learning organisations themselves: how they can become formative organisations with strong learning leadership, constantly informed by evidence. Finally, it discusses how technology has the potential to enhance innovation in schools by improving engagement and motivation and support student-driven learning and inquiry, interaction and collaboration, and considers the evidence for improved outcomes from investment in information and communications technology (ICT) in schools.

Introduction

Schools can only play their role in the local and regional ecosystem if they are themselves open to innovation. Indeed, schools have a great potential for innovation. Yet, to many observers schools are still bulwarks of outdated practices, limiting their capacity to develop the skills of tomorrow. The OECD 2008 Teaching and Learning International Survey (TALIS) found that two-thirds of the teachers surveyed considered the school where they work to be essentially an environment hostile to innovation. Yet, measures used to estimate change and innovation in schools, both at the micro-level of classroom practices and the mid-level of school organisation, point to significant levels of change (OECD, 2014). Recent CERI research into innovative learning environments has unveiled an impressive universe of innovative schools in systems around the world. Around the world, many schools are becoming serious about innovation. What can we learn from them? How can we foster new ways of learning, how can we more effectively build communities of collaborative learning? How can we encourage educators and learners to build a collaborative culture of learning?

While innovation in schools should happen at the micro-level and cannot be forced upon them "from above", ministers, policy makers and leaders more generally can play an important role in sparking innovation in schools. For example, they can provide a compelling vision of the future; set ambitious goals that force innovation; provide opportunities for autonomy, choice and competition; empower agents of change; tolerate risk taking; and reward success. Innovation only happens within a strong context of knowledge creation and diffusion, and, hence, also requires external partners in schools' networks to foster the knowledge dynamics and the collective learning. Schools need partners to embrace innovation.

This chapter looks at the characteristics of innovative schools, offering pointers to how innovation can be achieved in schools. Next, it investigates schools as learning organisations. Finally, it discusses the role of technology in innovation in schools.

Innovating learning environments

The Innovative Learning Environments project

OECD's Centre for Educational Research and Innovation (CERI) ran the Innovative Learning Environments (ILE) project from 2008 to 2017. Part of that work consisted of an in-depth study of some 40 powerful learning environments that have taken the innovation journey, published in 2013 (OECD, 2013a). The project used the broader concept of "learning environments", rather than "schools" or "classrooms" in order not to confine the analysis to particular institutionalised settings and to focus on the essence of what an ecosystem of learning is supposed to do.

Prior work on the learning sciences (Dumont et al., 2010) led to seven learning principles that define "21st century effectiveness" and together function as an analytical framework for examining innovative learning environments (see Box 2.1).

Box 2.1. **The learning principles of the Innovative Learning Environments project**

1. 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.
2. The learning environment is founded on the social nature of learning and actively encourages well-organised co-operative learning.
3. The learning professionals within the learning environment are highly attuned to the learners' motivations and the key role of emotions in achievement.
4. The learning environment is acutely sensitive to the individual differences among the learners in it, including their prior knowledge.
5. The learning environment devises programmes that demand hard work and challenge from all without excessive overload.
6. 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.
7. The learning environment strongly promotes "horizontal connectedness" across areas of knowledge and subjects as well as to the community and the wider world.

Source: OECD (2017), *The OECD Handbook for Innovative Learning Environments*, http://dx.doi.org/10.1787/9789264277274-en, based on Dumont et al., 2010 and OECD, 2013a.

The ILE project added three more dimensions to the framework, optimising the conditions for putting the seven principles into practice:

1. Innovate the "pedagogical core" of the learning environment, whether the core elements (learners, educators, content and learning resources) or the dynamics which connect them (pedagogy and formative evaluation, use of time and the organisation of educators and learners), or combinations of both.
2. Become "formative organisations" with strong learning leadership constantly informed by evidence about the learning achieved through different strategies and innovations.
3. Open up to partnerships by working with families and communities, higher education, cultural institutions, media, businesses and especially other schools and learning environments, in ways that directly shape the pedagogical core and the learning leadership.

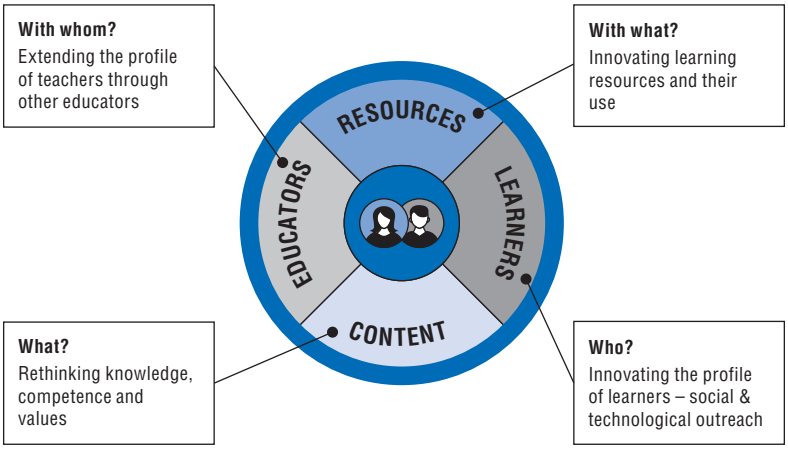
In the next section we explore the first element, innovating the pedagogical core. The section that follows will discuss the second dimension, of becoming formative organisations. The third and fourth chapters of this report focus on the third dimension, partnership. This chapter and the chapters that follow use case studies (in indented block text) drawn from OECD (2013a).

Innovating the pedagogical core

Four main elements comprise the pedagogical core in our framework: learners (who?), educators (with whom?), content (what?) and resources (with what?). To rethink and then innovate these core elements – each individually and especially all four together – is to change the heart of any learning environment (see Figure 2.1).

Innovating using the pedagogical core at the heart of schools and learning environments means transforming organisational relationships and dynamics to make them relevant for the 21st century. In many cases, this means rethinking the kinds of organisational patterns that are the backbone of most schools today: the lone teacher; the classroom separated from other classrooms, each with its own teacher; the familiar class schedule and bureaucratic units; and the traditional approaches to teaching and classroom organisation. This is not to suggest that all schools across OECD countries strictly follow this pattern; many no longer fit this profile at all. The case studies described below have systematically rethought many of these practices and have created new learning environments by regrouping teachers, regrouping learners, rescheduling learning, and/or changing pedagogical approaches and the mix of those approaches.

Figure 2.1. **Innovating the elements of the pedagogical core**



Source: OECD (2017), *The OECD Handbook for Innovative Learning Environments*, http://dx.doi.org/10.1787/9789264277274-en.

Regrouping educators and teachers

The case studies highlight three main reasons for abandoning the conventional one-teacher-per-group-of-learners format. First, teachers benefit from collaborative planning, working together and shared professional development strategies (i.e. teamwork as an organisational norm). Second, team teaching allows for a wider variety of teaching options. Third, teamwork can benefit certain groups of learners who might otherwise not get the attention they need when only one teacher is in charge.

In some of the cases, collaboration might be described as part of the general culture of the learning organisation:

> *Teaching teams are cross-curricular and complementary at Lakes South Morang P-9 School (Victoria, Australia), with team members planning and teaching together, as well as coaching one another. To support this, a collaborative data-storage system is available for sharing documentation, assessments, etc. Experienced team teachers also engage in coaching other teachers on various teaching approaches that cater to different learning styles.*
>
> *Lobdeburgschule, Jena (Thuringia, Germany): Twenty years ago, teachers introduced teamwork as a structural element. Organisational and pedagogical themes, as well as learning and working practices, are discussed in the teams. In the early 1990s, they established the "morning circle", when all students gather to discuss different aspects of school life.*

Teachers in the Quality Learning Center and Enquiry Zone, Mordialloc College (Victoria, Australia) used to "teach to the text", according to the assistant principal, within single, closed-door classrooms. This has changed. Now teachers open up their classrooms and work in teams to model and share good practice – not only with their colleagues, but also with students and the broader community.

Collaborative planning, orchestration and professional development

The collaborative process of team teaching encourages informal reflection and feedback. When teachers work together regularly, collaboration becomes a tool for recording, learning and sharing good practice. This is very much in line with the development of professional learning communities for teachers, which collaboratively analyse pedagogy and lesson content in order to continually refine practice.

Professional learning is a priority in the Community Learning Campus (CLC), Olds High School (Alberta, Canada). Much of the professional learning is embedded in daily activities, such as team teaching, curriculum building (multidisciplinary teams of teachers working collaboratively to design an integrated, multidisciplinary programme of study), collaborative lesson planning and team meetings. Teachers also attend professional learning days scheduled by the school or the district.

An important aspect in CEIP, Andalucía (Spain) is the collaborative work of both teachers and students. Adults in the school (teachers, families and volunteers) are organised into working groups, commissions, meetings, the Teachers' Assembly, etc. This teamwork culture is also present inside the classroom, where several adults often work together in the same class.

At Jenaplan-Schule, Jena (Thuringia, Germany), teachers collaborate in regular meetings, such as team conferences with teachers from all classes/grades. In the weekly team meetings, teachers discuss important topics for the forthcoming week and develop the subject matter, materials and methods to be used.

Regrouping teachers to introduce different mixes of learning and pedagogy

Several of the case studies refer to team teaching, which allows for different approaches by two or more educators working together with a large group of learners. It is worth noting that, in education, small is not always preferable to large. Large groups of students may sometimes be taught together in lecture mode, and then broken down into smaller groups for other styles of teaching.

Instead of deploying one teacher in a 30-student classroom, in certain subjects the Cramlington Learning Village (United Kingdom) features 2 teachers for a 60-student class. This adds flexibility to the class schedule and allows teachers to split students into groups in any way that suits their needs, such as for parallel or differentiated instruction. It also allows them to run cross-disciplinary sessions, such as an enquiry facilitated by a science and a media teacher. The result is that teachers across many disciplines can build flexibility at no extra cost. 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 CEIP (Spain), the entire class of students is regularly divided into groups of four or five. The lesson comprises activities that each last 15 or 20 minutes, and are accompanied by a teacher or another 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 at every lesson. Each group carries out a different activity, but the general subject matter of all activities is the same.

Team teaching is used in almost all lessons at Europäische Volksschule Dr. Leopold Zechner (Vienna, Austria). Many of these teachers speak the same language as the immigrant students in the classes.

Team teaching to target specific groups of learners

Specific groups of learners who might not get the attention they need in large classes often benefit from team teaching.

Having two teachers in the classroom in Europaschule (Linz, Austria) allows for a more personal level of attention. For example, one teacher concentrates on the subject matter and explains tasks, while the special needs teacher primarily focuses on social issues, supports group-building processes and attends to those who need special attention.

Similarly, in the Hauptschule (St. Marein bei Graz, Austria), students are taught in mixed-age 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.

Three to five teachers work with Dobbantó (Springboard) students (Hungary) on an ongoing basis; two of them are present together in the classroom 40% of the time. Generally, there are three teachers working with the group in the humanities, natural sciences and a vocational field, respectively, with at least one of the three having experience in teaching students with special education needs.

Instead of taking low-achieving students out of the classroom in CEIP (Spain), another teacher joins the class during the two hours each day when flexible groups are organised. As a result, there is less misconduct in classes and low-achievers have improved their academic performance.

Enhanced visibility

When teachers work together in teams, they all learn from each other's techniques and practices because they can finally see those practices (enhanced visibility); they are no longer hidden behind a closed classroom door. The visibility is enhanced even further when this becomes organisation-wide rather than just individual collaborating colleagues. While this practice might be unnerving to teachers at first, it is inherent in the nature of innovation to disrupt established habits before the innovation is integrated and becomes accepted in organisational practice.

Teachers at the John Monash Science School (Victoria, Australia) identified the benefits of "knowing what others are doing", and therefore learning from one another, as well as "having a stronger sense of what the students are learning" and the ways in which richer connections could be made between different areas of learning. This was a new way of working for teachers, traditionally used to closed-off private areas and personal desks.

The Distance Learning Classroom in Lok Sin Tong Leung Wong Wai Fong Memorial School (Hong Kong-China) gives students the opportunity to learn from their counterparts in different schools, and enables teachers to observe lessons and exchange information with their peers who are not physically "on site". The Smart Classroom is an advanced technological classroom that allows teachers to use a wide variety of media in their teaching. It also serves as a live link with other partner schools.

Regrouping learners

One of the most common ways in which the innovative learning environments discussed here regroup learners is by mixing older and younger learners together. When a school is very small, such mixing is inevitable.

Grouping together learners of different ages

There is a variety of reasons offered by the case-study schools for grouping together learners of different ages: as a stimulus to learning, as a way of encouraging diversity and contacts that would otherwise be unlikely to develop, to enable peer teaching, and as a way of reducing bullying and fostering good social relations.

In the Danish Lisbjerg School, there are two large groups composed of students whose ages span three years (6-9 year-olds and 10-13 year-olds). The students are also organised into smaller groups of 12, which are also mixed in terms of age. Teaching is differentiated and alternates between working within the bigger and the smaller groups. Every student follows an individualised learning path (called "the child's storyline"), and documents work in different portfolios.

In the Community of Learners Network (British Columbia, Canada), teachers work within the walls of the traditional school structures to create innovative approaches to teaching and learning. For example, in elementary (K-7) classrooms, where students are placed in cohorts based on age, teachers collaborate across grades. They have shifted the physical structures and the learning structures to enhance collaboration among students of different ages, and they have shifted the power structures to include students as key resources in the education of their peers – and their teachers.

In the Presteheia (Kristianssand, Norway), learner groups vary in age and size but tend to be between 33 and 54 students. Time in the large mixed groups is used to build relationships among children who would otherwise not socialise. This reduces the incidence of bullying at school and increases feelings of security and confidence. It also makes it easier for students to find someone with whom they can have a trusting relation because they can choose among more students. Teachers and other staff are deployed flexibly.

Some of the case studies are very small schools with mixed-grade classes. They intentionally use the heterogeneity of their students as the basis for an individualised education, to encourage integration and autonomous learning.

Gesamtschule Schupberg (Boll, Switzerland) is a small school with a multigrade classroom composed of students of varying cognitive and physical abilities. The school emphasises 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.

All 20 students, from grades 1 to 9, in the One-Room School, Gesamtschule Lindental (Boll, Switzerland) are placed in one mixed-age class. Although students are assigned to a certain grade, learning activities are adapted to their current level of development, allowing for gifted students to be challenged and for weaker students to develop greater self-confidence as learners.

At the Lycée Ermesinde in Luxembourg, students of every course are divided into two groups: students imparting and students requiring knowledge. The former are in charge of documenting the issue, designing exercises and organising activities and assisting the teacher, commenting and assessing the lesson. The latter are expected to critically engage in the classroom discussions and demand efficiency, assiduousness and empathy from the "experts". Motivation and emulation follow from this alternation of roles. As a result, main and secondary subjects no longer have any validity as every subject has the potential to becoming a main subject for specific students.

Smaller groups within the larger groups

Several of the innovation sites operate with a "house" system that offers a more manageable organisational unit and stimulates more "family-oriented" engagement among students.

Subscribing to the principle that learning is a social endeavour, the Community Learning Campus (CLC), Olds High School (Alberta, Canada) is both physically and programmatically organised into four learning communities, called "quads". The quads provide a range of learning settings for a wide variety of groupings and configurations of students. The quads are each named according to a colour: Red, Green, Blue and Gold. The Red Quad is composed of grade 9 students. It is the only quad that contains a single grade. The other three quads include a mix of grade 10, 11 and 12 students. Students remain in the same quad, with the same group of teachers, throughout their three years in high school.

A key part of the collaborative environment in the Australian Science and Mathematics School (South Australia, Australia) is the Tutor Group Programme. Each student is a member of the same multiyear group for the duration of his or her time at the school. The Tutor Group meets daily for 40 minutes. A key role of the Tutor Group is to "ensure that students feel a sense of belonging within the school" and to "provide care and guidance through strong student-teacher relationships".

At Colegio Karol Cardenal de Cracovia (Santiago, Chile), the unit is not the "house" or "family" or "quad", but the "ministry", as in a national or regional government. In each ministry there is a student minister, counsellor teacher, parent minister, chiefs of communal departments, mayor of the class and deputy secretary. The "president" is elected during political campaigns that involve voting boxes and election monitors. The student who wins the largest share of votes becomes president of the school government, and the student who wins the next highest number votes becomes the secretary-general to the president.

Co-operative learning is a prominent feature in many of the innovative sites. In some cases, it is more formalised through the establishment of learner groups that are considerably smaller than the houses or tutor groups described above.

In the case of a school in Hong Kong-China, there is a deliberate strategy of mixing abilities in small working groups.

Lok Sin Tong Leung Wong Wai Fong Memorial School (Hong Kong-China) has restructured all classes in primary grades 1-6, dividing students into small groups, normally of around 3 or 4 pupils. These heterogeneous groups are formed according to students' academic performance. Each group is made up of both more able and less able students. The heterogeneity of the groups enhances co-operative learning in which students work together to maximise their own and each other's learning.

Mevo'ot HaNegev Kibbutz Shoval (Israel) operates with a project-based pedagogy, with projects taking place around a specific problem or question that can be theoretical, practical or both. The learners divide into workgroups of 3-4 students each, and then examine a topic or a sub-topic from the wider subject.

Rescheduling learning: Innovating how time is used

Schedules structure the school day, week or cycle; the school timetable provides a central organising tool in schools the world over. Many educators still see time primarily in quantitative terms, i.e. as something one has more or less of, with the effectiveness of teaching directly related to it. But with innovative ways of using time, time is regarded in more qualitative terms.

Timetables, flexibility and time use

The distribution and planning of activities over time is a familiar part of school life. A number of the innovative learning environments described here have moved in the direction of organising learning into fewer, longer periods, partly for greater flexibility, but particularly in order to enhance the opportunities for deeper learning.

Mevo`ot HaNegev Kibbutz Shoval (Israel) has a shorter school week (5 days) and longer lessons (60 minutes) than is customary in Israel, to allow students to engage more deeply in their lessons. The number of subjects covered per week was reduced from 8 to 4 or 5; the relationship between teachers and learners has become more personal; learning has been oriented towards understanding; studying has become more individual and autonomous; and teachers mentor and support the learners.

Every day except Wednesday at John Monash Science School (Victoria, Australia) begins with a 15-minute tutorial group meeting. The timetable of the school operates on a 4-period day, and a 10-day cycle. Each period is 75 minutes long so as to provide, as described by the principal, "opportunities for deep learning".

The timetable at the Community Learning Campus (CLC), Olds High School (Alberta, Canada) consists of five 70-minute blocks with 10 minutes between classes. One of the five blocks of time is known as Flex Period (flexible period). Students explained that they have time to eat and also enough time to work on homework or anything else they might wish to work on. They also have access to a teacher during this time.

As some of the schools in the case studies move away from the standard subject-based curriculum, it is not surprising to find that this is reflected in their timetables.

In Spanish schools, time is organised according to subjects; but in the Instituto Escuela Jacint Verdaguer the timetable is based on methodology instead. The three areas into which the curriculum is organised are reflected in students' timetables and the "learning pyramid": 25% of the time is devoted to instrumental areas, 25% to personal work and autonomy, 40% to co-operative work, and the remaining 10% to intrapersonal work.

The academic year lasts 36 weeks in Dobbantó (Springboard) (Hungary), as in any other Hungarian vocational school, but the daily and weekly schedules are quite different. Approximately 60% of study time is devoted to general education and 40% is devoted to developing work-related competencies.

Many of the cases that were studied use time more flexibly than traditional schools. Flexibility goes hand-in-hand with individualised learning plans and with education philosophies that aim to make schooling less bureaucratic.

The Europaschule (Austria) has no school bell, since many believe the sound interrupts learning. Teachers start and end their lessons or break a double period when they consider it appropriate.

Instead of the 45-minute rhythm and subject-oriented instruction normally found in the German school system, an open, adaptive form of instruction is applied in the Jenaplan-Schule, Jena (Thuringia, Germany). Individual students have enough flexibility in their schedules and free time to work and learn at their own pace during the day, and to pursue their other interests, apply their creativity and develop their social skills. The goal is to have students understand themselves as active and independent learners who can enjoy the fruits of their efforts.

Some of the innovative learning environments studied provide their students with the opportunity to "accelerate" their learning. There is international evidence that this leads to improved results.

At the Australian Science and Mathematics School (South Australia, Australia), year-10 students may study subjects at year-11 or year-12 level, while year-12 students have the opportunity to take first-year courses at Flinders University as part of their year-12 studies. The school responds to the learning needs of its most motivated and gifted students by allowing them to self-pace their learning and do away with the confines of the traditional school year cycle.

Rituals can help to structure the school day and make it meaningful; they create routines of reflection or planning. Several of the innovation sites studied begin and conclude the school day or week with such a special moment. For example:

In the Projektschule Impuls, Rorschach (Bern, Switzerland) the day begins with a "morning circle" when a "speakerstone" is passed around and the children can talk about their feelings or thoughts. There is a regular structure to the day. Classes start with a foreign-language session, followed by group work based on learning plans. Afterwards there is a period of absolute quietness, timed by a sandglass that runs for 25 minutes while the students remain at their place and do not speak or walk around.

The Multimedia Programme, including "The Morning Show", the CGPS Radio Show and Film-Making project, has become central to the Courtenay Gardens Primary School (Victoria, Australia). The show is run each morning by a group of senior school learners who apply to do so and undertake appropriate training. It provides the school community with information about their day ahead, transmitted throughout the school at 9.00 a.m. on the television in each classroom, in the staffroom and at the entrance to the school, from a dedicated multimedia classroom. The show follows a structured storyboard that includes an overview of news around the school, including student and staff birthdays, teachers on yard duty, weather, a "maths minute", phone-ins from classrooms, and a film made by students.

Organised learning outside regular school hours

A number of the case-study learning environments systematically structure learning and support for their learners outside regular school hours. There are many more examples than those cited below, as all of the sites using virtual e-classrooms, for instance, have removed the close connection between face-to-face contact and organised learning.

The Entre Amigos association in the Polígono Sur is responsible for organising extracurricular activities through an official tender process of the City Council of Seville. From 8 a.m., the selected organisations are in charge of the "Morning Classroom", developed to assist those whose parents go to work early in the morning, most of them at street markets. Evening extracurricular activities start at 3 p.m. and finish at 5 p.m., although CEIP (Spain) is normally open later.

The Lok Sin Tong Leung Wong Wai Fong Memorial School (Hong Kong-China) has launched a number of activities for students before, during and after school. Those who need to be at school early can join the "Reading is Fun" programme, from 7:15 a.m. through most of the following hour. Students can choose different kinds of books to read and share afterwards. In addition to lunchtime activities, students can join the Student Gardener Team to look after the plants in the school garden and in the community garden during recess. Every afternoon, students have 40 minutes of self-study to work on their homework. There is also a two-hour period at the end of the school day for tutorial classes on academic and creative subjects.

The Enrichment Programmes, Rodica Primary School (Slovenia) offers an array of artistic, research, international, linguistic and social activities that encourage creative thinking, constructivist education and diverse paths to knowledge. These complement the regular programme and are offered mostly outside of regular lesson time, in the afternoon or on Saturdays.

Widening pedagogical repertoires

Innovative learning environments also work with different pedagogical approaches to expand teaching and learning. Many focus on inquiry approaches and collaborative work, both of which are critical for preparing students for future learning and for equipping students with 21st-century skills. These sites also take full advantage of the possibilities afforded by communication technologies. What is important are the mixes of pedagogical approaches. Innovation is not about using a single new teaching method or one kind of technology; it is about employing a combination of approaches, including direct teaching, and tools.

Inquiry learning

In many of the innovative cases studied, students engage in project-based learning. They are encouraged to acquire knowledge while practising skills, like hypothesis generation, scientific inquiry, self-monitoring and (sometimes on-line) literary analysis. Some sites have shifted from subject-specific teaching towards more interdisciplinary learning that links knowledge and skills from several subject areas.

The Jenaplan-Schule, Jena (Thuringia, Germany) distinguishes among learner group instruction (music, arts, sports, handicrafts/woodworking, etc., and social studies), learner group work, and learner group projects in nature, geography/history, German and ethics/religion. In all learner groups, the project work, scheduled for 100 minutes three times a week, is the central working form.

"Problem-Based Learning" is an important part of students' work in natural sciences, social sciences and technology at Instituto Escuela Jacint Verdaguer (Spain). All such work is planned as a team and carried out either co-operatively or individually. Understanding a problem is considered to be the first step on the path to finding a solution to the problem. The organisation of learning spaces, the timetable, activities, trips and workshops are based on this methodology.

At Matthew Moss High School, Innovation Unit (England, United Kingdom), student teams work one day per week on a research project. The teachers first introduce a challenge, which can vary from launching an egg as high as possible and returning it to earth without breaking or 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 the proposal is approved by the teacher, conduct the research throughout the school year. In the process, they are free to organise their own research, while the teachers act as facilitators who present in-time lessons or suggest additional sources of knowledge.

In the Community of Learners Network (British Columbia, Canada), educators design broad inquiry questions that encompass a range of learning intentions. Background knowledge is developed through direct instruction and a series of information-gathering collaborative processes, such as research, "jigsaw", literature circles, information circles, field experiences and guest presentations. A prominent feature of this phase is a series of "circle meetings" where students' learning is co-constructed and facilitated in small groups. Reflective writing and representations of evolving understanding, using mind maps, follow the small group meetings. After this phase, the students are coached to articulate their own inquiry questions that fit within the larger inquiry question. As they pursue their individual inquiries, they often facilitate learning experiences for their classmates. Ongoing progress is supported through multilevel feedback circles that rely on self, peer and teacher support. The inquiry process is followed by a celebration of learning, called

a Learning Showcase, where families, fellow students and community members are invited to share in the learning experience. Once the inquiry circle is completed a new one begins, following the same sequencing of activities. This allows the students to become more autonomous in their learning and gradually take on more challenging inquiry projects as they progress.

Authentic learning

It is a common feature of many innovative learning environments to 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 into learning activities. Central to authentic teaching are "real-life" problems, which are interesting to students because they are more relevant, complex and challenging than simplified problems designed by educators, and because they are more closely linked to the development of 21st-century skills.

In the Centre for Studies on Design at Monterrey (CEDIM), The Atelier of Ideas, Monterrey (Nuevo León, Mexico), the college co-operates with enterprises and institutions that submit "real-world" projects that student teams complete – from brainstorming to final evaluation, with instructors acting as counsellors in this process. There are three major steps: project design – coming up with a plan to bring the project to fruition; collaborative work – working together to optimise the process and the outcomes; and evaluation – by the teacher, peers, the individual student and the external agency that came up with the project proposal.

The three-year practical building and living project at Breidablikk Lower Secondary School (Norway) involves students building houses on a 1:20 scale. Students get to play the role of builder, gardener, electrician, bank employee, real estate agent and others. To this end, the school co-operates with representatives of different businesses. Students use the same digital tools that architects use, and houses are furnished with electricity and handmade furniture. All designs must be environmentally sustainable.

Work on real-life problems often goes together with hands-on experience. At a few sites, hands-on learning involves inviting native speakers of the languages students are learning into the classroom – or through videoconferencing – for face-to-face conversations, or letting students participate in international events where they can hear and speak the languages they are studying.

Hands-on experience may also entail running a small business, such as producing and selling homemade products or working on problems posed by external customers. The students naturally gain experience in such activities as marketing, accounting and customer service, but also in organisation, co-ordination and team work.

The Mypolonga Primary School (South Australia, Australia) has a student-organised shop in which the students sell homemade products, and products commissioned from the local community, to visitors and tourists. All classes are involved in business, craft and tourism, 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, acquiring language, mathematics, art, craft and hospitality skills along the way.

Authentic learning activities often involve aspects of the students' immediate environment. These allow students to explore the world around them and learn about the cultural and historical heritage of the place where they live.

Liikkeelle! (On the Move!), Heureka, Finnish Science Centre (Finland) encourages students to examine everyday settings from the perspective of natural sciences. Activities include investigating air quality and noise levels with the guidance of the relevant experts and authorities. Students

place a measuring device near their school, work with a centre for natural-science teaching for analysis, process the data and publish results in an interactive map on an on-line learning platform. They then discuss the results with students from other schools and with a wide network of experts.

Authentic learning often involves several rounds of review and revision towards a polished result, which may be an exhibition, a stage performance or a portfolio. When students can present their work to a real audience, it becomes a source of public learning and celebration. Working towards a final performance also motivates students to achieve genuine mastery because real audiences demand coherent presentations and a high level of understanding. Presentations are also learning events in themselves: setting them up involves skills like organising group efforts and communicating effectively with an audience. Once again, the relationship with 21st-century competencies is clear.

In the CEDIM, The Atelier of Ideas, Monterrey (Nuevo León, Mexico), students present the projects they have been working on – all of which respond to real enterprise and community demands – in front of local enterprises and public and/or private institutions. By doing so, the assessment of their work becomes much more authentic and meaningful to students.

The Showcase is a celebration that completes each inquiry cycle, and has come to be seen as an essential element of the learning process (Community of Learners Network, British Columbia, Canada). Classmates, school administrators, families and community members are all invited to view the products that the students have created, and to discuss their learning experiences with them.

Europäische Volksschule Dr. Leopold Zechner (Austria) practices a special performance assessment called "commented performance portfolio" up to the third grade. Twice a year students present their achievements to parents and teachers in a detailed conversation that lasts around 30 minutes. Students present work they have done and answer teachers' questions or demonstrate learning by solving problems they feel confident they can tackle in front of their parents.

Mixes of pedagogies

The orchestration of learning within the environment is complex, involving many decisions, often taken by teachers working collaboratively or with others in the learning leadership, about when and where and with whom particular pedagogies are appropriate, and how these should be modulated over time. In all of the examples below, part of the day involves whole-group, teacher-led activities, mixed in with other types of teaching and learning.

In the Lobdeburgschule (Thuringia, Germany), a typical week for a grade-1 student starts with the Monday "morning circle" where various topics are discussed. Then, learners work on their individual plans with partners, sometimes with the help of the teacher and using a range of different worksheets and prepared materials for support ("free work"). Then, it is the "epochal projects" session, which is project based. Students work for about a week on a single theme that includes different subjects and topics of the Thuringian curriculum. At the beginning of the project, the teacher provides core information; questions about the theme are developed, and sometimes small working groups are formed. The results are presented at the end of the week. Subject-oriented lessons follow, but students are more free to direct their learning in these lessons. The school week ends with the group "final circle" on Friday afternoon.

At the Mordialloc College (Victoria, Australia), the daily expedition time (11.00 a.m.-1.00 p.m.) provides opportunities for workshops and student conferences related to the substantive curriculum content, as well as embedded aspects of literacy and numeracy. Guides also hold workshops on areas that address the specific needs of students. These are the key points of direct instruction for students and are generally held for groups of 15 or more students.

Coursework at Jenaplan-Schule, Jena (Thuringia, Germany) includes mandatory subjects, but it also demands a high degree of development and discovery by individual students.

In the Instituto Escuela Jacint Verdaguer (Spain), teachers are still regarded as the best source of information on reading, writing and arithmetic, and they perform that knowledge-transmission function for learners who would not be able to discover core concepts by themselves or in a short time.

Traditional methods of teaching can be complemented by e-classrooms for acquiring and strengthening knowledge, as well as for assessment (Internet Classroom, Kkofja Loka Primary School, Slovenia). Teachers' learning materials, prepared in advance, are collected in one place within the e-classroom where they may be used directly without downloading. Instruction via e-classroom takes place through an interactive whiteboard and portable tablets. E-classrooms allow for individual feedback after completed work or activity, with messages or a grade or a knowledge test given before progression to the next level.

Even in learning environments that have deliberately sought to move away from conventional forms of teaching and organisation, there are particular subjects for which those more conventional approaches are judged to be the most suitable even if, in these cases, teachers are always looking to encourage more active engagement among their students. The mix of pedagogies may be realised through the different media and settings used, as when e-classroom work is integrated into the larger menu of teaching and learning options. It may also stem from teachers' preferences and choices as part of the wider orchestration of learning. Again, these innovative learning environments have not simply replaced one approach or methodology with another, but rather use a wide array of approaches, all of which are aligned with the broader learning strategy.

Schools as learning organisations

The analysis of cases in the ILE project underscored the finding that a learning environment should become a "formative organisation" through strong design strategies and corresponding leadership supported by learning information richness and effective feedback channels. In other words, to become innovative, schools themselves should become "learning organisations". A growing body of scholars, educators and policy makers have argued for reconceptualising schools as learning organisations. They consider this to be the ideal type of school organisation for dealing with the changing external environment, for facilitating organisational change and innovation, and even effectiveness, i.e. improvements in the learning outcomes of students and other important outcomes. However, relatively little progress has been made in advancing the concept – either in research or practice. This lack of progress partly stems from a lack of clarity around the concept. A recent OECD paper has explored developing a common understanding of the concept of the school as learning organisation that is both solidly founded in the literature and is recognisable to all parties involved, i.e. scholars, educators, policy makers, parents and others alike (Kools and Stoll, 2016). It concluded by proposing an integrated model of a school as learning organisation.

Informed by a small network of experts and on the basis of a critical review of the research literature the paper proposed the following characteristics of the school as learning organisation in an integrated model (see Figure 2.2) in which the collective endeavour is focused on:

- developing and sharing a vision centred on the learning of all students
- creating and supporting continuous learning opportunities for all staff
- promoting team learning and collaboration among all staff
- establishing a culture of inquiry, innovation and exploration
- embedding systems for collecting and exchanging knowledge and learning
- learning with and from the external environment and larger learning system
- modelling and growing learning leadership.

Figure 2.2. **Integrated model of the school as learning organisation**

SLO dimensions	Elements
Developing a shared vision centred on the learning of *all* students	● A shared and inclusive vision aims to enhance the learning experiences and outcomes of all students. ● The vision focuses on a broad range of learning outcomes, encompasses both the present and the future, and is inspiring and motivating. ● Learning and teaching are oriented towards realising the vision. ● The vision is the outcome of a process involving all staff. ● Students, parents, the external community and other partners are invited to contribute to the school's vision.
Creating and supporting continuous professional learning for all staff	● All staff engage in continuous professional learning. ● New staff receive induction and mentoring support. ● Professional learning is focused on student learning and school goals. ● Staff are fully engaged in identifying the aims and priorities for their own professional learning. ● Professional learning challenges thinking as part of changing practice. ● Professional learning connects work-based learning and external expertise. ● Professional learning is based on assessment and feedback. ● Time and other resources are provided to support professional learning. ● The school's culture promotes and supports professional learning.
Promoting team learning and collaboration among all staff	● Staff learn how to work together as a team. ● Collaborative working and collective learning – face-to-face and through information and communications technology (ICT) – are focused and enhance learning experiences and outcomes of students and/or staff practice. ● Staff feel comfortable turning to each other for consultation and advice. ● Trust and mutual respect are core values. ● Staff reflect together on how to make their own learning more powerful. ● The school allocates time and other resources for collaborative working and collective learning.
Establishing a culture of inquiry, exploration and innovation	● Staff want and dare to experiment and innovate in their practice. ● The school supports and recognises staff for taking initiative and risks. ● Staff engage in forms of inquiry to investigate and extend their practice. ● Inquiry is used to establish and maintain a rhythm of learning, change and innovation. ● Staff have open minds towards doing things differently. ● Problems and mistakes are seen as opportunities for learning. ● Students are actively engaged in inquiry.
Embedding systems for collecting and exchanging knowledge and learning	● Systems are in place to examine progress and gaps between current and expected impact. ● Examples of practice – good and bad – are made available to all staff to analyse. ● Sources of research evidence are readily available and easily accessed. ● Structures for regular dialogue and knowledge exchange are in place. ● Staff have the capacity to analyse and use multiple sources of data for feedback, including through ICT, to inform teaching and allocate resources. ● The school development plan is evidence-informed, based on learning from self-assessment, and updated regularly. ● The school regularly evaluates its theories of action, amending and updating them as necessary. ● The school evaluates the impact of professional learning.

Figure 2.2. **Integrated model of the school as learning organisation** *(cont.)*

SLO dimensions	Elements
Learning with and from the external environment and larger system	● The school scans its external environment to respond quickly to challenges and opportunities. ● The school is an open system, welcoming approaches from potential external collaborators. ● Partnerships are based on equality of relationships and opportunities for mutual learning. ● The school collaborates with parents/guardians and the community as partners in the education process and the organisation of the school. ● Staff collaborate, learn and exchange knowledge with peers in other schools through networks and/or school-to-school collaborations. ● The school partners with higher education institutions, businesses, and/or public or non-governmental organisations in efforts to deepen and extend learning. ● ICT is widely used to facilitate communication, knowledge exchange and collaboration with the external environment.
Modelling and growing learning leadership	● School leaders model learning leadership, distribute leadership and help grow other leaders, including students. ● School leaders are proactive and creative change agents. ● School leaders develop the culture, structures and conditions to facilitate professional dialogue, collaboration and knowledge exchange. ● School leaders ensure that the organisation's actions are consistent with its vision, goals and values. ● School leaders ensure the school is characterised by a "rhythm" of learning, change and innovation. ● School leaders promote and participate in strong collaboration with other schools, parents, the community, higher education institutions and other partners. ● School leaders ensure an integrated approach to responding to students' learning and other needs.

Source: Kools and Stoll (2016), "What makes a school a learning organisation?", http://dx.doi.org/10.1787/5jlwm62b3bvh-en.

Technology in innovative learning environments

The potential of technology-supported innovation

Innovating schools is not just a matter of putting more technology into more classrooms. Engagement and motivation, student-driven learning and inquiry, interactivity and collaboration, and personalisation and flexibility, may all be enhanced with technology – but all are possible without it. Yet, technology is everywhere and we cannot imagine learning environments not harnessing the potential of digital technology in some way(s). As the previous discussion and cases have shown, technology may contribute to all the different components, relationships, partnerships and principles that define innovative learning environments. There is not one single "technology effect" but instead technology can permeate in many different ways throughout learning environments. Technology can offer a platform for inquiry-based learning, providing a collaborative working space for individual learners, groups of learners and classes or networks of learners. Technology can be the mechanism upon which inquiry-based learning is built, such as through game-based learning or on-line simulations, structuring inquiry-based learning in an engaging and relevant way.

Powerful information and communications technology can recast all of the elements of innovation. It can redefine who learners are, for instance, by bringing in excluded learners or by connecting together learners who otherwise would be totally unconnected. Technology has the power to redefine the educators – the on-line tutor or expert, for instance, or the teacher in a classroom in another school or even another country. The role of digital resources and ICT in changing content is also potentially enormous, by opening up a wide range of otherwise inaccessible knowledge, by promoting the so-called 21st century skills using the media that are commonplace for learners in their activities outside school, and enhancing equity of access. Digital resources obviously transform resources for learning, as well as the very notion of a "learning space" by activating, for instance, virtual learning environments.

Virtual settings illustrate well how technology contributes to redefining the assumption that learning has to occur in a fixed place at a fixed time with standard batches of learners. Certain teaching and learning options would not be available without a high minimum of technology. It opens up complex learning experiences via simulation or games that could not otherwise normally be used. It permits distant communication and collaboration, and brings access to educational materials and experiences of a richness that previously would not have been possible except through such means as a university library.

For the learning environment to be a formative organisation, technology can play an obvious role in organising learning data and feedback. But it may well come into play in other ways, too. Distributed learning leadership may very well depend on it for communication and collaboration, as might teacher learning using on-line materials, collaborative platforms or social media. Strategic options for learning design and redesign may be critically informed by examples available on line, including any necessary support for it to be sustained.

Technology is often integral to and supports the widening of boundaries and capacity through partnerships, through enabling communication and sharing experiences and knowledge. This is particularly obvious and significant through networking with other learning environments. Sometimes, this will depend on technology for collaboration with others at a distance, sometimes it will rely on more direct forms of face-to-face dialogue and action.

Technology has not been singled out as defining a separate "learning principle" but, far from diminishing our assessment of its importance, when well used, technology can critically enhance all the ILE principles listed in Box 2.1:

- Technology has repeatedly shown its value in engaging young learners, hence, reinforcing "learner centeredness" and the key role of emotions and motivation.
- Technology facilitates collaboration and joint learning, including through use of social media, hence underpinning the "the social nature of learning" principle.
- Individual differentiation can be greatly facilitated through, for example, more systematic tracking of individual learning paths and achievements and hence also formative assessment and feedback.
- Making connections is a defining aspect of ICT, hence opening numerous possibilities for "horizontal connectedness".

At the same time, the mere presence of technology is not by itself enough to innovate learning environments. Nor should innovation be assumed to be synonymous with going digital, as this may only reproduce traditional methods and pedagogies in a different format.

The background report for the 2016 Global Education Industry Summit reviewed in greater detail the potential of technology-supported learning and the impact of digital technology on education and learning (OECD, 2016a). In the following section, therefore, a short update will suffice on the basis of the Programme for International Student Assessment (PISA) 2015 results.

PISA 2015 data on computers in schools

Introducing computers into the classroom can be justified on several grounds, including preparing students to become full participants in today's digital public space, equipping them with the digital skills needed for the labour market and allowing teachers to explore new teaching tools (OECD, 2015). It is therefore hardly surprising that governments have invested substantial resources in computers, Internet connections, software and ICT more

generally. But this investment has not always produced obvious gains in student learning. As the PISA report, *Students, Computers and Learning: Making the Connection* (OECD, 2015b) concludes, in general, schools and education systems have not been effective in leveraging the potential of technology.

PISA 2015 asked school principals to report the number of computers available to students in the school for educational purposes, and how many of these are connected to the Internet. Across OECD countries, there are 0.77 computers per student in schools, 96% of which are connected to the Internet. There are large differences in the computer-student ratio across education systems. In Australia, Austria, Canada, the Czech Republic, Iceland, Macao (China), New Zealand, the United Kingdom and the United States, there is at least one computer available per student, and at least 95% of the computers are connected to the Internet. By contrast, in Albania, Algeria, Indonesia, Kosovo and Tunisia, schools have less than one computer for every five students, and fewer than 70% of the computers are connected to the Internet (OECD, 2016b).

On average across OECD countries, there are more computers per student available for educational purposes in socio-economically disadvantaged schools than in advantaged schools, and more in rural than in urban schools. Education systems may be compensating for the fact that disadvantaged students and students living in rural areas often have limited access to computers and the Internet at home. However, the percentage of computers connected to the Internet in socio-economically disadvantaged schools is lower than in advantaged schools, and is also lower in rural than in urban schools.

Across OECD countries, the more computers available for educational purposes per student, the lower students score in science, but only before accounting for the socio-economic profile of students and schools. Once the socio-economic profiles of students and schools have been accounted for, 7 PISA-participating countries and economies show a positive relationship between numbers of computers and science scores, and 11 show a negative one (OECD, 2016b).

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Chapter 3

Schools driving progress and well-being in local communities

With schools no longer seen as secluded spaces for learning, this chapter asks what can be learned from schools that partner with businesses, other educational services and cultural organisations, and truly engage with and contribute to their local community for the benefit of all concerned. Using case studies from the Innovative Learning Environment (ILE) project, it shows how schools can serve their communities through extracurricular and service-learning, teaching their students lifelong civic engagement, and how schools benefit from partnerships with businesses and cultural organisations. Noting the multidimensional nature of learning ecosystems, with learning taking place in families, workplaces and communities as well as schools, it considers how the barriers between formal, non-formal and informal learning can be broken down as networked learning systems evolve. Ultimately, such networks could become more than the sum of their parts, and make schools more widely accountable to their students, parents, and the community as a whole.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Introduction

In many countries schools are now increasingly seen as important spaces and hubs in the local community and regional economy. The time has long passed when schools were merely seen as secluded spaces where children and youngsters were dropped off and locked away while parents went to work. More and more schools are becoming outward looking and opening up to local communities and to the learning opportunities that the local environment provides. At the same time they are also taking on activities and roles promoting the common good and well-being in the local community. For example, schools offer extracurricular activities that enrich the life of the local community in sports, social care, voluntary work or culture. Research and development projects offer innovative answers to the needs of local enterprises and social-purpose organisations, while enhancing entrepreneurialism among students and providing real-world experiences. The concept of "service-learning", which expresses the learning value of students engaging in providing services to the local community, offers an appealing vision of the opportunities available to schools to drive progress and well-being in local communities.

In connecting to the local and regional environment, schools also engage many stakeholders to work together to improve the well-being of everyone involved. Schools not only engage parents and families in learning, but also draw on the various resources provided by local enterprises, community organisations, social services, and sports and cultural institutions such as museums, theatres or libraries. Yet, because local communities differ in wealth and cultural capital, schools do not find themselves on a level playing field. Geographical segregation can lead to unequal opportunities for schools to benefit from engaging with the local community.

Still, schools can also become critically important partners in serving the needs of local communities, especially in disadvantaged communities or through working with populations at risk of exclusion or distress. In recent refugee crises in various parts of the world, there have been inspiring examples of schools playing a socially and ethically responsible role in providing help, shelter and assistance to refugees.

Creating wider partnerships is also an outstanding feature of innovative schools. They have an urgent drive to avoid isolation and are aware that significant innovation cannot be achieved and sustained alone. They look to build and maintain the capital they need as organisations – social capital, intellectual capital and professional capital through forging alliances, partnerships and networks. They extend themselves beyond given institutional and organisational boundaries, and introduce their learners to a range of other possibilities and resources, with benefits for both the learners and the community.

When looking at innovative schools, the range of some of their partnerships is quite impressive, as shown by the following three cases (as in Chapter 2, these case studies and the ones that follow are taken from OECD, 2013):

Jenaplan-Schule (Thuringia, Germany) co-operates with diverse institutional partners in the city and region. Prominent among the partners are: Goepel Electronics, the Planwerkstatt, the Schiller

House, the Romantic House, the One-World-House, the Public Radio Channel Jena, the public cinema in the Schillerhof, Kommunal Real Estate Office of the City of Jena, the Ernst-Abbe Public Library, the University of Applied Sciences Jena, the University of Jena, the EJBW, the Protestant Adult Education Thuringia, the Philosophia e.V., the Imaginata, the Heritage Office, the City Museum Göhre, the Diskurs e.V., Grund genug e.V., the Theater House Jena and the German National Theatre in Weimar.

The starting point of Liikkeelle! (On the Move!) (Finland) was an initiative of the Finnish National Board of Education, which attracted the attention of the town of Kalajoki and the Science Center Heureka. They applied for the funding together, building on existing social networks and good practices. An important further partner has been PaikkaOppi (Location Learning), which collaborated in developing the interactive virtual map (their primary aim is to produce an interactive map for supporting the teaching of geography, geographical information systems (GIS), and environmental studies in schools). The template for the map came from National Land Survey of Finland. Other partners are the universities of Helsinki and Oulu who have helped to create new teaching methods, such as time-space-paths, and a jointly organised course for student teachers of the arts and upper secondary school students. In addition, the universities have contributed by studying Liikkeelle! and producing scientific knowledge and a survey report about the project. Commercial actors are also involved to further develop the virtual environment to accommodate the needs of teachers and learners.

A range of institutions collaborate with CEIP Andalucía, Seville (Spain) in different ways: the Cajasol Foundation (which subsidises library activities), RENFE (the Spanish railways network, which finances the travel expenses of some students to Madrid), the Universidad de Sevilla (teachers and students of the Faculty of Psychology do some hours in the school, in exchange for credits, and participate in interactive groups), and the Universidad Pablo de Olavide (scholarship holders of the Flora Tristán student residence and some teachers take part in interactive groups and in workshops, mainly on the radio).

What can we learn from schools that partner with businesses, other educational services and cultural bodies in their community, and that excel at driving business and social innovation in their communities? How can schools truly engage the local community and contribute to corporate social responsibility?

Conceptualising school/community engagement

Horizontal connectedness

As demonstrated in the Innovative Learning Environments (ILE) project, innovative schools are characterised by a high level of horizontal connectedness to their environment. In many innovative learning environments, inquiry- or problem-based learning are defined by real-world problems and carried out with real-world partners: universities and vocational training centres, the local business world, libraries, museums, theatres and sports clubs.

The early childhood development centre CENDI (Nuevo León, Mexico) is not a secluded institution withdrawn from "real life" but, on the contrary, draws significant content from the daily life of the community, its families, its neighbourhood stories, social and demographic developments, and traditions to enrich its educational programme.

The Culture Path programme (Finland) is for all elementary schools of the city and involving the community in students' learning process. Students follow one "path" for each grade level, such as the "library path" or the "music path". In so doing, 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 grade level in question.

Another kind of boundary crossed was that between participating in school activities on the one hand, and contributing to adult activities outside of school on the other. The students engaged much more seriously in measurements that were similar to those reported in the national media. For example, the students asked more insightful questions, and realised that conducting the measurements and documenting the results was surprisingly hard and messy (Liikkeelle! (On the Move!), Finland).

In the Enrichment Programmes, Rodica Primary School (Slovenia), students participate in voluntary activities such as helping nursery school teachers or helping in schools for children with special needs.

One of the unique features of the Dobbantó (Springboard) programme in Hungary is that by design the place of study is not just the classroom: there are occasions for learning outside the school that are part of the curriculum.

The Väätsa primary school took a slightly different approach by venturing on a project with regard to modern class room space solutions. Pupils from different classes and ages, architecture students, teachers, parents and entrepreneurs were collaborating on the design of the future learning environment. Two classrooms were refurbished as a result of the four-months project. In addition to product development and design competencies, young students thus also acquire entrepreneurship skills.

At the Yuille Park P-8 Community College (Victoria, Australia), the school and the community are very closely linked as part of the "Community Learning Hub", which includes education, health and facilities for all members of the community. The building is designed so that the community facilities can be accessed from within or outside the school. Having access to these is particularly important for the community, as it is one of the most disadvantaged in Victoria and many parents are unemployed.

The school library at CEIP Andalucía, Seville (Spain) supports the publication of the school newspaper, Nevipens Andalucía. "Nevipens" means "news" in Romany. The idea of the newspaper is to get students closer to the press and make them assume the role of journalists. They prepare the different sections of a newspaper: leading articles, news stories on the school and the neighbourhood, culture (with a section on children's literature), reading and library, citizenship, puzzles, dedications, etc. The newspaper helps to open communication and participation of families and other educational agents in the neighbourhood and develops linguistic communication and social citizenship skills in learners.

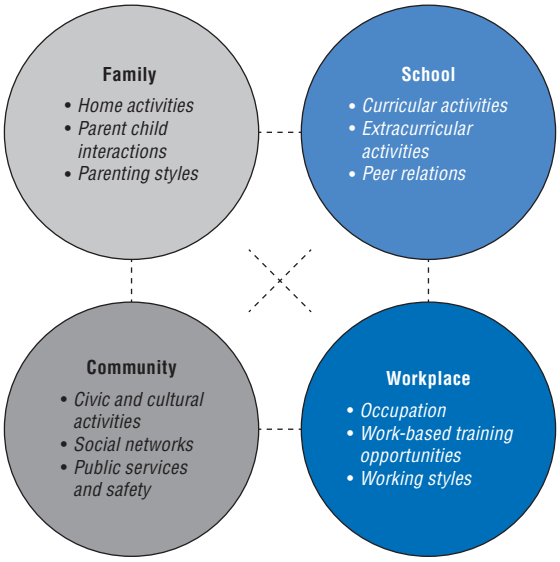
Learning ecosystems are multidimensional

The diversity of social contexts in which learning takes place points to the value of formal, non-formal and informal learning. Formal learning involves institutionalised, curriculum-based learning and teaching, such as learning which occurs within the education system, or workplace learning. Informal learning can take place within work, family or community contexts. It is not structured, and is more unintentional from the learner's perspective. This type of learning happens, for instance, when children play. Non-formal learning is situated between formal and informal learning. It is structured and intentional, but not regulated, nor is it accredited or formally supported.

Hence, learning takes place in a variety of social settings, summarised in the current framework as the school, the family, the community and the workplace. Within each type of context we can distinguish a number of specific elements, with examples presented in

Figure 3.1. Each context contributes to the development of cognitive, social and emotional skills, although their relative importance will change depending on an individual's stage in life. For instance, parents are clearly crucial during infancy and early childhood, but school and the community become increasingly important as a child enters formal education and interacts with diverse social networks. The workplace, in turn, is a key learning context, particularly during late adolescence and (early) adulthood.

Figure 3.1. **Variety of learning contexts**



Source: OECD (2015a), *Skills for Social Progress: The Power of Social and Emotional Skills*, http://dx.doi.org/10.1787/9789264226159-en.

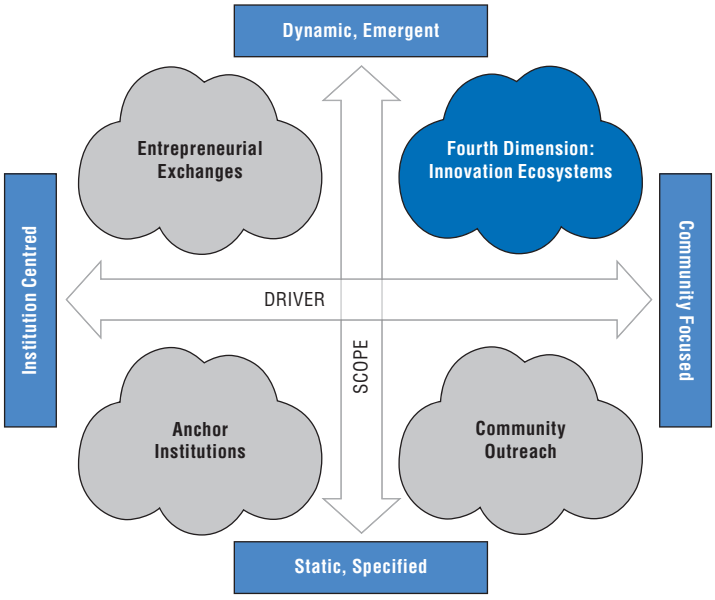
Dimensions of school/community engagement

Schools' engagement with their external communities has conventionally been categorised into three domains (Watson, 2007):

- First order engagement, reflecting schools' standing as anchor institutions in their communities, with benefits arising from "just being there".
- Second order engagement based on entrepreneurial "third stream" trading relationships with different client groups: providing educational services to students and employers, and transferring knowledge-based expertise to industry, policy makers and public services.
- Third order engagement involving schools in the life of the wider community through a variety of corporate social responsibility activities, ranging from outreach programmes with schools or community groups, to public lectures and cultural events, and opening campus facilities to public and outside users.

The diagram in Figure 3.2 illustrates schools' engagement with their external communities along two axes – from provider-centred to community-focused, and from static and specific activities to dynamic and emergent solutions. This framework captures the three domains described here, while highlighting a fourth space, of open and collaborative partnerships through which schools and stakeholder communities work together to resolve shared needs and to create collective economic and social benefits. This mode of engagement goes well beyond institution-centred interactions, and has special resonance within the movement to develop local or regional responses to economic and social challenges (Stevenson, 2015).

Figure 3.2. **Dimensions of school/community engagement**



Source: Stevenson and Boxall (2015), *Communities of Talent: Universities in Local Learning and Innovation Ecosystems*, www.paconsulting.com/insights/how-can-local-learning-partnerships-overcome-our-national-skills-deficit/.

Serving the community as learning

Extracurricular activities

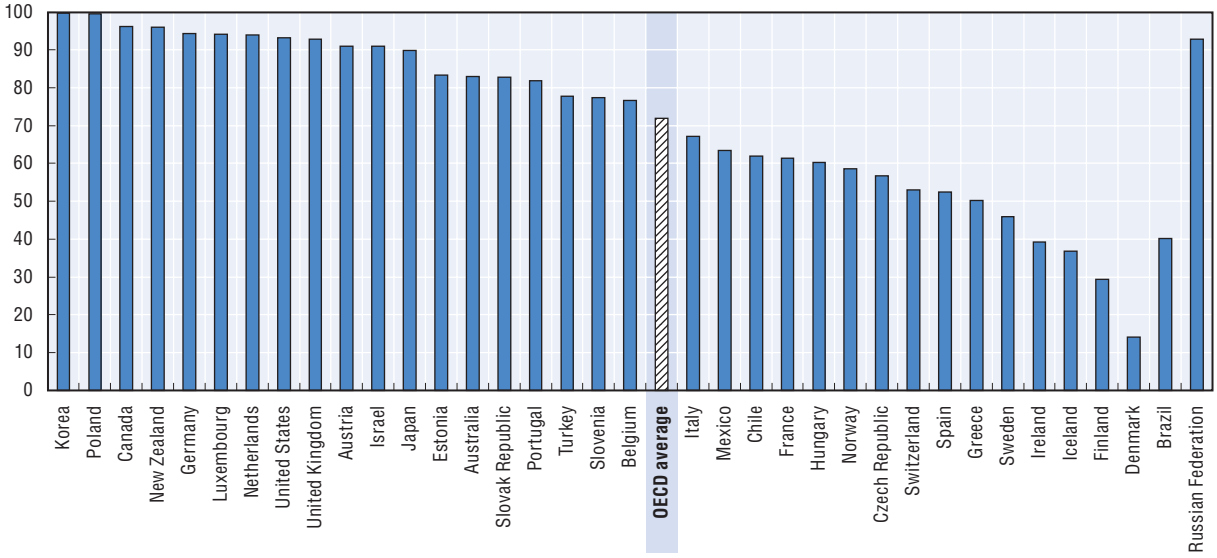
In many school systems extracurricular activities provide opportunities to students to engage in the local community and to develop social and emotional skills, including civic engagement (OECD, 2015a). Extracurricular activities refer to those activities that complement core academic content, such as sports, clubs, student government associations, volunteer work and school chores. These activities provide students with real-life situations outside the classroom with the help of adult facilitators who can act as mentors.

Extracurricular activities can be found in schools in all OECD countries and partner economies. According to the student background questionnaire of the OECD Programme for International Student Assessment (PISA) 2012, 73% of 15-year-olds across OECD countries attended schools that organised volunteering or service activities (Figure 3.3). Similarly, 90% of them reported attending schools that supported extracurricular sports activities and more than 60% were in schools that supported mathematics competitions, art and theatre clubs. The availability of these activities, however, varies greatly across countries. This may reflect cross-country differences in the amount of resources that can be allocated to support extracurricular activities, including teachers' time. It may also reflect differences in demand for such activities from parents. In some countries, certain extracurricular activities are organised by external associations.

Countries approach the organisation of extracurricular activities in schools in different ways (OECD, 2015a). In the majority of OECD countries, the organisation of extracurricular activities is not formally regulated. The implementation of these activities is often left to the discretion of local authorities or individual schools. The scope and nature of these activities therefore vary across, and within, countries. For example, local school administrations in

Luxembourg define their own objectives for extracurricular activities without being bounded by national guidelines. While all schools in Luxembourg offer extracurricular activities, the range and content of extracurricular activities are only subject to the goals defined by the local school administrations. In France, an initiative launched in 2013 called "projet éducatif territorial" (PEDT) requires municipalities to organise extracurricular (sport, cultural and artistic) activities with financial support from the state government. This initiative aims to promote existing and new extracurricular activities and allow all students equal access to culture and sport. The PEDT is driven by the local authority while involving other stakeholders in the field of education, including national government institutions, associations, and cultural and sporting institutions.

Figure 3.3. **Availability of volunteering or service-learning activities at school. Percentage of 15-year-old students who were in schools that offer volunteering or service activities (PISA, 2012)**



Source: OECD (2015a), *Skills for Social Progress: The Power of Social and Emotional Skills*, based on PISA 2012 data.

StatLink http://dx.doi.org/10.1787/888933163837

In some countries, there are formal national guidelines for extracurricular activities that specify the hours and types of activities. For example, extracurricular activities are organised as an integral part of school education in Japan. The Japanese curriculum standards (the "Courses of Study") for primary school students specifies minimum hours that schools should secure for four types of special activities: homeroom activities, student government, club activities and school events. For school events, the curriculum suggests organising specific activities such as school trips through which students can experience intensive group interactions and learn to be respectful of others. Besides these activities specified in the curriculum, most schools organise the cleaning of school facilities by students. This provides an opportunity for students to learn ways to collaborate with others and discipline themselves, while helping to maintain a clean learning environment. Korea also has similar guidelines on extracurricular activities, specifying time allocation for "creative experiential activities", including self-regulated activities, club activities, voluntary activities and career education.

Whether there are formal regulations or not, schools and local education authorities have greater autonomy to plan extracurricular activities than curricular ones. Since schools are less constrained by the physical boundaries of classrooms (and, in some cases, schools), facilitators or mentors of extracurricular activities can flexibly mobilise real-life activities and scenarios to teach life skills that typically require strong social and emotional capability. Extracurricular activities often stimulate students to actively contribute to designing their own learning experience. They can also provide opportunities for schools to strengthen linkages with the community.

School-community partnerships can also provide additional opportunities for social and emotional learning by improving children's access to extracurricular activities, and enhance their engagement in the community. Recently there has been a movement encouraging schools to actively reach out to stakeholders outside schools, including higher education, businesses and community groups, to enhance their educational programmes (OECD, 2015a).

In Denmark, a public school reform will be implemented from 2014 to enhance a school-community link that may improve extracurricular activities. With this reform, schools will be required to collaborate with the surrounding community, by involving local sports clubs, cultural centres, art and musical schools and various associations. The municipalities will also be required to commit to ensuring school-community co-operation.

In the United Kingdom, the Outward-Facing Schools programme at the Sinnott Foundation promotes schools' links with communities and parents by providing fellowships to education practitioners in secondary schools. Their initiatives include schools' active collaboration with local groups and businesses to create community work opportunities for students, such as volunteering at care homes and teaching at local primary schools.

Service-learning

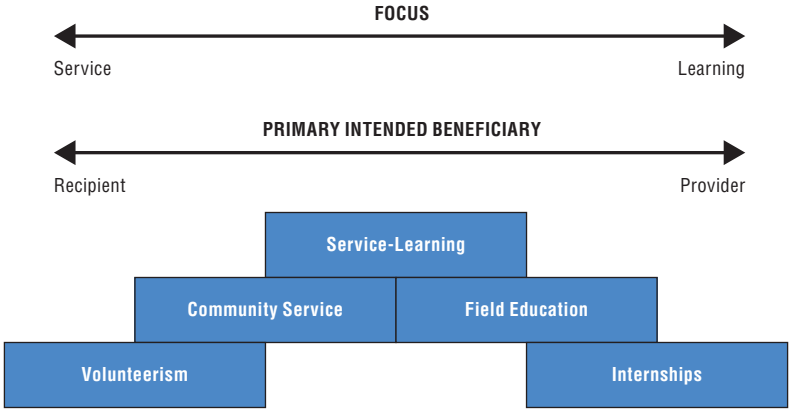
Learning based on engaging with the local community is often conceptualised as service-learning. At its most basic level, academic service-learning is an experiential learning pedagogy in which education is delivered by engaging students in community service that is integrated with the learning objectives of core academic curricula (Furco, 2010). Academic service-learning is premised on providing students with contextualised learning experiences that are based on authentic, real-time situations in their communities. Using the community as a resource for learning, the primary goal of academic service-learning is to enhance students' understanding of the broader value and utility of academic lessons within the traditional disciplines (e.g. science, mathematics, social studies, language arts and fine arts), all while engaging young people in social activities through which they derive and implement solutions to important community issues. Ideally, the community service the students perform helps them learn better how the academic concepts taught in the classroom can be applied to situations in their everyday lives. In this regard, academic service-learning seeks simultaneously to enhance students' academic achievement and their civic development.

The literature on service-learning reveals that the community service activities in which students are engaged tackle a broad range of societal issues, including those concerning the environment, health, public safety, human needs, literacy and multiculturalism. In implementing service-learning activities, students can address a societal issue either through direct service (e.g. serving food at a homeless shelter) or indirect service (e.g. producing a

research report that provides recommendations to the homeless shelter for improving its food distribution). Regardless of the type or focus of the service activity, academic service-learning is designed to help students apply their academic content knowledge to act on authentic and often complex societal issues.

Although service-learning resembles other forms of community-based learning approaches, such as internships, field studies or volunteering, it is distinguished from these programmes by placing equal emphasis on both community service and academic learning, as well as its intention to benefit both the provider and recipient of the service (see Figure 3.4).

Figure 3.4. **Service-learning situated within experiential learning**



Source: Furco (2010), "The community as a resource for learning: An analysis of academic service-learning in primary and secondary education", http://dx.doi.org/10.1787/9789264086487-en.

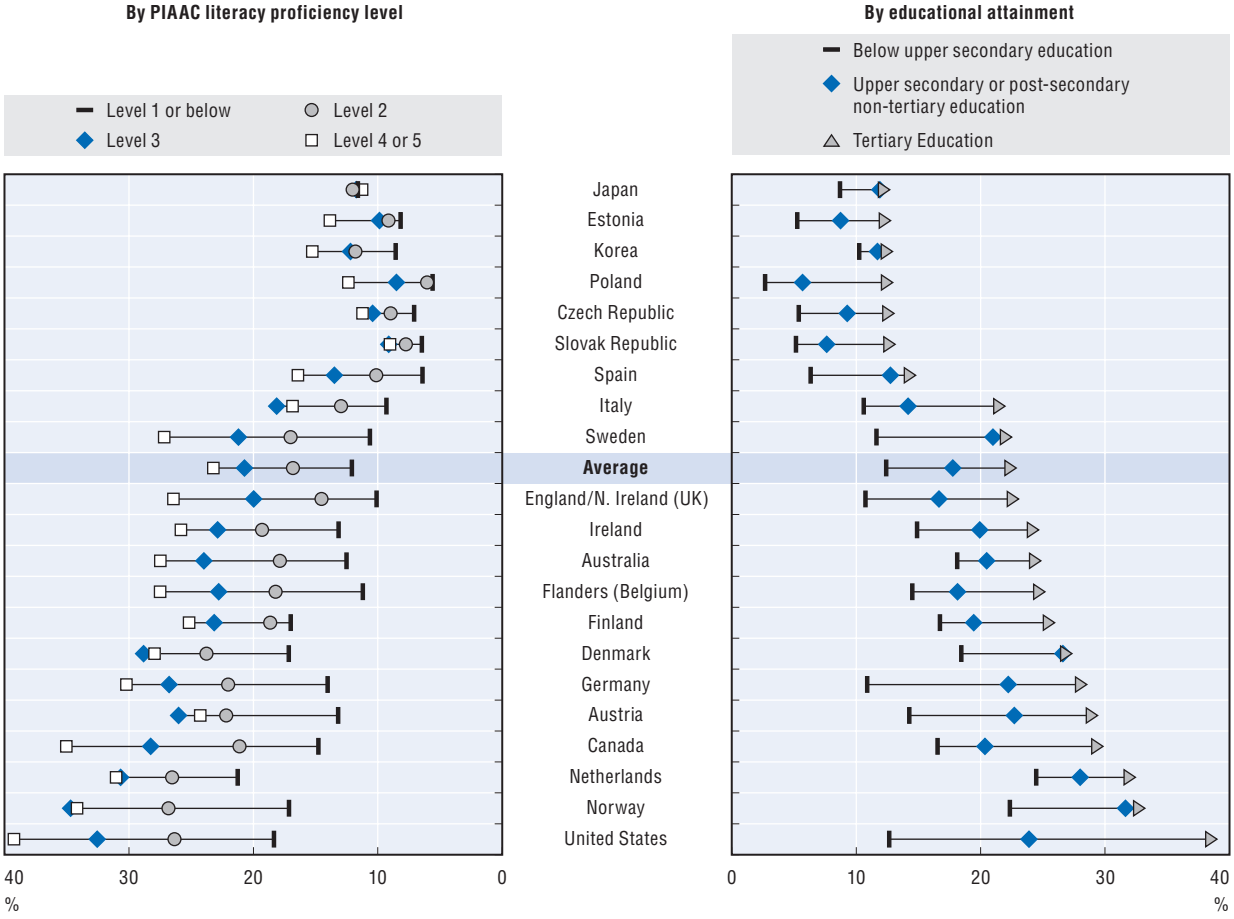
In contrast to other forms of project-based learning, academic service-learning learning projects are purposefully community-focused and community-based, are usually conducted in partnership with members of the community, and, most importantly, are designed with a community need in mind. In essence, like a textbook or laboratory, the community becomes a resource for learning whereby the environs outside school offer students authentic learning opportunities to use their academic knowledge and skills to construct and implement solutions to real-life social problems in the local community or broader society.

The emphasis on community service and its use of the community as a resource for academic study intentionally shifts the role that students play in the learning process: they become producers rather than recipients of knowledge, active rather than passive learners, and providers rather than recipients of assistance. Unlike most other experiential learning approaches, academic service-learning places students in situations where they focus less on using resources for their own gain and more on acting as a resource for the benefit of others. Service-learning creates an educational atmosphere whereby learners confront real-life issues through community-engaged experiences that call on them to develop meaningful, academically-relevant actions that have real consequences for the community and themselves. Perhaps more than any other experiential or community-engaged learning pedagogy, academic service-learning has a strong civic dimension at its core. Its emphasis on community service establishes an inherent civic dimension that promotes social responsibility and citizenship among participants.

Learning to engage

Education, whether measured in terms of educational attainment or skills acquired, seem to have a strong impact on the civic and community engagement shown later in life. Figure 3.5, based on data of the OECD Survey of Adult Skills, shows the strength of the relationship, but also that the strength differs from country to country.

Figure 3.5. **Percentage of adults reporting that they volunteer at least once a month, by educational attainment and literacy proficiency level (2012). Survey of Adult Skills, 25-64 year-olds**



Source: OECD (2014), *Education at a Glance 2014: OECD Indicators*, http://dx.doi.org/10.1787/eag-2014-en.

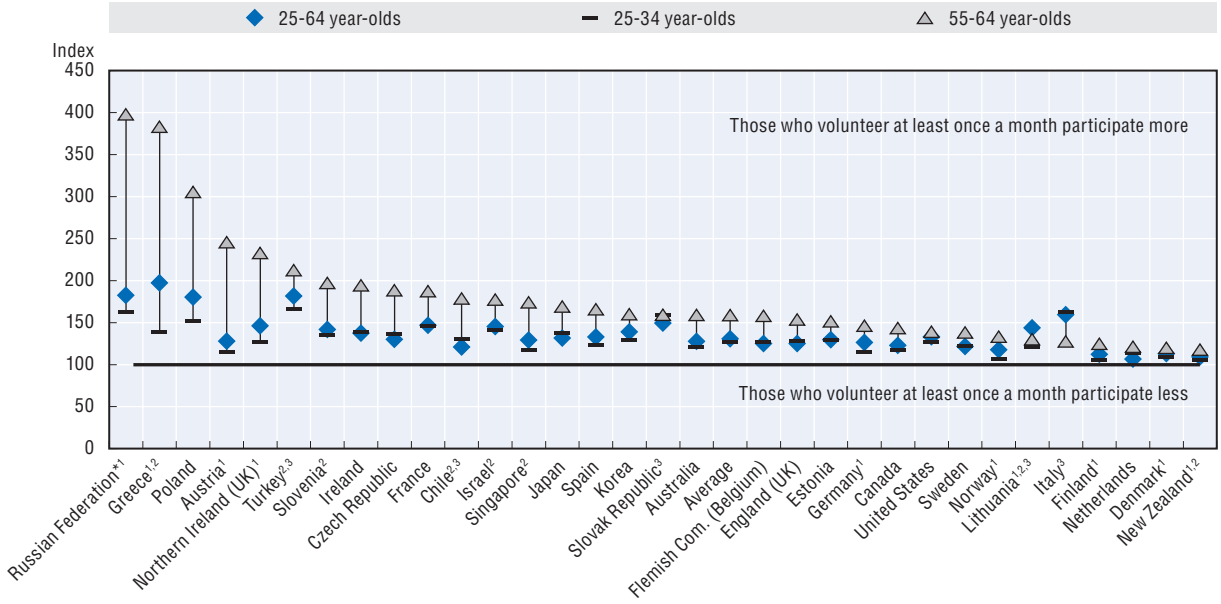
StatLink http://dx.doi.org/10.1787/888933116680

Better-educated individuals on average are more likely to exhibit higher levels of civic and social engagement than the less educated. Also, better-educated parents are more likely to stimulate their children's civic engagement, and an educated society tends to be more cohesive and have less crime. However, the precise mechanisms and pathways through which education promotes civic and social engagement remain unclear (Borgonovi and Miyamoto, 2010). Current OECD research is focusing on the role that specific personality traits and social and emotional skills play in the development of civic engagement and on how such skills can be developed and nurtured.

It is also very interesting to see, as shown in Figure 3.6, that volunteering and adult learning are closely related: people who volunteer, especially those in older age groups,

are also relatively more likely to participate in various forms of formal and non-formal education. This adds further weight to the suggestion that learning adds to social capital and engagement in the local community.

Figure 3.6. **Volunteering and relative participation in formal and/or non-formal education, by age group (2012 and 2015)**



Note: Values are missing for some countries and economies because there are too few observations to provide a reliable estimate.
1. The difference in participation in formal and/or non-formal education between unemployed 25-64 year-olds who volunteer and do not volunteer is not statistically significant at 5%.
2. Reference year is 2015; for all other countries and economies the reference year is 2012.
3. The difference in participation in formal and/or non-formal education between employed 25-64 year-olds who volunteer and do not volunteer is not statistically significant at 5%.
4. The difference in participation in formal and/or non-formal education between inactive 25-64 year-olds who volunteer and do not volunteer is not statistically significant at 5%.

Source: OECD (2017), *Education at a Glance 2017: OECD Indicators*, http://dx.doi.org/10.1787/eag-2017-en.

StatLink http://dx.doi.org/10.1787/888933558610

Partnering with business and cultural bodies in the local community

The contemporary learning environment needs to develop strong connections with partners so as to extend its boundaries, resources and learning spaces. Partnerships should include local community bodies, businesses and cultural institutions, including museums and libraries. Creating wider partnerships should be a constant endeavour of the 21st century learning environment, overcoming the limitations of isolation in order to acquire the expertise, knowledge partners and synergies that come from working in partnership with others. Partners extend the educational experience, resources and sites for learning. Working with partners is a form of capital investment – in the social, intellectual and professional capital on which a thriving learning organisation depends. It generates benefits, both for the learning environments and learners themselves, and for the partners involved.

Corporate partners

A very important channel through which schools partner with and contribute to the local economy and community is their engagement with local business and industry. Some corporate partnerships may be the conventional community links of businesses helping

through taking a funding or sponsorship role, but they may be much more about the learning that takes place as well.

The Lobdeburgschule (Thuringia, Germany) co-operates with many regional partners. This includes membership of "Berufsstart plus" (a project for the transition into vocational training) of the Eastern Thuringian Apprenticeship Network. Further co-operation partners are: Eine-Welt-Haus e.V., the car dealer Reichstein and Opitz GmbH, the Bildungswerk BAU Hessen-Thüringen (an educational institution), the JBZ (an education centre in Jena), DKJS Regionalstelle Thüringen (the regional office of the German Children and Youth Foundation), the University of Applied Science of Jena, the "Lobdeburgschule" e.V (registered association), the International AKademie INA gGmbH, the University of Berlin, the University of Jena, the Jenaer Antriebstechnik GmbH, the Kaufland Jena-Lobeda, Kindertagesstätte "Anne Frank" (day care centre), the KOMME e.V. of MEWA Textil-Service AG und Co. Jena OHG, the MoMoLo e.V., the vocational training centre for health and social issues, the Theaterhaus Jena gGmbH (theatre), the adult education centre Jena, and the vocational training centre in Jena-Göschwitz.

The connection between schools and the economic activity of the surrounding community is exemplified in the Instituto Agrícola Pascual Baburizza (Chile). The education of these students is guided by a group of farmers from the community, who are part of the school board and make sure that what is taught at the school is linked to real needs: "learning by doing and producing". Internships must be done in real situations to train people and professionals – the students learn about employers' demands and it is expected they will continue to develop throughout their professional lives. Everything that students learn in internships must have a practical application. All of this is done in the countryside, the "big classroom".

Cultural partners

Cultural partnerships can be very useful in extending the boundaries of the learning environment beyond formal school provision, and in offering access to arts materials and experiences directly. As in the case of Fiskars, artists and craftspeople become part of the educational workforce, too.

The Fiskars Elementary School (Finland) may be defined as an enlarged learning environment. The basis for the model and its central working method are the workshops that are developed, and organised in co-operation with such actors as the Artisans, Designers and Artists Co-operative of the village of Fiskars.

Thanks to the cultural offer of Sant Sadurní D'Anoia and other nearby towns, all students at Instituto Escuela Jacint Verdaguer (Spain) annually attend a performance of each artistic discipline – music, dance and theatre – visit exhibitions and have similar cultural experiences.

The Culture Path programme (Finland) has been implemented in close collaboration with the city's cultural institutions, schools and teachers, as well as other relevant interest groups such as the Eastern Regional Center for Dance, Children's Cultural Center Lastu, many cultural associations and private culture activists. The project aims to produce a service that is easily accessible, and which would enable both students and teachers to experience culture and art as a source of learning and enjoyment. It has nine paths – library, art, museum, media, environment, dance, music, theatre and the K-9 card – one for each grade level. With the K-9 card, a 9th grader can use the city's cultural services for free, or at minimal cost, after "trekking" for eight years on the Culture Path.

These, and many other examples of partnerships with museums, galleries and theatres, but also with radio and media companies, extend the materials and the means of learning as well as the range of professionals involved.

Innovating the space of learning

Networking

So far, we have discussed the relationships between schools and their surrounding communities in terms of "serving the community", "outreach" and "partnerships". From this perspective the distinction between the formal education environment of the school and the surrounding informal and non-formal opportunities for learning is still very powerful and limits the degree of integration of the school with its environment. In more innovative arrangements, the mixing of formal with informal and non-formal learning becomes more pronounced. Broadening the institutional base beyond schools through service-learning, diverse non-formal and informal learning opportunities on line and in communities, and establishing "hybrid" formal/non-formal programmes are all part of creating dynamic learning systems.

A distinguishing feature of the New Zealand LCN strategy is the deliberate positioning of students at the forefront of the network activity with teachers and families closely involved. This in particular brings in students who are M¯aori, Pasifiika or have special educational needs and whose achievements have not reached national standards. It also involves the students' families/ wh¯anau *and teaching professionals who discuss how to move learners along the continuum from passive to active, which often calls for reconsideration of the nature of professional authority in the facilitation of students' learning. Some networks are engaging students and families as co-investigators in the readjustment process while others are more cautious, with teachers and leaders still firmly at the forefront. Priority students and their families/*wh¯anau *are inherently capable and, as agents of their own cultures, are articulate in sharing with teachers and leaders their knowledge about the way they learn and what they may need to change.*

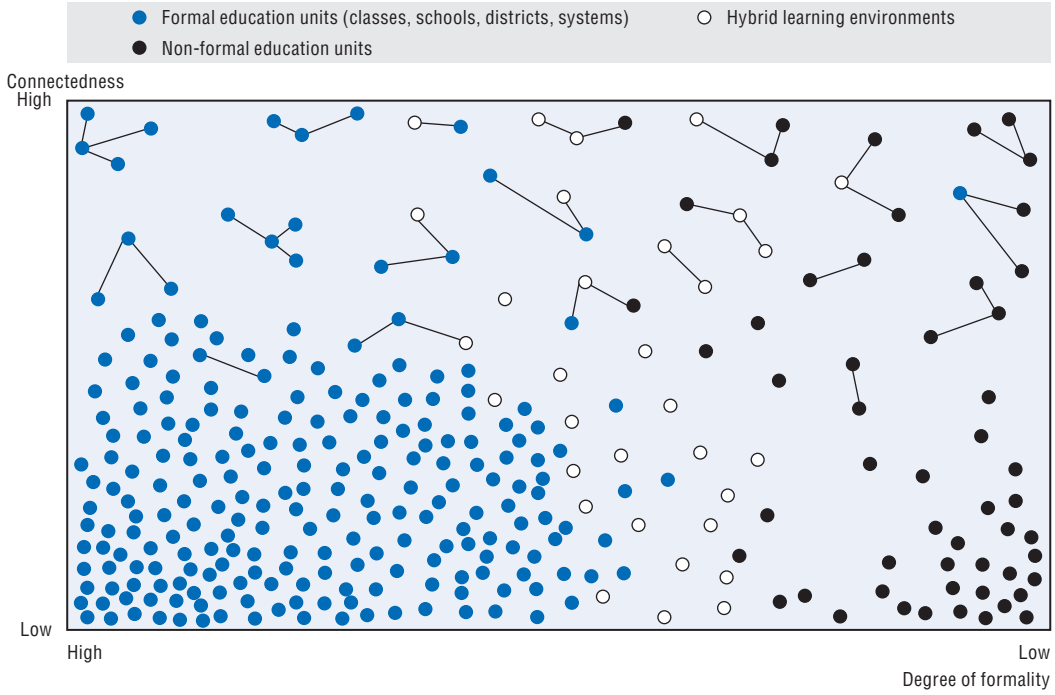
In Thuringia (Germany), the start-up project Development of Innovative Learning Environments recognises that since education is not only accomplished in formal contexts, the understanding of innovative learning environments goes well beyond educational institutions. It also opens up to family (parents and legal guardians), the wider natural environment, and the larger community and regional environment. There is a close co-operation with the Thuringian initiative "nelecom" (new learning culture in communes).

Such examples and others evolve into networked arrangements as emerging learning ecosystems around four different models (OECD, 2015b):

- school chains, which are groups of schools sharing a mission and acting as a micro system
- locally embedded hubs, responding through innovation to particular needs in a community or locality
- innovation zones, centrally facilitated innovation strategies in, for example, a city creating a network of schools, system leaders and broader education partners
- looser networks and coalitions, socialising new ways of working among professionals and school leaders.

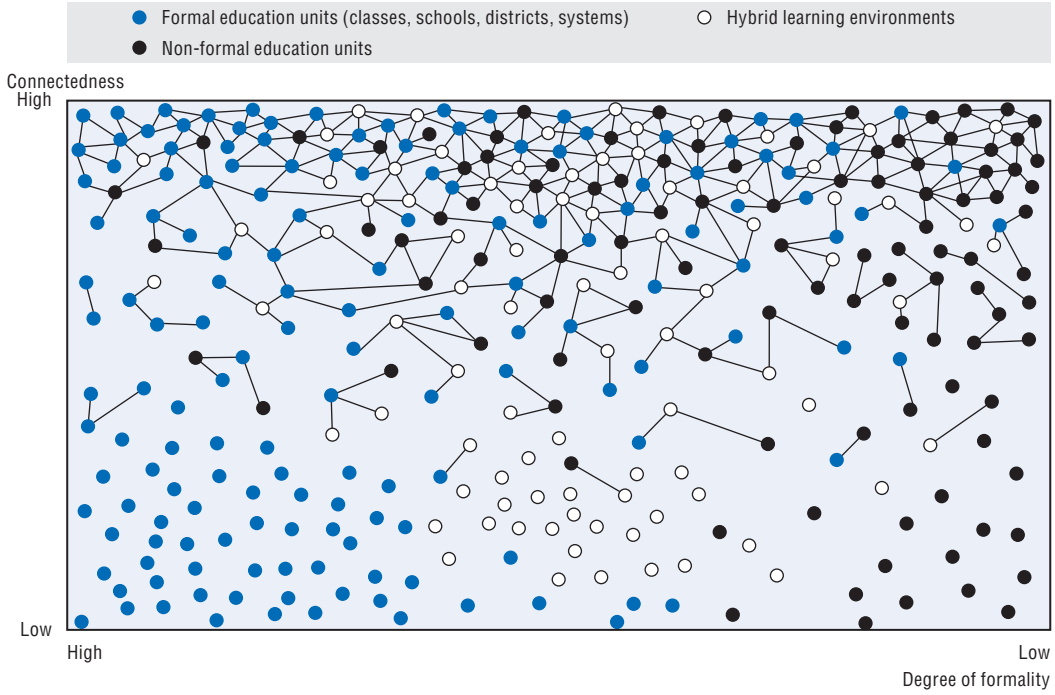
Figure 3.7 and Figure 3.8 represent two different systems, including formal, non-formal and hybrid forms, and units of education (OECD, 2015b). Moving from top to bottom, there are more connections among formal units, which can be clusters and chains of schools. Moving from left to right, from the formal to the non-formal education providers, there are more connections among themselves or with hybrid partners or partners from the non-formal sector. The hybrids might combine work and learning, sports and learning, or community service and formal learning.

Figure 3.7. **A weakly-connected system**



Source: OECD (2015b), *Schooling Redesigned: Towards Innovative Learning Systems*, http://dx.doi.org/10.1787/9789264245914-en.

Figure 3.8. **A networked system**



Source: OECD (2015b), *Schooling Redesigned: Towards Innovative Learning Systems*, http://dx.doi.org/10.1787/9789264245914-en.

Figure 3.7 represents a hypothetical weakly networked meta learning system. There are few networks and cross-school communities, and very little evidence of hybrids. While there are some non-formal programmes and providers, as these are responding to demand for alternatives to schools there is little connection between them and the formal system.

The networked learning system (Figure 3.8) implies a significant increase in the number of groups, organisations and organisms devoted to learning as units, not only working by themselves as before but connecting up in a flourishing range of collaborative groupings. The networked system shows the learning space is fuller horizontally. There are also more non-formal providers and programmes, encouraged by the dynamism of learning and the opportunities opened up by technology and by demand. Some of these form networks totally outside the formal system but often the formal and the non-formal come together and fill the "hybrid" space in the middle. There are also more networks and communities of practice created in the formal system as it encourages clusters, networks and collaboration among districts, schools, classes and teachers as well.

Innovative learning ecosystems constantly change, with groupings forming and disbanding all the time; as they are organic, they are less predictable. In being less defined by acquired position and regulated status, they rely critically on relationships and connectivity whose importance grows. Especially important are knowledge and ideas as connectors. Increasingly, but not exclusively, they depend on communication technologies.

Networks can be singled out, not because they are by themselves always effective or innovative but because they offer the connections through which knowledge passes and ultimately collaborative action takes place. They are particularly valued for their capacity to bring diverse perspectives to the table, whether from inside or outside government, clarify problems, facilitate co-ordination and actually implement change. Effective networks can cut through complex hierarchies and generate new solutions to intractable and often challenging local problems whether in preventative health, welfare issues such as social housing and support for vulnerable youth, energy solutions, the environment, or in restructuring regional economies. Complex issues put a premium on the capacity of leaders and organisations to take account of a multitude of interdependencies and work across traditional boundaries. Well-functioning collaborative networks add high value and can enable the whole to become more than the sum of its parts.

Horizontal accountability

A networking ecosystem fundamentally changes the relationships between schools (and other learning organisations) and their main stakeholders and also alters the steering and accountability mechanisms around them.

In a context of increasing school autonomy and decentralisation, many education systems have reinforced instruments of school accountability. This is based on the assumption that holding schools accountable for attaining high standards will, in fact, motivate schools to improve their quality. Thus, the following purposes for school accountability can be distinguished:

- legitimation through compliance with laws and regulations
- accounting for the quality of services provided, in terms of quality of education (effectiveness), value for money (efficiency), equity or access
- improving the quality of services provided, in terms of quality of education (effectiveness), value for money (efficiency), equity or access.

Hooge, Burns and Wilkoszewski (2012) distinguish between two main types of accountability mechanisms: vertical and horizontal. Vertical accountability is top-down and hierarchical. It enforces compliance with laws and regulation and/or holds schools accountable for the quality of education they provide. Horizontal accountability presupposes non-hierarchical relationships. It is directed at how schools and teachers conduct their profession and/or how schools and teachers provide multiple stakeholders with insight into their educational processes, decision making, implementation and results. Each of the two types of accountability is further divided into two subsections, as shown in Figure 3.9.

Figure 3.9. **Forms of school accountability**

Vertical	**Regulatory school accountability:** compliance with laws and regulations; focuses on inputs and processes within the school. Mechanism: reporting to higher levels of school authority.
	School performance accountability: periodic school evaluations. Mechanisms include: 1) standardised student testing, 2) public reporting of school performance and 3) rewards or sanctions.
Horizontal	**Professional school accountability**: professional standards for teachers and other educational staff. Mechanisms: credible, useful standards and the creation of professional learning communities.
	Multiple school accountability: involving students, parents, communities and other stakeholders in formulating strategies, decision making and evaluation.

Source: Hooge, E., T. Burns and H. Wilkoszewski (2012), "Looking Beyond the Numbers: Stakeholders and Multiple School Accountability", *OECD Education Working Papers*, No. 85, http://dx.doi.org/10.1787/5k91dl7ct6q6-en.

According to Hooge, Burns and Wilkoszewski (2012) there is a gradual shift taking place in the governance of education from the vertical to the horizontal forms of accountability. Horizontal elements in education governance have had a relatively long tradition in a range of OECD countries. School boards or councils comprised of elected, voluntary members have sought to integrate the voices of parents into the governing process. However, many of these bodies do not include wider groups of stakeholders. In some countries, however, notably Denmark, the Netherlands and the United Kingdom, there has recently been a trend to move towards more profound multiple school accountability designs. Defined as a process involving students, parents, communities and other stakeholders in formulating strategies, decision making and evaluation for education, multiple school accountability aims to provide:

1. legitimation of the strategy and decision making of the school (is the school doing the right things?)
2. legitimation of the quality of services provided (is the school doing things well?)
3. improvement of the quality of services provided.

A form of horizontal accountability, multiple accountability means that schools are accountable to students and their parents, to members of the community, and to the community as a whole for multiple aspects of schooling, based on various information sources. Multiple accountability aims to increase legitimacy and trust from the local community through the processes of learning and feedback that it entails. It requires that schools work closely with different stakeholders, supporters and constituents in their environment in order to:

- help them learn about their rights and duties, requirements, desires and expectations concerning education
- establish a relationship (by negotiating, collaborating and/or involving them)
- obtain support for school policies, strategy, decisions and practices
- be held accountable by them.

The practice of multiple accountability has yet to come to fruition in education, and the amount of available research on this topic is modest. Based on theory and experience from other sectors however, some lessons can be learned to make multiple school accountability work:

1. It is important to identify the right stakeholders. The process of stakeholder identification can be heavily influenced by "stakeholder salience", that is, the ability of stakeholders to attract schools' attention, depending on their power, legitimacy and urgency with regards to the school. In order to ensure that the identification of stakeholders is not limited to those most salient, schools must make efforts to involve less powerful or inactive stakeholders. Being less powerful or inactive does not mean that these stakeholders are not relevant to the school. On the contrary, these are often the very stakeholders for whom the school aims to add value; therefore, schools need them.
2. Build stakeholder capacity. This is particularly important while establishing accountability relationships with weaker stakeholders who might not have the requisite knowledge and language to play the role holding schools to account and, therefore, may inadvertently be excluded from accountability processes. Avoiding apathy and "consultation fatigue" is key because they weaken the effectiveness of the process, and ultimately the strength of this approach is determined by its weakest accountees. Schools can involve and activate their stakeholders by being inviting, by structuring participation and accountability processes, and by motivating and empowering them.
3. Self evaluation that provides real insight into schools' quality and processes is needed to make multiple accountability work. Proper school self evaluation requires "assessment literacy" from school leaders as well as from teachers and other professional staff. The work of school leaders is crucial here: they must empower staff to be involved and open to parents and members of the local community and to be held accountable by them, and they must create the effective environments by building bridges between teachers and educational staff and external accountability demands. Autonomy and a (governance) environment that provides support foster this work of school leaders.

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Chapter 4

Local economy supporting schools

This chapter looks the role of employers in innovation and some of the most important ways that they can engage in education and support schools. It outlines the benefits of employers being involved in vocational education and training (VET), particularly through work-based learning which offers students a high-quality real world learning environment, and improves labour market outcomes for employers and employees. It considers the key factors for successful VET systems, including the involvement of employers and trades unions, and effective local implementation. It goes on to consider enterprises as learning organisations themselves and the relationship between firms which put learning at the centre of their organisation, and levels of innovation and lifelong learning more widely. Finally it discusses the engagement of employers in education policy making and their priorities for education reform.

Introduction

Schools opening up to their local communities and economies create the conditions for supporting the improvement in quality of their own learning environments. The emergence and quality improvement of vocational education and training systems is a good example: without apprenticeships, adequate state-of-the-art equipment, internships and on-the-job training opportunities, vocational education would simply not be possible today. In so-called "dual systems" but also in more modest systems for vocational education, the responsibility of the business sector for creating opportunities for learning is a critical success factor. But examples also come from other sectors than vocational and professional education. Research-oriented education in universities and colleges offer endless and often untapped opportunities for local enterprises to foster innovation, develop start-ups or promote micro-companies. Learning in secondary schools can also benefit from real-work challenges and questions that students can tackle in project work and inquiry-based learning.

Such dynamic and collaborative learning spaces and partnerships are indispensable to building today's learning ecosystems. They can help students develop skills that cannot be learned easily in classrooms. Connecting schools to local businesses creates better opportunities for learning the skills that matter in today's economies and societies. Entrepreneurship skills cannot be developed in the abstract, but require hands-on experience with real-world problems. Problem-solving skills are now rightly considered to be critical 21st century skills. The old distinction between theoretical, abstract knowledge and more practical, applied and concrete knowledge is quickly losing relevance. Abstract knowledge remains incredibly important, but is best acquired through the interaction between concrete problem solving and theoretical reflection. Enterprises cannot replace school-based learning, but can profoundly enrich and broaden the learning experience, while assuring its relevance and supporting learners' motivation.

There are many ways in which employers can engage in education and support schools: by providing work experience placements, by providing hands-on learning opportunities, by providing workplace tours and speaking with young people about possible career opportunities, by collaborating with teachers to design and deliver learning experiences that connect classroom learning with the real world, by participating in local career expos, etc. In this chapter we will not discuss them all, but focus on some of the most important ones.

Engaging employers and industry in education

Cost-sharing mechanisms

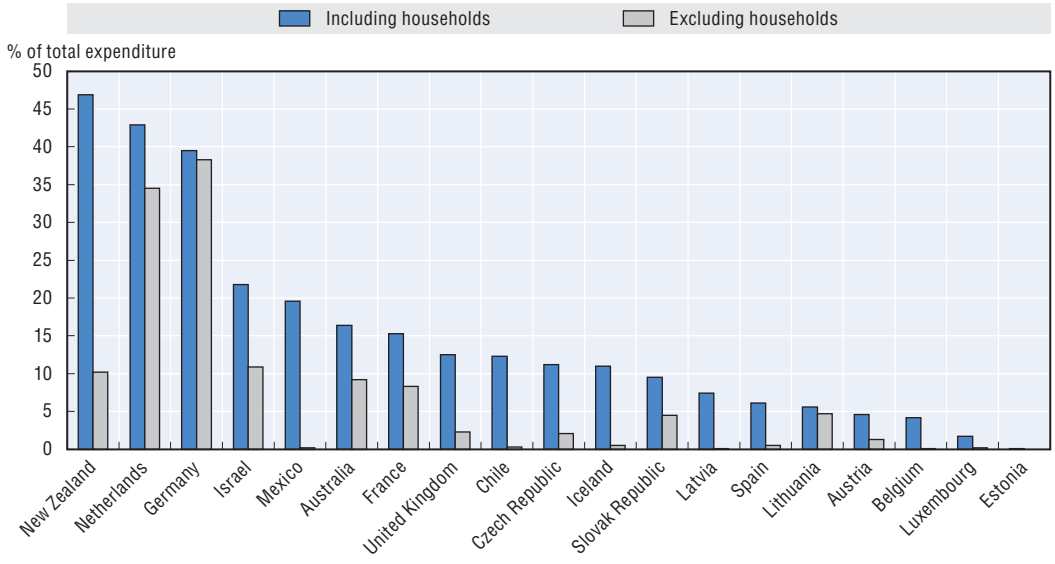
The most obvious way in which employers and industry support schools is by cost-sharing mechanisms for those education subsystems that are directly relevant to the labour market, most notably the vocational education and training (VET) sector (OECD, 2017). Across the OECD, the average annual expenditure per upper secondary VET student in 2013 was

10% higher than that for students in general education (OECD, 2016). The specialised equipment required to teach many technical and practical subjects often entails higher costs. Unlike general education programmes, in many countries the funding of the VET sector involves contributions from employers. Given the larger set of actors involved, the funding of VET is frequently based on agreements between public and private stakeholders determining their respective funding contributions as well as their role in the provision of services such as work-based and school-based learning. Employers tend to contribute to VET in the form of financial transfers (directly to VET providers or indirectly via training levies) as well as through the provision of equipment, staff and training places.

Given the direct benefits that students' acquisition of occupation-specific skills brings to the industry, employers sometimes bear the cost of work-based learning and contribute to covering costs for materials, trainers or the remuneration of trainees. The school-based component of VET is more commonly publicly funded.

However, cost-sharing arrangements involving significant private contributions are relatively rare in upper secondary VET programmes (see Figure 4.1). Private sector contributions tend to be significant in countries with a large apprenticeship system in which employers cover most of the costs of work placements (e.g. apprentices' pay, instruction costs, tools and equipment). Among the 19 OECD and partner countries with available data for 2012, funding from private sources other than households typically accounted for less than 10% of total expenditure, with the notable exceptions of Germany and the Netherlands.

Figure 4.1. **Private expenditure on upper secondary VET**



Source: OECD (2017), *The Funding of School Education: Connecting Resources and Learning*, http://dx.doi.org/10.1787/9789264276147-en.

The German VET system, as described in Box 4.1, provides an example of cost-sharing arrangements involving contributions from all of the system's major stakeholders. In several countries, however, students have very few opportunities to engage in work-based learning or apprenticeships and there is no legal requirement for firms or industries to make financial contributions to the state-run vocational system.

Box 4.1. **Cost-sharing arrangements in the German VET system**

The German dual VET system is characterised by high levels of expenditure per student, high levels of enrolment in apprenticeship schemes and a high level of involvement among employers, with more than 60% of firms taking part in the provision of initial vocational education and training. The funding of VET involves all stakeholders. Public resources are provided by federal ministries (the Ministry of Education and Research, the Ministry of Economic Affairs and Energy, and the Ministry of Labour and Social Affairs), central agencies, such as the federal employment agency, as well as the federal states (*Länder*). Private sector resources are contributed by companies, unions and chambers of commerce as well as students and their families.

The school-based learning component is provided by vocational schools and funded primarily out of the federal states' budgets. The states are responsible for funding teaching staff and on average cover 80% of vocational schools' expenses. Municipalities are the second largest contributor, covering the largest share of material costs and investments out of their own revenue. The work-based learning provided through the apprenticeship system is largely self-financing and public authorities only indirectly contribute to its funding by providing students and employers with financial incentives to engage in training activities.

German employers are required to contribute to the funding of work-based learning for their apprentices on the basis of collective agreements. The resources made available by employers include the apprentices' wages as well as the material and human resources necessary to provide adequate training conditions. With the exception of the construction sector, employers do not contribute to training levies.

Source: Papalia (forthcoming), "The funding of vocational education and training: A literature review".

Ensuring adequate involvement of companies in both the provision and funding of initial VET is a challenge shared by several OECD countries. Evidence from across OECD countries indicates that the labour-market outcomes of vocational graduates improve if their programmes include substantial work-based learning, such as apprenticeships offered by companies (OECD, 2014). In countries where practical training is primarily provided by schools, a number of efficiency challenges may arise. For schools, continuously updating their practical training offer to ensure its relevance to the requirements of the labour market involves significant investment in training, equipment and physical infrastructure, which may discourage innovation and experimentation. The failure to provide opportunities for work-based skills development can thereby reduce the efficiency of VET provision and diminish its labour-market relevance.

Countries such as Switzerland, Germany and Denmark operate so-called dual systems whose VET pathways alternate periods of school-based learning with work-based training which companies support through the contribution of financial and human resources. Regardless of whether employers are directly involved in the provision of VET, training levies are the most common mechanism to collect earmarked VET resources from the private sector. While some levies primarily serve to raise revenue to provide VET, for example through a tax paid by every employer, other levy schemes provide employers with incentives to actively engage in work-based training. These types of training levies are typically linked to a disbursement or exemption mechanism that redistributes the funds raised by the levy to employers that engage in the training of apprentices.

Feedback mechanisms in vocational education and training

The involvement of employers is crucial if VET systems are to meet labour-market needs (OECD, 2010b). Employers are clearly in a strong position to determine if the content of curricula and qualifications meet current labour-market needs, and to guide their adaptation to emerging requirements. Employer engagement in policy development is essential if policies are to be successfully implemented.

In VET systems, connectivity with the world of work and with society is considered very important. In order to bridge and align education, training and work, VET institutions are assumed to take into account perceptions and convictions of employers about the purposes, goals, content, pedagogy and quality of the VET. There are multiple ways for VET institutions to do this, and different examples of formal and informal feedback mechanisms of VET labour-market co-operation have been identified (see Figure 4.2).

Figure 4.2. **Formal and informal feedback mechanisms from stakeholders in VET**

Formal feedback mechanisms	Informal feedback mechanisms
• Sector skills councils, e.g. the cooperation between employer-led organisations and the Commission for Employment and Skills in England • Trade committees, e.g. Denmark, bipartite arrangements of employer associations and trade unions supporting new VET, adjustments or closing of outdated programmes. • Advisory boards on apprenticeships, e.g. Austria, where social partners are involved in the process of developing/renewing occupational profiles • Managing boards and expert committees for VET, e.g. Bulgaria, where state and social partners cooperate in the development and renewal of school-based VET curricula commissions to be found in most countries examined	• local school boards • professional internships • exchange programs • dual systems, work-based training • alumni networks • career fairs • projects in companies • school at work initiatives (in-company learning in cooperation with schools) • work at school initiatives (experienced professionals provide supervision and professional skills training in school).

Source: Burns and Köster (2016), *Governing Education in a Complex World*, http://dx.doi.org/10.1787/9789264255364-en.

While employers have a proper and very important role in articulating the skills needs of the labour market, they also have some significant limitations. They will naturally have an interest in meeting specific skills requirements, but may have less interest in equipping young people with more transferable skills, as such skills will bid up wages and increase job turnover. To some extent this depends on the level at which their interests are articulated. Employers as a whole have a very strong interest in general transferable skills, including literacy, numeracy and soft skills, while individual employers and sectoral groupings often have narrower interests.

Trade unions can usefully balance the impact of employers in VET. Potentially they can voice the student and employee interest in transferable as well as firm-specific skills. As representatives of the workforce, they commonly take part in negotiations about the design of VET policy. Trade unions have complex incentives in respect of training. They have incentives to protect the interests of existing workers, to ensure that those in work have access to good-quality training and that employees have transferable skills. Less positively they also have incentives to reduce access to shortage occupations, so as to maintain high wages and union bargaining power for the group of workers involved.

Workplace learning and apprenticeships

Industries contribute to and benefit from education mainly through providing workplace learning opportunities to students, usually in VET programmes. Workplace learning includes a diverse set of practices ranging from brief periods allowing the learner to observe a workplace to structured long-term apprenticeships leading to a qualification (OECD, 2010):

- **Job shadowing**: very short periods of time – typically days – in which students "shadow" a worker to learn about their job. Shadowing often involves younger students and serves the purpose of career exploration.
- **Internships**: short periods of time – typically weeks or months – in which students attend workplaces and undertake work there, typically for zero or nominal wages. They may be governed by a special contract.
- **Apprenticeships**: more structured long-term workplace learning, typically over a period of years, leading to a qualification.

There are four major advantages of training in workplaces rather than in VET institutions from both the students' and the employers' points of view. First, workplace training can offer a high-quality learning environment and also allows students to develop key soft skills – such as dealing with customers – in a real-world environment. Second, it facilitates a two-way flow of information between potential employers and employees, making later recruitment much more effective and less costly. Third, employer provision of workplace training provides a signal that a VET programme is of labour-market value. Fourth, trainees in the workplace can make a productive contribution. All of these advantages apply to a structured and substantive element of workplace learning in a vocational programme – such as an apprenticeship – but most of them also apply, sometimes to a lesser extent, to other less formal and shorter forms of workplace learning.

Workplaces provide a strong learning environment because they offer real on-the-job experience. This makes it easier to acquire both hard and soft skills. The acquisition of hard skills sometimes requires practical training on expensive equipment. Rapidly changing technologies mean that equipment quickly becomes obsolete and VET institutions are often unable to afford modern equipment. Workplace training will therefore often be more cost effective, since it makes use of equipment already available in firms. Firms also employ people who understand how to use the latest equipment and can explain the associated techniques.

In the workplace, employers and trainees get to see each other for what they are, when under pressure, and when there is conflict. Research shows that the employee characteristics on display in these contexts are critical to job performance, so that employers learn about the performance of trainees and apprentices as potential recruits. Since other potential employers cannot readily observe these characteristics, an employer taking trainees is in a position to recruit the best among them, and use their information advantage to pay lower salaries than the individual's productivity levels. This is the recruitment benefit to employers of workplace training. Evidence from various countries suggests that this is one of the major motives for employers to offer workplace training.

Apprentices and trainees who undertake useful work generate a productive benefit for the employer. This benefit tends to be important in the case of apprenticeships, and is also possible in more substantial internships, but more difficult to obtain in very short work placements (unless trainees perform only unskilled tasks, but that would be a poor learning experience). Their contribution typically increases with experience and depends also on how their work is organised.

Embedding young people within an existing business is an effective way to train future workers to the specific requirements, values and expectations of a particular workforce. While some time must be devoted to training young and inexperienced people, many employers recoup the cost of training before the completion of the apprenticeship and others within a time frame as short as 1-2 years, depending on the extent to which apprentices are engaged in productive activities. Investing in apprenticeship training has other diffused benefits for the business, including increased skills development for other employees as a result of interaction with training organisations, increased entrepreneurship and increased exposure to new technologies in the workplace (OECD/ILO, 2017).

In addition, employers sometimes say that taking on trainees is a social responsibility, and, more subtly, that trainees and apprentices ask questions, encouraging a reflective approach to the work.

Key components of successful local employer engagement strategies

At the local level, effective apprenticeship programmes can help to achieve key economic development objectives. They provide a mechanism to boost the competitiveness of strategic local sectors. Apprenticeship programmes can stimulate quality employment opportunities in service-based occupations by providing skills-development opportunities that are tied to the workplace. They can thus be targeted beyond the traditional trades to new and emerging sectors which can provide new economic growth opportunities.

One precondition for a high-quality apprenticeship system is effective implementation at the local level. The potential role of local governments, public agencies and social partners in enhancing apprenticeships can often be overlooked at the national level and even by local actors themselves when they do not have the ability to shape local actions. The design of national schemes should include specific measures to encourage engagement of stakeholders at the local level to incentivise their engagement with the apprenticeship system.

Leadership from key stakeholders is particularly important in ensuring that national schemes are effectively implemented at the local level. In the New Zealand town of Otorohanga for example, employers and young people were targeted by a group of concerned local leaders, including the mayor, church leaders and major employers. The activism and leadership from these actors resulted in custom initiatives to improve apprenticeship participation and completion rates, including personalised assistance, increased access to off-the-job vocational training and personal pastoral care. The mayor, a former apprentice himself, prioritised the development of a network of local stakeholders to improve the outcomes of the apprenticeship system and to reach out to local employers. Similarly, the presence of a hands-on tutor to help apprentices liaise with employers and complete their academic training requirements was critical to improving apprentice retention and completion rates.

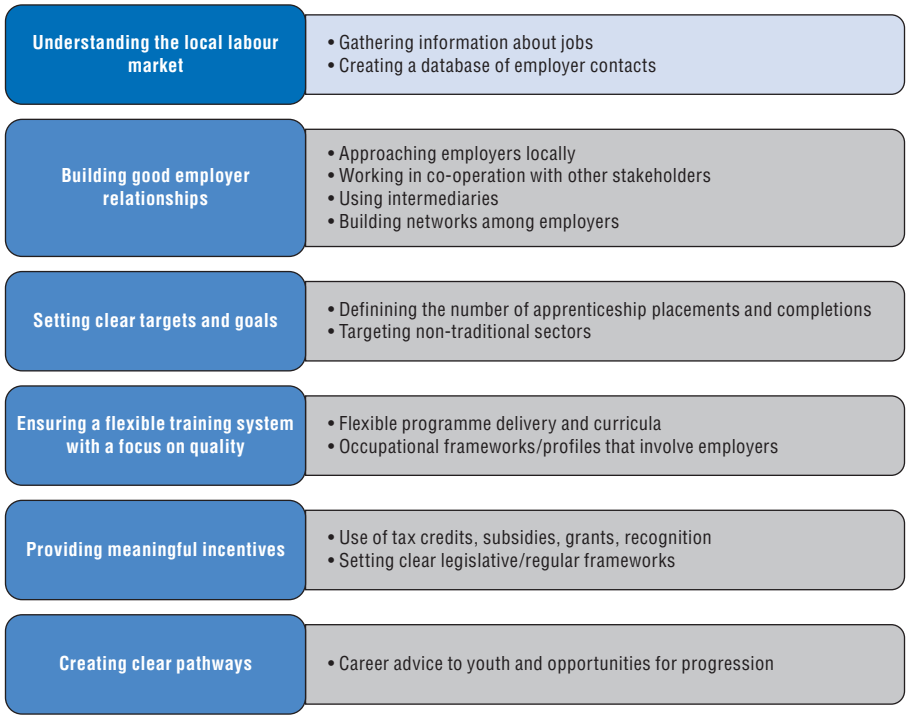
While the initial collaboration was largely informal, the outgoing leaders developed formal governance and implementation mechanisms for the stakeholders through the creation of a District Development Board for Economic Development. Since the initiation of the project, local youth increasingly engage in the apprenticeship system and Otorohanga now has one of the lowest rates of youth unemployment in New Zealand (OECD/ILO, 2017).

There are a number of methods of developing a supportive, stakeholder-led infrastructure of local actors in the apprenticeship system. In Western Australia, a core employer identified skills shortages in the local building and construction industry as a result of labour being

attracted to the booming mining industry. The employer then specifically approached the regional government to develop a discussion committee that included representatives of the state government, industry councils and associations and unions. As a result, the regional apprenticeship system was reformed to allow the recognition of previous qualifications from apprentices and the development of enterprise specific competence-based learning frameworks. In this case, direct engagement from employers was necessary to build a strategic partnership to align the goals and needs of the relevant stakeholders.

Granting concrete powers to regional and local governments to develop the priorities for apprenticeships can also be effective. For example, the devolution of national powers to local regions in England has allowed city areas to independently develop and implement apprenticeship and skills policies. In the case of Manchester and the Greater Leeds city regions, new local powers enabled the development of grant schemes to employers that supported the economic priorities of each local area. They were also able to emphasise high-quality apprenticeships by prioritising advanced or higher apprenticeships or those with career progression opportunities. They also enabled the local regions to specifically target core social groups, including young people with ethnic minority origins.

Figure 4.3. **Key components of successful local employer engagement strategies**



Source: OECD/ILO (2017), *Engaging Employers in Apprenticeship Opportunities: Making It Happen Locally*, http://dx.doi.org/10.1787/9789264266681-en

Benefits of strong school-business relationships

The potential benefits for schools of connecting better and partnering with local communities and business can be manifold. The benefits are also reciprocal, equally benefitting the communities and businesses surrounding the schools. Boxes 4.2 and 4.3 enumerate the benefits for schools and business based on an interesting document from the New South Wales Department for Education and Training (2004).

The KAREL project as one of the European Commission's success stories of Comenius partnerships is an additional good example for mutual benefits of school-business relationships. KAREL brought together four institutions from Poland, Greece, Turkey and Romania to develop curricular materials for science and technology learning with robots. The business community supported the design and testing of electronics by providing specifications and free samples for building prototypes.

Box 4.2. **Benefits for schools**

The school and its community

School-business relationships:

- have been associated with improved student motivation and achievement
- contribute to the development in students of attributes such as independent learning, good citizenship and employability
- encourage cohesion between the school and its community. For example, they can lead to more community involvement across the school
- strengthen community awareness of the school and improve its public image
- demonstrate that education is valued beyond the school and so enhance and develop positive attitudes to lifelong learning
- provide a tangible way for the community to support public education
- contribute to community projects that involve a variety of other government agencies and community groups. For example, programs for students at risk of disengaging from education and employment have been developed in many countries and regions.

Teaching and learning

School-business relationships:

- assist schools to deliver educational services by providing community support and encouragement, and resources such as volunteer time, money and equipment
- support the school curriculum, such as curriculum frameworks for VET
- enrich the school curriculum by:
  - providing accurate and up-to-date specialist knowledge and skills, such as in technical and industry-related subjects
  - providing work-related examples and case studies in school courses
  - presenting career information
  - assisting schools to maintain and raise standards in specialised curriculum areas
- enhance learning in schools by providing a wider range of contexts, learning styles and experiences through which students can acquire and apply knowledge and skills
- address cross-curricular content areas, such as work, employment and enterprise, difference and diversity, key competencies, multiculturalism and literacy.

Curriculum specialisation

School-business relationships:

- increase opportunities for innovation and enterprise
- support the development of specific curriculum expertise and achievement in individual schools
- support diversity of curriculum in a region, giving more choice to students
- contribute to vocational learning.

Box 4.2. **Benefits for schools** *(cont.)*

School-to-work initiatives

School-business relationships:

- provide opportunities for students to learn about the world of work
- establish the link between academic and vocational learning, and assist in the transition by students from school to work or to further education
- assist students to develop workplace skills, such as teamwork and problem solving, and increase an understanding of the range of skills that are of value in the workplace
- assist students to develop generic skills for the workplace, such as appropriate behaviour and forms of communication
- assist students to develop awareness of career opportunities, and of suitable employers and business organisations
- provide students with a wider range of opportunities to obtain and demonstrate skills and abilities and to perform at high standards
- provide opportunities for students to participate in a range of work-related activities, such as work experience, voluntary and mandatory work placements, mentoring with business staff and career shadowing
- provide suitable business role models who may have a critical influence in raising the expectations and participation of students in education and employment. This can be particularly important for at-risk students who often benefit from role models who more closely match their cultural, ethnic or socio-economic background.

Mentoring and management practices

School-business relationships:

- provide opportunities for teachers to learn about the world of work and the employability skills needed by students
- provide opportunities for teachers to communicate with the business community about educational activities that promote learning and develop skills and understanding in students
- increase the understanding of educational practices and terminology in businesses and the community
- provide opportunities for teachers to mentor with business representatives, to improve management skills or specific technical skills
- provide business role models for education staff, for example, as leadership models and as teachers-as-facilitators.

Resourcing

School-business relationships:

- provide skilled volunteers for school-based committees, for mentoring and for a range of school programs and activities
- provide opportunities to access state-of-the-art equipment and supplies for students and teachers
- can provide opportunities to access additional funds for the school
- can explore the development of innovative technology and processes, as creative students and businesses work together.

Source: adapted from NSW Department of Education and Training (2004), *Schools and Businesses Working Together*, www.det.nsw.edu.au/media/downloads/doingbusiness/schbusiness/schbuspaper.pdf, accessed 2 August 2017.

Box 4.3. **Benefits for business**

Local businesses will choose to participate in school-business relationships for their own reasons. These could include:

- obtaining professional and personal satisfaction from contributing to public education and the local community
- obtaining positive status or increased visibility in the community
- contributing to communication about, and therefore the development of, workplace skills and assisting in economic development, both current and future, in an industry or area
- learning about educational standards and practices in schools and increasing awareness of lifelong learning
- learning about youth, to improve staff selection and avoid stereotyping
- experiencing a wider cross-section of "workers" than usual, and so learning how to make provision for and to benefit from employing people with a range of needs and abilities
- learning about and participating in funded workplace learning schemes
- providing training and development for business staff; for example, exposing staff to quality school teaching/learning practices and mentoring opportunities.

Source: adapted from NSW Department of Education and Training (2004), *Schools and Businesses Working Together*, www.det.nsw.edu.au/media/downloads/doingbusiness/schbusiness/schbuspaper.pdf, accessed 2 August 2017.

Innovative workplaces

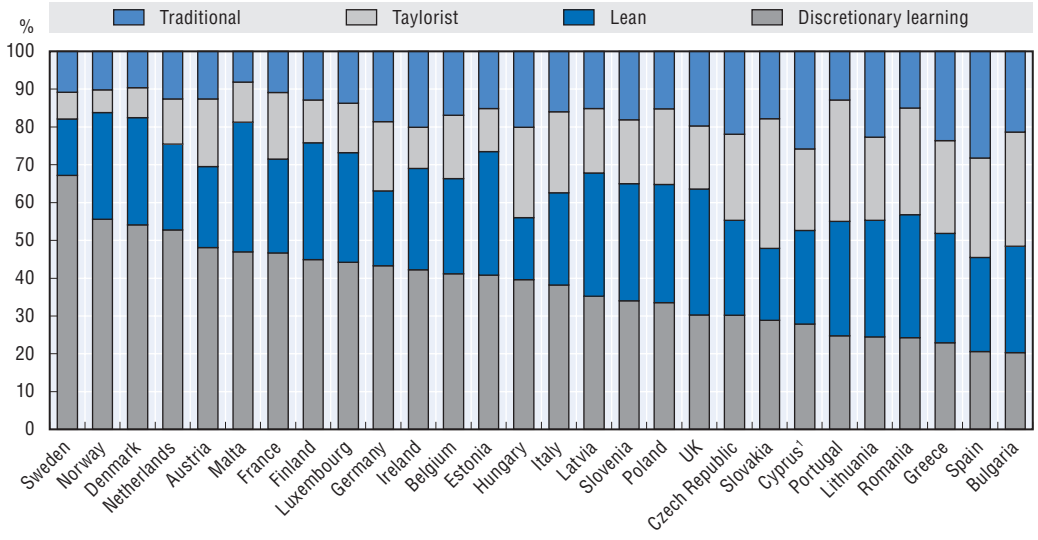
Work organisations based on learning

Connecting business and industry with schools in an innovation ecosystem definitely works better when firms also put learning at the centre. Innovation in enterprises and organisations does not only depend on research and development (R&D) and technological advances, but is also fostered by a particular organisational culture where learning is the key focus. Earlier OECD/CERI work supports and contributes to a broader approach to innovation analysis and policy by showing the importance of work organisation, interactions within organisations, and individual and organisational learning and training for innovation (OECD, 2010a). The analytical tools and empirical results this work provides are designed to open the black box of what a learning organisation is, that is, a work organisation supporting innovation through the use of employee autonomy and discretion, supported by learning and training opportunities. A learning organisation is an organisation that promotes management tools concerned with the improvement of individual and organisational learning. Learning organisations are those with a capacity to adapt and compete through learning.

Analysis of the 2005 data from the European Working Conditions Survey (EWCS) distinguishes four different types of work organisations in Europe, and assesses their relative prevalence (Figure 4.4). Discretionary learning organisations, which account for 39% of employees, are distinctive for the way they combine high levels of autonomy in work with high levels of learning, problem solving and task complexity. As Figure 4.4 shows, discretionary learning forms of work organisation are most widespread in the Netherlands, the Nordic countries and to a lesser extent Germany and Austria, while they are less common in Ireland and the southern European nations. The more bureaucratic lean model is most in evidence in the United Kingdom, Ireland and Spain and to a lesser extent in France, while it is little developed in the Nordic countries or in Germany, Austria

and the Netherlands. The low-learning Taylorist forms of work organisation show almost the reverse pattern to the discretionary learning forms, being most common in the southern European nations and in Ireland and Italy. Finally, the traditional forms of work organisation are most in evidence in Greece and Italy and to a lesser extent in Germany, Sweden, Belgium, Spain and Portugal.

Figure 4.4. **The prevalence of learning organisations in Europe (2005)**



1. Note by Turkey

The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

Note by all the European Union Member States of the OECD and the European Union

The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government

Source: OECD (2010a) *Innovative Workplaces: Making Better Use of Skills within Organisations*, http://dx.doi.org/10.1787/9789264095687-en Figure 2.2.

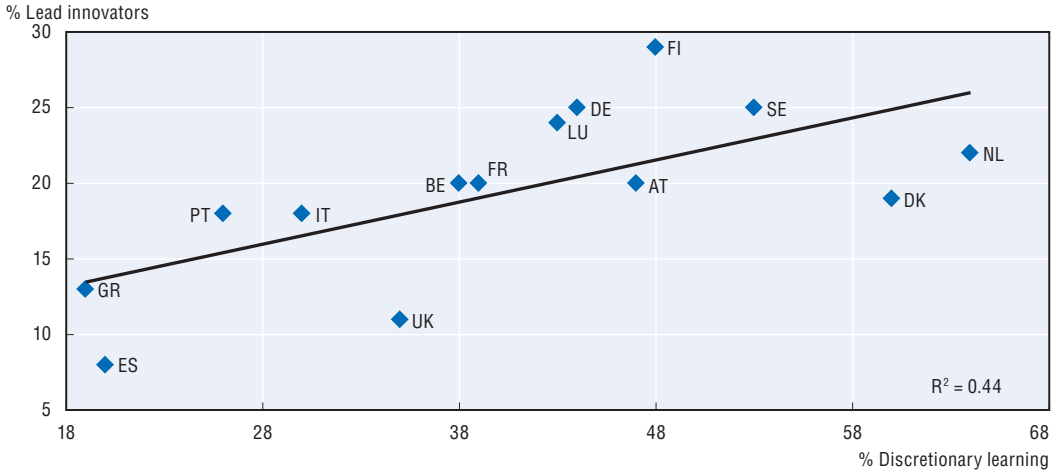
As Figure 4.5 shows, there is a strong correlation (R^2 of .44) between the share of organisations oriented towards discretionary learning and the share of "lead innovator" firms, as measured by the European Innovation Surveys. For lead innovator firms, creative in-house innovative activities form an important part of their strategy. All firms have introduced at least one product or process innovation developed at least partly in-house, perform R&D at least on an occasional basis, and have introduced a new-to-market innovation. These firms are also common sources of innovations that are later adopted or imitated by other firms.

Learning organisations in a learning ecosystem

Learning organisations can also be expected to interact with education and training institutions in their environment and network with them to satisfy their learning demands. Since discretionary learning organisations depend on the capacity of employees to undertake complex problem-solving tasks in relatively unconstrained or "organic" work settings, nations with a high frequency of these forms of organisation can be expected to have made substantial investments in the development of the knowledge and skills of their labour forces. Investment in education and training takes various forms and the analysis that follows focuses on the continuing vocational training provided by enterprises both through

external and internal courses. Some of this training will be designed to renew employees' technical skills and knowledge in order to respond to the requirement of ongoing product and process innovation in particular technological domains or areas. Other parts of it, notably that provided in-house, will be more organisationally focused and designed to develop employee competence in the specific routines and operating procedures required for the daily production activities of the firm. This latter kind of vocational training will be highly complementary to the more informal forms of learning that occur on the job, as employees seek solutions to the problems they confront in their daily work.

Figure 4.5. **Correlation between the prevalence of discretionary learning organisations and the share of lead innovators**



Source: OECD (2010a) *Innovative Workplaces: Making Better Use of Skills within Organisations*, http://dx.doi.org/10.1787/9789264095687-en Figure 2.3a.

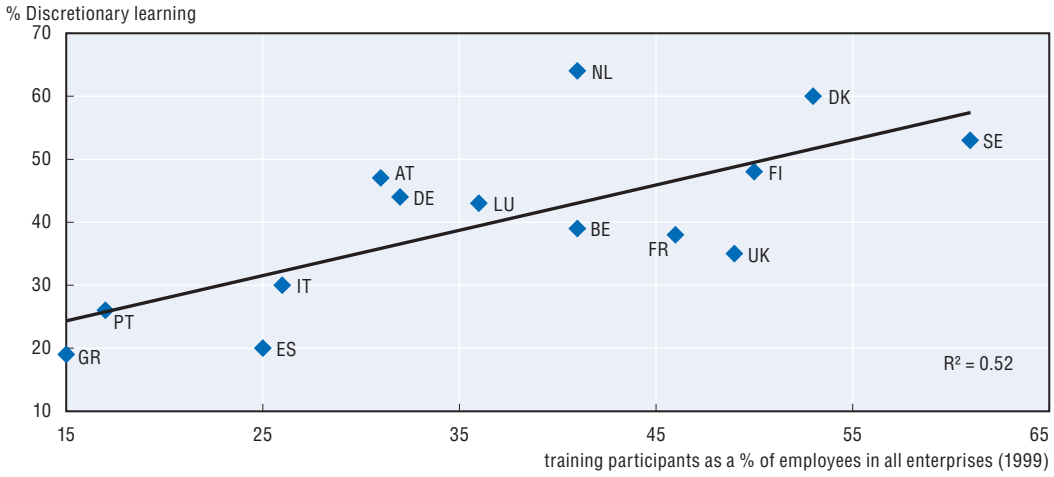
Figure 4.6 shows that there are there is a fairly strong positive correlation (R^2 of .52) between the frequency of discretionary learning organisations and levels of participation in vocational training by employees in all enterprises. The results suggest that training is a key complementary resources in the development of firms' capacity for knowledge exploration and innovation. Figure 4.6 also points to a possible north/south divide within Europe. The four less technologically developed southern nations are characterised by both low levels of continuing vocational training in enterprises and low levels of discretionary learning organisations, while the more developed northern and central European nations are characterised by relatively high levels of enterprise training and by high level use of the discretionary learning form of organisation.

The work on learning organisations has important lessons. First, in line with the OECD emphasis on widening the concept of innovation, they imply a need to place the organisation of work more centrally in the analysis of innovation. Indicators for innovation need to capture how material and human resources are used and whether or not the work environment promotes the further development of employees' knowledge and skills.

Second, policies designed to promote innovation, especially in countries that are trailing behind, have tended to focus on the need to increase expenditure on R&D, raise the percentage of the population with tertiary educational attainment and further the diffusion of information and communications technology. Considerable progress has been made with respect to the latter two indicators. However, the barrier to improving the innovative capabilities of firms might not be low levels of R&D expenditures, which are

strongly determined by industry structures and consequently difficult to change, but the widespread presence of working environments that are unable to provide fertile grounds for innovation. If this is the case, then an important policy measure would be to encourage the adoption of "pro-innovation" organisational practices, particularly in countries with poor innovative performance.

Figure 4.6. **Correlation between discretionary learning and participation in training**



Source: OECD (2010a) *Innovative Workplaces: Making Better Use of Skills within Organisations*, http://dx.doi.org/10.1787/9789264095687-en Figure 2.6d.

Giving a voice to employers

As already indicated at the end of Chapter 1, it is critically important that employers and business have a voice in education, and more particularly on the course of change and innovation in education, as much at the national as at the local and regional level.

Possibly more important than financial support, workplace learning opportunities and apprenticeships is the support from employers to schools as "critical friends" voicing their concerns, views and priorities. It is clear that contemporary employers and business have a great interest in what is happening in today's schools. Their views and opinions are more outspoken than in the past and the way they voice them is more organised.

Many countries face the challenge of persistently high levels of long-term unemployment among young people, as well as older workers. At the same time, employers often report that they are unable to find suitably skilled candidates to fill job vacancies. There is therefore a need for action to increase the employability of individuals, thereby boosting innovation, productivity and growth. This is considered key for economic growth as much as it is essential for social cohesion.

Reforming education systems and labour markets is critical to ensuring a smooth transition into the labour market. Towards this objective, employers are well positioned to help identify where education and training policies and initiatives can narrow skills gaps. Co-operation among employers, policy makers and education institutions is therefore important for strengthening the employability of individuals and can not only benefit employers and jobseekers, but also help reduce unemployment, strengthen competitiveness and foster inclusive growth for the benefit of economies and societies.

Forging closer linkages between the worlds of education and work is critical to help inform individuals' educational choices and enhance their employability (OECD, 2012). According to the 2013 Business and Industry Advisory Committee (BIAC) survey on the involvement in education of employers' organisations, this was consistently identified as a top priority across all levels of education (BIAC, 2013; OECD, 2015). The survey also indicated that methods to improve co-operation in education policy making can take different forms, such as establishing multi-stakeholder foresight systems, providing incentives to educational institutions to engage with employers, raising awareness among employers about education trends and fostering joint initiatives for work-based learning opportunities.

Engaging employers' organisations in education policy making

Employer engagement in education policy making can take many channels, including:

- employer-led proactive initiatives, such as roundtables with policy makers and education institutions, but also involvement in vocational education and training course design
- advice to policy makers through various consultation formats, such as official multi-stakeholder bodies or mechanisms of government consultation with business and employers' organisations
- less formalised forms of dialogue
- co-creation and co-decision processes, e.g. in designing vocational training courses or qualification systems.

Some of these channels are described in the BIAC survey. It finds that there is a largely even spread between the use of official multi-stakeholder bodies or mechanisms, internal consultation processes by employer organisations among their respective members, and informal dialogue with policy makers. All of these are considered to be similarly effective. No business organisation indicated that it had no participation in the education policy reform process.

Despite the various channels for engagement, their success is mixed. Around 90% of respondents to the BIAC survey indicated that some of their recommendations to their country's education reform discussions were considered to a sufficient extent, others not. Some respondents reported that their recommendations were only rarely considered.

Employers' priorities for education reform

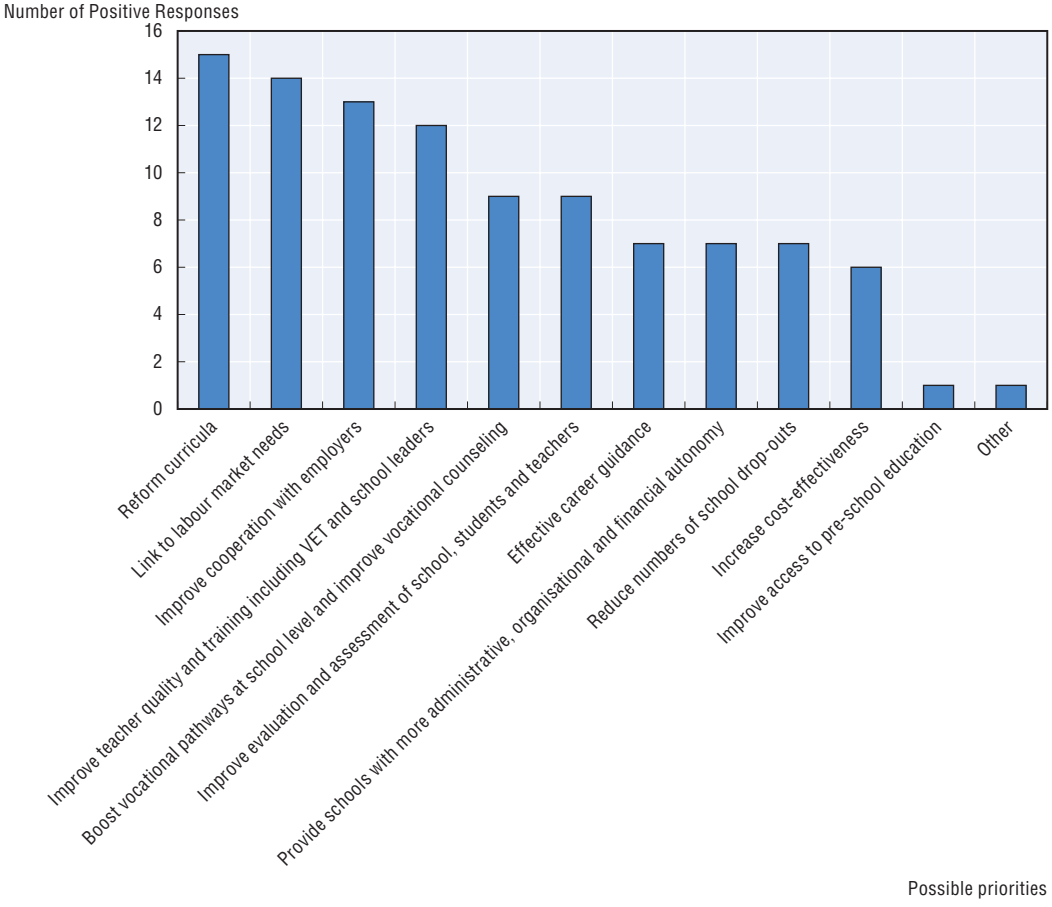
In a world where globalisation is creating new and shifting markets, changing demands for skills, and different forms of work, hiring a new employee represents one of the most important investment decisions for companies. On top of the many fundamental policy conditions that are required for businesses to create sustainable jobs, companies look for employees who have the particular knowledge, skills and character to meet their specific needs.

However, companies are challenged in many sectors and regions to find suitable employees, as many candidates have inadequate proficiency in basic tasks and skills (OECD, 2013). The demand for skills is increasingly shifting to more sophisticated tasks in technology-rich environments, yet at least 10% of adults on average lack the most elementary computer skills. At the same time, employers in Europe also report a particular shortage of soft skills such as communication skills and a work ethic (Mourshed, Patel and Suder, 2014). Skills gaps and mismatches threaten the competitiveness of enterprises, undermine social mobility and contribute to unemployment, as data from the OECD Survey of Adult Skills shows that those with low literacy skills are more than twice as likely to be unemployed.

In response to these skills gaps, greater priority needs to be given to improving the provision of basic skill levels prior to individuals' entry into the labour market. This entails increasing access for all individuals to high-quality, relevant education. Reforming education systems and labour markets to ensure a smooth transition into the labour market is critical.

It is very interesting to see that the education priorities of employers' organisations revolve mainly around reforming curricula, better linking education to labour-market needs and improving co-operation between education and employers (see Figure 4.7). The first two express a genuine interest in the content, quality and relevance of education, while the third shows the high interest among employers in better co-operation. Similar results have been found in other employer surveys.

Figure 4.7. **Employers' top priorities for education policy reform in schools**



Source: BIAC (2013), *BIAC Education Committee Survey Synthesis Report*, http://biac.org/wp-content/uploads/2014/05/130605_BIAC_Education_Survey_PREMIUM.pdf.

Further, the results of the BIAC survey show that employers also seek action on the following:

- Strengthen teacher quality and training, including for vocational education and training and school leaders: in order to motivate teachers and raise the quality of teachers and school leaders, actions should be taken to evaluate and incentivise them. One way of incentivising teachers could be through the provision of differential pay systems capable of rewarding teacher excellence.

- Strengthen VET systems: this includes encouraging more access into VET systems; improving VET qualification systems; increasing recognition of the need for excellence across all occupations, including VET; and facilitating transitions between VET systems and other levels of education. (BIAC, 2013).
- Encourage smarter investment in the areas of education that yield the largest economic and social benefits, for example improving access to and the quality of early childhood education and care, preventing students dropping out, and integrating immigrants.
- Increase the autonomy of schools (including school leadership), while at the same time improving their accountability through greater evaluation of schools, students and teachers.
- Improve career guidance for students, both in schools and higher education.

These policy reforms are needed in many countries to raise education outcomes and facilitate school-to-work transition, together with labour-market reforms to encourage job creation and incentives to work. Complementing these reforms, employer organisations and companies around the world are already implementing many of their own initiatives to help bridge skills gaps, while broader co-operative efforts will also be required among employers, policy makers and education institutions to help instigate the reforms needed to most effectively increase the employability of individuals.

Options for private sector engagement in education policy

While employer engagement in policy making helps to maintain a workplace perspective throughout education and training programmes, there is no single model for engaging employers and much may depend on country, region and sector specifics. A range of possible options for co-operation may be considered, such as:

- Countries could be encouraged to establish high-quality, system-level foresight systems for education policy, engaging all stakeholders (including employers and employers' organisations) to anticipate skills needs and labour-market trends over the medium term. This would help to ensure the labour-market relevance of lifelong education and training programmes, although this also will mean making it possible to adapt the organisation and operation of education institutions to meet these changing education needs.
- Education institutions could be encouraged to foster co-operation with employers, notably for assessment and quality assurance systems. Steps may include budget allocation and explicit mandates for employer dialogue initiatives.
- Awareness raising could be encouraged among employers on education and training trends, and the possibilities for engaging in education policy. Employer organisations can work with governments to help inform companies of such issues and explain the advantages of their engagement in education policy. BUSINESSHUNGARY and the Hungarian National Association of Entrepreneurs and Employers carried out a multiyear research project which sought to describe the labour-market needs of Hungary's regions, based upon questionnaire responses provided by companies and education institutions. Consequently, regional committees for the development of VET were established to address local skills needs.
- Joint initiatives to help develop work-based learning opportunities could be pursued through co-operation and trust building between employers, teachers, researchers and students. This could involve greater use of alumni networks; closer linkages between education institutions, new start-ups and existing employers; professional development

of teachers in various industries and roles; and deeper connections between education, innovation and research activities.

Strengthening mechanisms by which employers, policy makers and education institutions can co-operate to increase the employability of individuals is a policy issue that can generate significant shared benefits for all actors, as well as for economies and societies at large. This co-operation should reinforce the incentives to undertake the sorts of reforms described earlier that are required in education systems and labour markets, by improving their policy design and implementation.

Recognising that there are many different forms of co-operation, there is significant potential at the international level to examine conditions for success and to share good practices and lessons learned in order to build effective employer engagement mechanisms in countries, regions and sectors.

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Chapter 5

Policies for better ecosystems of innovation

This chapter considers the role of local, regional and central government policies in creating the conditions for schools to engage in innovation ecosystems. It examines the role of schools as partners in regional and local renewal, by delivering the skills on which local economies depend, acting as key nodes in the social fabric of their communities, and raising aspirations among local people to sustain change and innovation. It lays out a practical strategy schools can use to open up to businesses and the wider community and goes on to look at how businesses, not-for-profit organisations and other associations can benefit from developing partnerships with schools in their area. Finally it lays out the role of the regions in supporting innovation, and the policy principles behind creating learning cities and regions.

Introduction

The previous chapters have already discussed the important role of policies in hindering or enabling the engagement of schools in innovation ecosystems. Local, regional and central governments play a very powerful role in creating the conditions for schools to engage in innovation ecosystems. Innovating schools and engaging with the local economy requires navigating regulatory frameworks, accountability systems and policy conditions. Public policy can also create opportunities for developing local and regional ecosystems of innovation.

Policies intervene in many of the components, dimensions and steps involved in the process of innovation. They can hinder or facilitate the openness of schools to their local environments, the opportunities school leaders have to engage in partnerships and networking, the decision-making and governance arrangements for schools, etc. They also determine various dimensions of the education system that create the conditions for openness, such as the competences required from teachers, the autonomy of schools, the regulation of the time and space for learning, the objectives set for learning, the curriculum, and the teaching methods and pedagogies for learning.

Policies for better innovation ecosystems will also require horizontal collaboration between education ministries and other parts of central and local government, such as those responsible for research and development (R&D), general economic and social policy, and trade unions and collective bargaining. Taking a broad perspective on networking and innovation ecosystems also means that cultural policy and policies affecting social services and local community organisations at large enter the picture. A whole-of-government approach will be needed to create coherent and consistent framework conditions for innovation.

In France, for instance, within the National Education Ministry, two main institutional stakeholders contribute to developing innovation and experimentation: a network of 30 local authority advisors on innovation and the Department for Innovation and Experimentation Research and Development of the Directorate-general for Schools. Their role is to stimulate the initiatives of teaching staff, to pool and build on knowledge as well as to promote links with research.

But the word "policies" should not suggest that only governments and public authorities have a role to play. Developing innovation ecosystems is a task and a responsibility for all actors and agents of change in the community. Schools, enterprises and community organisations all have role to play by becoming the focal points of the collective energy of change in the learning and innovation ecosystem at large.

The European Commission's Directorate General for Education, Youth, Sport and Culture is about to publish a study on 'Tools and policy pointers for mainstreaming innovative pedagogies and school organisation practices'. The aim of this study is to better understand how policy-makers can support all levels of the education system in mainstreaming innovative school organisational practices and pedagogies. The study also seeks to analyse what systemic elements act as catalysts and inhibitors to schools being 'innovative'. Ultimately, the study will deliver tools for policy-makers to promote new models for positive change at all levels of the school education system, including policy pointers and practical methods to support transformation within schools.

What schools can do

Regional growth and city development have become important policy objectives for central, regional and local government in many countries, especially for depressed regions. Supra-national bodies, such as the European Union, are also very interested in regional development, in order to mitigate economic and social inequalities and to boost overall innovation. However, although the traditional policy instruments chosen, such as investments in infrastructure, network connectivity or transport, make sense in many places, they are often not well suited to the specific challenges and opportunities of a knowledge-based economy.

Too often, education, schools, skills and human capital in general are overlooked in regional and local development and innovation policies. Even when education and skills are part of the policy mix, consideration is often confined to universities, which are expected to play a regional innovation role through their research and development functions in technology. However, schools in general, including primary and secondary schools, vocational training institutes, and organisations for non-formal education, can be very important and effective partners in regional and local renewal.

First, they make up the educational infrastructure that takes care of learning, educational qualifications, workforce training, skills development and broader cultural learning. The educational infrastructure of a region produces the knowledge and skills on which the regional economy depends. They deliver the qualified workforce for regional industry and business. The quality of education provided filters down through the workplace via their graduates, but also through apprenticeships and fieldwork placements, or through various kinds of practical assignments in project-based learning.

Second, and equally important, schools and other educational institutions constitute critically important nodes in the social fabric of regional societies and local communities. They are places where families meet and network, where social capital and trust are generated and social cohesion is constructed. The quality of life in local communities depends on the strength and impact of educational institutions. Schools contribute to the development of regional and local identities, while at the same time also transmitting modern attitudes and values, including global awareness.

Third, and related to the previous two points, schools' educational function and impact on the community can help to raise the level of aspiration among people, necessary for a sustainable process of change and innovation. An important dimension of change is that people believe that they can cope with it and can steer it if they have the right kind of cognitive and emotional tools. A well-educated population is critically important not only for knowledge-based change and innovation in the economy, but also for accepting and absorbing innovation into regional society and the many changes in the population's lifeworld that come with innovation.

By opening up to local enterprises and communities, schools can reinforce their role in building strong and inclusive local societies and innovative economies. They can do this by providing free use of school infrastructure and facilities to local enterprises and community organisations, but also – and more interestingly – by actively involving the learning resources available in the local economic and social context in the learning process. The mutual benefit can be enormous, both to the learners who benefit from real-world challenges and learning opportunities and from the chance to serve the community, and to the enterprises and the community at large who profit from learners' contributions.

Strengthening the role of schools in regional and local development requires schools themselves to become more innovative and dynamic, more specifically by innovating their pedagogical core and by turning into networking organisations in which connectivity to the surrounding environment becomes part of the educational mission. Networking and developing partnerships across the economy and community are an indispensable aspect of sustainable innovation in schools. Innovating schools, innovation in the regional economy and social innovation in the local community are not different from one another, but just different dimensions of the same process of transformation.

A strategy for schools to open up to businesses and the wider community is laid out in more practical terms in Box 5.1.

Box 5.1. **A four-step process to develop school-business relationships**

Many schools already have effective procedures and extensive experience in developing relationships with businesses. These emphasise leadership and sound organisation by the school and provide guidance for businesses who have not established school-business relationships before.

The four-step process recommended below can be used by schools as they review existing relationships and seek to develop new ones. This process takes account of many issues that can arise when school-business relationships are developed and implemented.

1. Conduct an audit of school needs

A representative group that may include teachers, students, parents, business people and other community members could meet to discuss the potential for developing school–business relationships. For example, the group could complete a strengths, weaknesses, opportunities and threats (SWOT) analysis, considering factors such as:

Your school's strengths

- Does your school have a strong mission statement and a clear agenda for the future that provides a focus for closer relationships with business?
- Are there distinctive characteristics of your school and/or your teachers and students that may align with local businesses in terms of values, image and resources?
- Is there a core of staff, parents and/or other community members who are committed to providing increased choice and diversity in your school's educational programmes through school-business relationships?
- Are staff open to training and development opportunities, in curriculum and management areas, that could emerge from school-business relationships?
- Does your school have management and administration structures that can support school-business relationships?
- What strategies or programmes are already in place in your school to enhance work-related learning and to encourage positive attitudes to lifelong learning?
- Does your school develop exit plans for students with special needs?
- What school-business relationships already exist? For example, these may relate to excursions, work experience and work placements, school fundraising or more formal partnerships, sponsorships or other relationships.

Potential weaknesses

- How well does your school understand its local business community and its local operating environment?
- Does your school have sufficient local business and community recognition to attract supporters?

Box 5.1. **A four-step process to develop school-business relationships** *(cont.)*

- Does your school have effective communication mechanisms, such as a prospectus, newsletter and webpage, which could be used to attract and distribute information about relationships with business?

Opportunities

- Do individual students have needs, aspirations and aptitudes that could be met through school-based interactions with business?
- What types of business involvement could make your school more innovative and help to raise standards in teaching and learning?
- Is funding available for the implementation of school-business activities?
- Have local businesses or progress associations expressed interest in supporting public education? Increasingly, the business sector is seeking links that help to develop an educated, skilled and motivated workforce and contribute to development of young people as active members of society.
- Will local commerce and progress associations disseminate information about your school's intention to develop school-business relationships and provide opportunities for networking between your school and businesses?
- Do networking and communication channels with local businesses already exist? Do any teachers or parents participate in local business or progress associations?

Potential threats

- What resources, in-time and equipment, will be required to develop and maintain effective school-business relationships? What existing programmes could be curtailed as a result?
- Is there an attitude of responsiveness, client service and openness to change within your school?
- Are potentially supportive local businesses already aligned with other schools or non-school organisations, making new school-business relationships unlikely or limited?

Once the needs of your school have been clearly identified, you are ready to look for businesses that will be able to provide support, encouragement and resources.

2. Collect and evaluate information about local businesses and establish contact

Suitable businesses have a public image, products and services consistent with the values, goals and specific policies of public education. To identify and make contact with suitable businesses, consider:

- Which local businesses are suitable? List as many as you can. Some sources of business names include: school committees and parent groups, industry associations and local business organisations such as chambers of commerce, regional government bodies and local government, and community groups.
- What are the capabilities of these suitable businesses? Find out about their skills and systems, industry knowledge, and available equipment or resources. Investigate their ability to meet the needs of your students, such as physical access for students with disabilities.
- What is the relationship between your audit of school needs and the attributes of suitable businesses? Identify businesses that may significantly contribute to teaching and learning. The school can make initial contact with these businesses, to ascertain their interest in a school-business relationship and to explore possible interactions. Businesses may be willing to host a brief meeting to discuss possibilities.
- How will your school develop relationships with suitable businesses? Follow-up after initial contact is very important. For example, the business may offer a facility tour for school staff to learn more about the business and to meet some employees. Your school could offer to show business representatives the facilities at your school and introduce participating staff.

Once suitable and supportive businesses are identified, you are ready to develop clear guidelines for each relationship that will underpin successful programs and activities.

Box 5.1. **A four-step process to develop school-business relationships** *(cont.)*

3. Develop clear guidelines for collaboration with specific businesses

Guidelines for each school-business relationship are valuable as they clarify expectations and commitments. They should be jointly developed by school and business representatives (ideally, along with student, parent and community representatives) to promote commitment to the relationship and its goals. While guidelines can remain oral, written agreements are often clearer and engage more commitment; they can also be useful as evidence when new school-business relationships are being negotiated.

When developing guidelines, questions to consider could include:

Public education requirements

- How will the relationship enhance teaching and learning in public education and, specifically, in your school?
- What are the requirements of national and regional policies and guidelines, child protection, privacy and all other relevant legislation for the relationship?

Vision and scope

- What are the common goals and shared aspirations for the relationship? A longer-term vision, say three to five years, is desirable.
- Is the school principal committed to the relationship and vision? Is the business CEO? Is there a core of other school and business staff who will undertake to pursue the shared vision?
- Can the vision be expressed in specific, measurable outcomes? Do most relate to realistic and achievable student performance outcomes? Is the bigger sense of the vision still evident through these outcomes?
- What roles will be required to achieve the outcomes and to support the relationship?
- Are any budgeting and/or resourcing commitments agreed as part of the relationship?
- How will achievement of outcomes be evaluated? What data will be measured or collected? How and to whom will results be reported?

Mechanisms

- Who will be responsible for the roles defined for the relationship? Can individuals be designated to particular roles?
- How can leadership and responsibilities be shared, to help distribute the workload and to ensure that the relationship continues effectively when individuals move on?
- How regularly should the organising group of school, business, student, parent and community representatives meet to evaluate progress towards outcomes and to review the school-business relationship?
- What records of meetings will be kept? Who will receive copies?
- How will your school and the business communicate with each other? Will frequent face-to-face meetings or teleconferences be timetabled? Will emails be exchanged to a schedule or as need arises?
- Are special strategies needed to develop a common vocabulary and open communication between your school and the business?
- How will conflict and/or misunderstandings be discussed and resolved?
- Would it be advantageous to formalise the relationship in a document? For example, this could be a joint declaration, contract or memorandum of understanding.

Once there is agreement about how the school-business relationship will operate, programmes and activities can be planned.

Box 5.1. **A four-step process to develop school-business relationships** *(cont.)*

4. Develop a plan for implementing and evaluating school–business relationships

Plans should be clear and relate to short-term and long-term goals. Concurrent one, two and five year plans provide sufficient detail to encourage action while supporting continual growth in school–business relationships. Questions to consider during planning could include:

- What programmes and activities will enhance teaching and learning and the achievement of outcomes?
- What is the priority order for proposed programmes and activities?
- What is a realistic timeline for undertaking programmes and activities?
- Where will programmes and activities be held? For example, they could occur at school, in a workplace, in another training location or across all these places.
- When will events or reporting about programmes and activities occur? For example, can dates be set for the release of newsletters and media reports or for school assemblies and public displays?
- When and how will programmes and activities be evaluated?
- What events are needed to build a sense of team for school, business, student, parent and community participants?
- What skill sets and capabilities are needed by various participants in the school-business relationship for it to succeed?
- What training and development, for the school and/or business, will be needed to support the implementation of programmes and activities? How can this training be provided?
- How will people be incorporated into the school-business relationship to keep it fresh and active? How will vacancies be filled when key people leave?
- When and how will the overall school-business relationship be evaluated? Factors to consider could include the teaching and learning benefits for the school, time and cost efficiencies, and potential improvements to this and other school-business relationships.

Each school can adapt this recommended four-step process to better fit its circumstances. There are also other procedures that have been established and endorsed by educational and training organisations. In addition, educational and training organisations have proposed a range of strategies that have been successful in supporting school-business relationships.

Source: adapted from NSW Department of Education and Training (2004), *Schools and Businesses Working Together*, www.det.nsw.edu.au/media/downloads/doingbusiness/schbusiness/schbuspaper.pdf, accessed 2 August 2017.

What businesses and communities can do

Local and regional learning and innovation ecosystems very much revolve around enterprises, businesses and not-for-profit organisations in the community. However, with a more holistic approach to innovation their success depends on their ability to create partnerships and networks with other agents of change. In an increasingly knowledge-based economy innovation will depend on the capacity of innovators to connect to and engage those institutions in the economy that produce, develop and disseminate knowledge and skills. Schools thus become the obvious partners.

For example, Google deploys the apps for students and teachers in the Peruvian Innova Schools, a private educational system that offers quality education at a reasonable cost with initiatives and interventions that have innovation at the core. Another strategic partner for Innova is IDEO, which is an international consultant firm with whom the schools have developed some of the innovative strategies in terms of use of space, pedagogy, construction model, use of technology etc.

As discussed in previous chapters, employers have a clear interest in working closely with schools and they are increasingly doing so. This is most obvious in the area of vocational education and training, where industry has a direct role – and interest – in establishing well-functioning partnerships with schools and training institutes. The provision of apprenticeships and workplace training is probably the single most important form of engagement for businesses. Industry will also play a natural role in defining skill needs and providing feedback on vocational education and training programmes, curricula and learning outcomes.

Enterprises and organisations also need education and training institutions to meet their own training and human resource development needs, often complementary to their own internal training and learning investments. Businesses are increasingly outsourcing training to specialised providers and schools are starting to develop their capacity to engage in the education and training market. When firms develop into real learning organisations, their human resource development needs will move beyond specific specialised knowledge and skills into broader skills-development demands, where schools can play a more important role. And, as shown in Box 4.3 in the previous chapter, businesses can gain many other, wide-ranging benefits from developing partnerships and networking with schools in their environment.

It is critically important that enterprises, with the support of intermediary bodies such as chambers of commerce or sector organisations, move beyond a purely utilitarian and instrumentalist approach and develop a strategic vision for networking with schools in a wider learning ecosystem development perspective. A learning and innovation ecosystem perspective might take more time to develop and to yield positive outcomes, but will ultimately lead to an environment that will be beneficial to business as well.

Not-for-profit organisations and associations in the local and regional community can also enhance and improve their networking and partnerships with schools, for example by intensifying their demand and opportunities for service-learning, fieldwork and applied research assignments. They can benefit from using school infrastructure more intensively after lessons finish or get involved in extracurricular activities.

For these organisations too, the immediate benefits are clear, but the longer-term systemic benefits might even be more relevant. The quality of life in the community depends on building relationships of social cohesion, trust and social capital and the associated cognitive, social and emotional skills that young people learn in actively performing these activities. Volunteering and community engagement is something that is learned, not given by nature.

Making regions agents of change

Regions support innovation to boost growth and improve quality of life. Innovation support is relevant for all regions, but an appropriate policy mix must be formulated. The questions are how to set priorities among possible avenues of innovation promotion, and how to design policies and implement an appropriate mix of instruments corresponding to defined priorities.

What can regions do? Regions are, or can be, agents of change. Regional governments play a key role in recognising opportunities for change, mobilising resources towards diversification and identifying new frontiers. However, this search for new regional advantages will require input and collaboration from the community at large. Regions can

transform themselves by what some have termed "constructing their regional advantages", based on a clear appraisal of their existing asset base and attraction of new talent and businesses. The focus of regional innovation policies should hence be on encouraging openness to change by agents in the system. Business support instruments should prioritise the development of human capital and learning processes, including cultivating behavioural change in people and firms.

The policy implications for learning cities and regions are summarised in Box 5.2.

Box 5.2. **Ten policy principles for creating learning cities and regions**

Cities and regions seeking to improve their economic performance within a knowledge-based economy through the development of innovation-intensive activities are advised to:

Inputs to the learning process

- Ensure that high-quality and well-resourced educational provision is in place, on which effective individual learning throughout people's lives can be developed.
- Carefully co-ordinate the supply of skilled and knowledgeable individuals through education and training, and the demand for them in the regional economy, so that the full benefits of individual learning may be reaped through its effects on organisational learning.
- Establish appropriate framework conditions for the improvement of organisational learning, both within firms and between firms and other organisations in networks of interaction, and demonstrate to firms the benefits of these forms of learning.
- Facilitate effective organisational learning not simply for a pre-selected set of conventionally defined "high-tech" sectors, but across all those industries and services within the regional economy that have the potential to develop high levels of innovative capacity.
- Identify very carefully the extent to which the resources currently available to the region (such as existing industries, educational provision, research facilities and positive social capital) constitute an impediment to economic development ("lock-in") or may usefully contribute in developing innovative strategies for the future.
- Respond positively to emergent economic and social conditions, especially where this involves the "unlearning" of inappropriate practices and bodies of knowledge (including policy makers' own) left over from the regional institutions of previous eras.

Mechanisms of the learning process

- Pay close attention to mechanisms for co-ordinating policies across what have generally been separate departmental responsibilities (for industrial development, R&D, science and technology, education and training and so on) and between different levels of governance (regional, national and supra-national).
- Develop strategies to foster appropriate forms of social capital as a key mechanism in promoting more effective organisational learning and innovation.
- Continuously evaluate the relationships between participation in individual learning, innovation and wider labour-market changes, especially with respect to the social exclusion of groups within the regional population.
- Ensure that the regional strategy for learning and innovation is accorded legitimacy by the population of the region to be transformed.

Source: OECD (2001), *Cities and Regions in the New Learning Economy*, http://dx.doi.org/10.1787/9789264189713-en.

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ANNEX 1

Report from the 2015 Global Education Industry Summit, held in Helsinki on 19-20 October 2015

The following text provides a report, drafted by the general rapporteur and the session facilitators, of the discussions that took place at the first Global Education Industry Summit in Helsinki on 19-20 October 2015.

Summary

Discussion in each of the sessions was helpful in identifying challenges that could be addressed through collaboration between all of the parties associated with education and some of the solutions. At times different points of view highlighted tensions. Such tensions appeared, for example, where innovation reduced dependence on traditional teachers, possibly in a situation where there is a limited supply of teachers, pointing towards the importance of careful consideration of context.

The argument in support of analysis of context was also seen to be critical when considering taking a successful practice in one location and adopting it in another. As suggested at the summit, practice is not changed by having technology. It is not like fire. You can be warmed by simply standing next to a fire. Simply providing technology or making people aware of an innovative practice is unlikely to change anything. Greater care in management of change, perhaps through the adoption of design thinking, might have a greater likelihood of impact and points again to the importance of supporting communities and networks of practice to take practice forward.

Another tension lay in the tendency to view groups as homogenous. Students are students, teachers are teachers, commercial companies are commercial companies and policy makers are policy makers. Just as there seems to be increasing recognition of the benefits of personalisation for students' learning, so we should look at how to engage each of these other groups and the constraints or freedom within which they work. Those with solutions to promote, sell or share may still be excellent listeners and have the judgement to apply their creative thinking and experience to the learning challenge with which they are faced. Alternatively, they may be solely focused on their pre-prepared solution and be a less supportive party with which to collaborate. In similar ways, finding where teachers are in terms of the normal distribution curve of innovative thinking may indicate how likely they are to adopt and succeed with new ways of working and point towards the type of personal development appropriate to their circumstances.

Solutions to each of these challenges probably lie first in the development of each of us as lifelong and life-wide learners and implementers. It is partly about what we know, what we are able to do, and how we apply our knowledge and skills to the challenges we meet. That reflection on our own work is important in modelling the skills and behaviours that many of us appear to wish to see in our students.

Second, we should focus on collaboration and assist set up the circumstances in which those behaviours are adopted and amplified – in order to seek and implement workable and supported solutions. Taking steps to develop the conversation between industry, governments and education professionals is one step towards setting the circumstances in which collaborations can develop. Providing mechanisms for networking and development of communities of practice is another way in which collaboration might be assisted.

Third, in a more structured and evidence-based way, we might learn from the experience of other sectors and consider their adoption in education. To do so would not simply be a question of looking at outcomes, but also understanding the policies, skills, guiding values, behaviours, and practices. The Global Education Industry Summit is a potential location for learning from such practice given the participation by industry and other organisations.

Further suggestions for actions included:

- Recognising the importance and strength of learning from time off line as well as time on line.
- Providing the circumstances in which government, industry and education can effectively "speed-date" and match potential solutions with challenges to be addressed.
- Recognising and articulating what constitutes an effective market for education technology and supporting its development in countries where none exists.
- Addressing the relevance of learning to life and student's future success and not presuming relevance – associated with "unlearning" some of the practices we have developed.
- Development of a culture of appropriate risk taking and learning from failure rather than viewing failure as purely a fault.
- Creating a shared resource of vignettes demonstrating the practices that are successful through government-education-industry collaboration.
- Creating a shared resource to gather information on leading schools using technology particularly well and how they are managing their relationships with industry and government to achieve optimal results.
- Markets for skills, enterprise and small businesses can have positive societal impacts, providing opportunity and hope to sections of the community that might have been excluded from traditional success. Finding ways in which industry and entrepreneurs can share their expertise and approach may help spread their practice more widely.
- Call for actions from each country participating in the GEIS2015 to suggest a number of new ideas and act upon them.
- Ensure that the overriding vision for education-industry collaboration is clear and that actions are initiated in support of that vision.
- Ensure that the creative energy and ideas of children and students are engaged and supported.

SESSION 1 – Redesigning learning environments to better support learning

Three challenges were set for discussants:

1. Schools need a physical and digital infrastructure through which improved teaching and learning products can be delivered. However, using technology does not automatically improve learning – it is not an innovation like fire, where one gets a benefit just by standing near it. Instead, technology is a catalyst that can empower deeper content, more active learning, more authentic assessment, and links between classrooms and the real world. These are innovations we know improve learning. How can we ensure that schools are given the optimum digital infrastructure?
2. The range of knowledge and skills students need for a global, knowledge-based, innovation-centred economy is greater than can be taught in even the best classrooms during the school day. In the world of adult employment, people do business anywhere anytime. Working is no longer localised in an office but distributed throughout the waking life of the adult. Schools need to adapt learning to similar modes of living. The biggest difference between an industrial educational system and a 21st century educational system is extending learning life-wide, using technology to make any place, anytime a rich opportunity for learning and enlisting the help of parents, community members, and informal educators as students' coaches, mentors, and tutors outside of school. Technology is a vehicle for accomplishing this vision, as it already has in business and in wellness. How can we help learning become life-wide?
3. The biggest problem in education is scale. While phones and social media have gone to scale, education innovation has not. We can find wonderful learning environments that accomplish every educational goal one can name – but the vast majority of these are not scalable to new settings that do not have all the unusual conditions for success these innovations require. The big challenge for business in education is designing and implementing scalable innovations that adapt to the strengths – and weaknesses – at each educational site. As we have seen in other sectors of society, technology can be a powerful means for scale. How can we develop innovations that are designed for adaptation not simply adoption?

Discussants reinforced these challenges, or added additional ones:

1. We need to bring innovative approaches into the standards infrastructure. Can we develop new ways of measuring which validate innovative approaches and how is this best achieved?
2. We must move forward in the light of evidence and experience, at the same time as enhancing teacher capacity and motivation. So how can we support teachers so that they act at the heart of innovation?
3. We need to use technology to improve teacher capacity, not provide a substitute. How can we avoid corporations using their significant investment to replace professional teachers with low-paid substitutes?
4. The differences between educational challenges across Europe remain vast. How can we build on a Europe-wide interest in improving learning outcomes to take learning solutions to scale?
5. There is widespread agreement that learning needs to become more personalised, and yet most of the innovations remain fixated with mass roll-out. How can we retain the focus, while going to scale, on the individual child?

6. We need to improve educational outcomes for migrant children. For instance, how can we shorten the time it takes for migrants to learn a new language?
7. We know that we want more entrepreneurial young people, and we know that they will need information and communications technology (ICT) skills and knowledge. But what skills and knowledge precisely will be of value to them?
8. The world beyond education is changing very rapidly. For instance, computers have fundamentally changed the nature of maths, and yet we still teach maths as if nothing has changed. How can we get education to start moving at the speed of the world beyond?
9. The skills required in the labour market are changing. How can the two sectors of education and employers work more effectively together to generate better outcomes for young people's employment prospects?
10. Informal learning plays a much greater role in young people's lives than ever before. Learning in the family is now of much greater importance. What sort of infrastructure would better support family learning?
11. Most innovation does not come from the top, it comes from the bottom. How can we ensure that the sparks of innovation light system-wide conflagrations?
12. What stops teachers from innovating is not lack of budget or lack of will. It is lack of time. How do we make more time for teachers to plan and implement better practices?
13. We must remember that education is more than the core subjects of science, maths and literacy. How do we ensure that local traditions, culture and values continue to play an important part in the education of young people?
14. Education should be about improving the quality of people's lives and to do so we must better understand what young people want to learn and why. How can we create systems that allow pupils to self-organise to achieve their chosen learning?
15. We need to put more effort into improving education in the Southern two-thirds of the globe. How can we focus on solving problems in these regions quickly ensuring that change is for the better?
16. Schools in Denmark have been focusing on life-wide learning. How can we build on this experience to allow more private companies, sports clubs and other organisations to support and enhance the learning of pupils in schools?
17. We should view learning as taking place in a much wider set of environments than in school alone.
18. New Zealand has a sophisticated integrated education service. But is such organisation the prerogative of small more affluent countries, or can this model be applied to developing countries with huge resource challenges?
19. National governments with responsibility for education are under huge pressure to get education right. Education is probably the biggest single activity for which each government is responsible. How can we turn this focus on educational progress at the political level into a force for good?
20. There are innovations that have been developed, trialled and have proved to be successful. But how can we make education systems more open to adopting such innovations?

The discussion was concluded with the reflection that what had emerged was a comprehensive list of challenges to address. The list of challenges proved the importance of opening up this dialogue.

SESSION 2 – Mobilising technology to widen access and improve quality

Education systems face the challenge of widening access to high-quality opportunities to learn. In the 20th century, education at scale and standardisation have led to an extraordinary expansion of education systems. However, scale and standardisation have had their limitations and have not brought opportunities to all.

- Can technology do more to widen and differentiate access for disadvantaged learners?
- How can technology be harnessed to personalise learning and to fine-tune educational opportunities to each learner's needs?
- Which policies can and should be developed to ensure that all learners benefit from the best possible opportunities to learn?

The opening presentation in this session reflected on the challenges of widening access and improving quality at the same time. New educational resources including open education resources have made significant impacts, as have new formal and informal education environments.

Digital technologies increase access to education and opportunities to learn, but technology is not a magic wand, we need to think about other factors including access to technology and connectivity, social attitudes to learning, legal issues associated with use, skills and competences of learners and teachers, and business and financial models.

In some countries access to technology and connectivity is considered a public good. The goal for all countries must surely be universal access to all that you need as a teacher and a student. We should also reflect on the growing influence of non-market entities and their ability to provide access. Services and offerings such as Wikipedia, Khan Academy, freely available press articles and video material through YouTube provide additional opportunities. Some governments decide to provide resources, often framed as open educational resources (OERs), for example, content repositories in Belgium and Norway, state content aligned to the Core Curriculum in the United States, open book publishers in South Africa and France, policies for teacher resources in France and New Zealand, and open digital textbooks in Poland.

Access to content will not on its own transform education, although it can be a foundation for a good education. We should transform ways in which educators and learners make use of content; where appropriate we should move static content and traditional resources like textbooks towards new, more engaging materials that encourage curiosity, exploration, engagement and learning.

Discussants discussed some of the challenges of "Mobilising technology to widen access and improve quality" and suggested that a vision for ICT in education must precede the development of systems, criteria, networks, clusters and co-operation as a foundation for improving quality in education. The discussion could be divided into the following six themes:

1. Open educational resources

Open educational resources (OERs) are growing in breadth and quality, as is their use in classrooms, networks, and school communities. It is important to understand that "open" does not necessarily or simply mean "free of charge" but may also mean free in terms of ownership and usage rights. The use and adoption of OER materials is increasingly a matter of policy in schools, especially in the many disciplines for which high-quality educational

content is more abundant than ever. The goal is that OER materials are free to copy, free to remix, culturally sensitive and free from barriers to access, sharing and educational use. The goal is to give students the flexibility to make their learning as effective and efficient as possible. Appropriate mentorship, especially for primary and secondary school students is essential.

Partial solutions may lie in developing and sharing appropriate policies for open educational resources built on co-operation between industry and the ministries and public organisations. Systematic development of networks and clusters may encourage joint development of an open education resource market.

2. Open standards

Better, more accessible services are best delivered through a truly open process: open to those who use our public services, and open to suppliers, of all sizes, so that competition and innovation can deliver improved services. Transparency and access to data should be at the heart of government and public services, making it easier for publishers to release data in standardised, open formats.

3. Research and development

Evaluation, research and development in terms of prototyping new approaches to use of materials, are required to ensure that progress is encouraged and good practice developed.

4. Teacher education

Teacher education should include purposeful use of IT for teaching, to equip and support teachers in development of core skills in teaching with IT and to encourage engagement of institutions of higher education and industry partners in schools. Such work could help to provide states, districts, schools, and teacher education institutions the foundations upon which the integration of technology into their programmes can be built.

5. Education Leaders

The rapid and continuing development of technology in schools requires a new generation of leaders who use these new tools to enhance their own productivity and decision-making activities and who understand the benefits of integrating technology into learning. Such mature leadership in the use of technology includes understanding of when it can provide real benefit, and when it cannot. Leadership is often the most important factor in the successful integration of ICT into a school's instructional practices and curriculum. Research has shown that without effective and supportive leadership, changes in the teaching-learning process and widespread, effective use of technology in learning are not likely to occur.

6. Personalised learning

A key opportunity for technology's use in support of learning lies in its potential to support and develop students' personalised learning. Software can track and indicate learners' progress in relation to learning objectives, reflect their state of knowledge at granular levels, and use gathered evidence to suggest an appropriate next step for each student. Technology has the potential to make learning plans more flexible and personalised, and to assist in making students' learning and teacher's teaching as effective as possible. Such personalisation can assist not only within the school system, but also in life-wide and lifelong learning.

SESSION 3 – Digital revolution supporting pedagogies and teachers

Digitisation challenges everyone, but also enables new opportunities. Teachers in particular have a role to play. However, is simply "going digital" enough, or should digitisation be considered an opportunity to rethink pedagogies and teaching practices, and more broadly, change working cultures in education?

If digitisation is such an opportunity, then policy making should respond by providing new opportunities for teachers, so that students benefit from new opportunities to learn and to demonstrate their creativity. New pedagogies should meaningfully make the most of digital devices and resources.

Making such digital change in education cannot be left to schools and educational institutions alone; it requires smart innovation in devices, software, materials and, of course, the associated development of competences and strategies for teachers and school communities as a whole.

In most countries governments are not at the steering wheel of digitisation, but they can certainly set the framework conditions. We need innovators and experts from government, business, research and education to work together to develop and implement new approaches for educating and supporting teachers so that they are well prepared and equipped to face the digitisation challenges. How can and should governments and industry work together to support this?

The digital revolution is a very real revolution. The opening presentation of the session highlighted two of the fundamental shifts in learning and education that are having an impact on pedagogies and teaching practices:

- increasing access to information and educational material
- new ways of presenting the material, reflecting on it and discussing it

In terms of access to information, digitisation is introducing many more possibilities than ever before. Traditionally, students were limited to access to a textbook and to a teacher. When trying to solve a problem in class, students could study the textbook or ask the teacher. Now things are different – connectivity, devices and access to a world of information in digital format is fundamentally changing this dynamic.

In terms of presentation of learning material and how discussions in class and beyond take place, digitisation has introduced many technological developments. Discussion on the digital revolution has tended to concentrate around presentation, rather than access to information. In the longer term, the revolution in access to information is likely to have a greater impact than the changes in presentation.

It seems obvious that digitisation should be considered an opportunity to rethink pedagogies and teaching practices, and more broadly, to change working cultures in education. The real questions are, however, how will this change happen and what is the role of policy makers?

How do we provide new opportunities for teachers to make new and make the most of new pedagogies? We need innovators and experts from government, business, research and education to work together to develop and implement new approaches for educating and supporting teachers so that they are well prepared and equipped to face the digitisation challenges.

Building innovative capacity into education: Pedagogies and teaching

Building innovative capacity into education is therefore a conversation about change and one of the words you rarely hear in the context of change is "easy". We also know that "being right is not a strategy for change"[1] – today's pedagogies and teaching practices may be very effective in the here and now, but need to be reviewed constantly to take account of the challenges of the future.

So the fundamental issue is how to build innovative capacity into the education system. Innovation and education are in many ways unhappy bedfellows. We desire the ability to take risks but we want to avoid risk taking. We desire innovation but we want stability. We also have to be wary of our desire in education to depend entirely on "evidence-based change" – the time taken to generate research evidence to support innovation in a rapidly evolving technology cycle presents a fundamental paradox. Maybe the answer lies in better and faster sharing of research evidence using non-traditional means.

We need a vision supported by the courage to change – for example, in fundamental areas such as how we teach subjects. Identifying a vision of where we are trying to get to – as opposed to the mechanics of how to get there – is perhaps the most challenging aspect in the context of policy making.

The fundamental question for education systems is now how to remain relevant in a world of educational alternatives. The discussion within the session was wide-ranging but can be distilled into four key themes for building innovative capacity:

1. *Teacher education – rethinking continuing professional development*

To support teachers, we should build the capacity to change and to innovate into teacher education. We need to strengthen the capacity of teachers to make use of latest findings and empower them to deploy that in the classroom. If we are asking teachers constantly to do better things (as opposed to simply doing things better) then we need to think about how to best help teachers. Part of that is about "unlearning", which requires affective and social support.

One of the answers may be with an innovative learning system to support teacher development. Taking cues from the corporate learning world, the issue is one of performance support rather than "training". An innovative support system for teachers could include learning at the point of need – rethinking the paradigm for continuing professional development (CPD).

Importantly, bottom-up change also requires teacher-led collaboration. Trends such as content sharing, content curation and on-line collaboration building trust are essential to developing an innovative ecosystem.

2. *Design thinking – supporting innovation*

Introducing design thinking into the process of innovation around pedagogy and teaching practice could also deliver results. Take a cue from world class digital designers – designing for use with digital is a different discipline requiring, for example, an understanding of issues such as user interface/user experience (UI/UX) understanding. There may also be an opportunity to develop simple "rules of thumb" such as "only use technology to do things better".

3. *Models of assessment*

Digital pedagogies and new teaching practices imply new models of assessment. There is a widespread recognition that you cannot assess knowledge in the same way that you teach it, but how do we improve assessment literacy to support innovation? How to move away from a situation where we continue to value what we measure, rather than measuring what we value? Undoubtedly, as students generate massive amounts of valuable data through digital interactions, learner analytics, personalisation and adaptive learning take on a whole new importance.

4. *Student voice*

We can learn a lot from how students engage with new technologies and pedagogies. In the digital gaming industry, there is a philosophy of "player first", giving players an embedded role in product development – maybe a "student first" approach to developing pedagogies could also be adopted. There are many examples of ground-up movements driven by students – for example Coder Dojo and Digital Youth Councils.

SESSION 4 – Partnerships for transformative education policies

"How to create transformative education policies?", that was the question. "Through partnerships" was the answer.

There was a very strong consensus among the participants that forward-looking education policies require a very close co-operation between industry, schools and authorities. That is the starting point. However, it is not enough. We also need:

- networks of like-minded people
- clusters where start-ups and teachers, researchers and educators, parents and business leaders, artists, and students can experiment with new ways of learning and new ways of teaching
- leadership from policy makers.

It was noted that we are entering an unprecedented era of learning. It is an era of new opportunities but it is also an era of a great disruption. Future classrooms and schools may look very different from what we are used to seeing. Methods of teaching may seem strange compared to those of the past. One thing is, however, likely to remain: learning takes place in a fruitful interaction between a teacher and a student in a structured environment. The task at hand is to create as fruitful an environment for learning as possible.

The session started with a discussion about the uncertainty created by technological change and by government cuts in many countries. It was felt that sometimes there is "change for change's sake". Better co-ordination was called for.

A central theme in the discussion was whether a well-functioning educational market already exits. It was felt that in a few countries such a market does indeed exist. In addition to book publishers, authors and illustrators it includes technology companies, software developers and other players. In other countries, there is no educational market. Partnerships can be a step towards creating a proper educational market where public and private actors can find each other. It was pointed out that governments must avoid policies or creating institutions that crowd out market-based solutions.

Participants emphasised that collaboration between education industry, ministries and schools must be concrete and open. It must be based on clear standards and platforms. And it must be open to everyone to participate.

Collaboration between vocational schools and industry must be as pragmatic as possible. It must provide new and authentic skills and work experience.

Partnerships can be developed through experimentation. "Speed-dating" between educators and start-ups was mentioned. "Experience visits" to companies or research centres was another example. Getting parents involved in different aspects of education was also deemed valuable.

The role of technology was discussed in length. It was pointed out that technology amplifies both good and bad teaching. We must not lose sight of the fact that quality teaching is and will remain in the centre of the learning process.

Discussants also noted that:

1. We need advancements in technology to create connectivity and access across the globe.
2. We need powerful and less expensive devices, interoperability standards, APIs, single sign-ons, platforms and more. These are technical and engineering solutions.
3. We need researchers – neuroscientists and cognitive scientists and other fields of study to improve our understanding of how people learn.
4. We need support for research and development, product testing methods and protocols, learning analytics, and data mining.
5. We need entrepreneurs and designers and start-ups to create and pursue solutions to challenges both grand and small.
6. We need teachers and teacher teams to provide deep insights into pedagogy, the best ways to manage groups of students, the methods for engagement and motivation, ways to engage students with relevant and powerful problem solving. Teachers design curricula, new assignments and share insights into evolving pedagogy.
7. We need governments and policy makers to ensure laws, regulations and policies that keep our sights on the public good, ensure safety and security, and promote rather than hinder innovation.

Together we are capable of developing powerful, purposeful networks that connect the right people, and organisations. If we can develop these partnerships, we will offer the world something of value.

Note

1. This quote belongs to Michael Fullan, who used it in his keynote to the CoSN Conference Atlanta March 2015.

ANNEX 2

Report from the 2016 Global Education Industry Summit, held in Jerusalem on 26-27 September 2016

Prepared by the Ministry of Education of the State of Israel, the host of the Summit.

Forward: What did we discuss?

During our three days in Jerusalem we covered many topics, usually raising questions without providing sufficient answers; this is the nature of such events. Many times throughout this year I found myself revisiting thoughts and insights provided by my colleagues during our time together, and I am certain others have had similar experiences.

All the time, I found myself returning to one of the themes present in most – if not all – of the sessions and presentations: How can we best adapt our schools to provide our children with the tools needed in an unpredictable and always changing workplace? My answer consists of two words: innovation and entrepreneurship. These were the issues we returned to in all three days together.

There is a need for innovation and entrepreneurship in every system, including the education system. Innovation is bringing up new, novel and original ideas. Entrepreneurship is making them happen in the real world.

One of the secrets for creating an innovative and start-up culture is by motivating students to debate, even for the sake of the debate and to ask "why".

Education, which used to be about delivering knowledge, is now about helping students develop a reliable compass and navigation tools to find their own ways to the complex world.

There is a need to focus on how to design, implement, scale and spread good ideas, as well as use the people, the time, the space and the technology to educate students in an innovative way for their future. The key to success are the people who have the ability to make the connection between students, technology and learning.

Governments can provide the level playing field as well as create an innovative friendly climate and lift ideas to actions.

The central question is how to promote a culture of innovation in education, taking into account its relevance, quality and the speed of which ideas impact the education system?

Sincerely,

Naftali Bennett

Session 1: The teacher in the innovative world

Teachers play a strong role in developing innovation in education.

Teachers are connected to three innovate worlds: the classroom, the teaching profession and the ecosystem of policy, technology and other supports and tools.

There is a need for revolution and changing paradigm, while looking to the future of teaching. With the focus moving towards start-ups and entrepreneurships, there is a shift of teachers required to teach towards the unknown.

Personalised learning has become nearly synonymous with innovation in classroom. There is a striking shift in the student-teacher team, where the student is the leader and the teacher is the activator and advisor. Students' interest becomes the energy that drives the learning. It creates deeper teacher-student relationships, since the teacher has to be aware of the students' interests and progress, in order to customise the learning process.

Technology can be a major accelerator in education. The use of technology can bring in an immersive experience that a traditional teacher cannot deliver. It can connect students to technical career expertise that a teacher may not have, or connect a student to subjects which they would not otherwise have access. However, technology alone, without teachers, cannot equal innovation in the classroom and cannot teach students life skills, which are part of every great success in society.

Teachers want to be partners in implementing the ecosystem. They are not just costumers of innovative projects. They are participants, co-authors, co-designers, co-implementers and co-leaders of the process. They want to ensure that the policies formulated by the governments reflect what happens in schools. Once teachers are engaged in policy making there are better outcomes and designed programs.

Teachers need to have the autonomy in order to experiment and have the connection to the industry and entrepreneurs. The tools available, especially digital tools, do not yet fulfil the promise of being easy to use, creating big gains and fitting into their work in ways that do not demand more time. Teachers are eager to inform educational developers what they need, since they face the problems in the classroom. The majority of teachers are willing to use digital tools to help solve problems in their classroom.

The system should be based on trust in teachers. Assessment should be used to support, not to punish and control.

Teachers welcome opportunities for collaboration with other teachers, whom they trust and consider experts. They want to contribute to their profession and to the learning and sustaining of their colleagues.

Aging of teaching force becomes a problem once they are perceived as consumers and not part of the innovation process. Governments need to strengthen the status of the teaching profession and attract the most qualified people, but also provide the chance to change their career.

Teachers can play a larger role in the system and help craft policy and advocating. The teaching profession is a mastery of craft, which should leave teachers free to practice what they believe, is the art of teaching.

Session 2: Educating for innovation and entrepreneurship

There is a need for revolution in thinking in order to flip the education system. Education systems need to shift the system from knowledge transmission to instilling 21st century skills and optimising for teamwork, decision making, strategic thinking, emotional intelligence and curiosity. Students need to acquire deep knowledge in particular areas, which should be combined with learning skills.

Redesigning the system requires a new paradigm, involving production and a need to find the way to shift the system without additional expenses.

This revolution does not necessarily require technology. The mindset part is critical for the success of integrating technology in education and nourishing other learning elements.

The secret to reinventing the education is related to three main elements: unit mentality, oriented missions and real-life activities. A class that turns into a team has responsibility for the whole class. Project-based learning can include missions and real activities, which require critical thinking and discovering knowledge by the student. On the other hand, education system should not fix the shift in education to certain types of pedagogy. Project-based learning and design thinking are part of the various types of innovative learning.

Regulations may hamper innovation in education if profession and schools are not involved in the decision-making process. Governments play an important role in listening to teachers and making sure that their ideas are translated into action. Governments should not be experimenting on students of today, because students will not have another chance tomorrow. The challenge is to create a safe space for redesigning the system, and reframing from changing the entire system until perceiving the results of the new system.

The role of governments is to teach entrepreneurship, which is a difficult task for central governments with complex ecosystems. Innovation does not come out of law. Governments need to set up conditions and ambitious goals, to serve as a platform for private and public sectors.

Entrepreneurship can be implemented via the speed boat approach, in which many speed boats, namely pilot programs, are carried out and only successful programs are continued.

Entrepreneurship is not the sole purpose of vocational education. There are vocational education systems where conceptual thinking is part of the application process. The education system should be designed in a way that application goes side by side with thinking skills.

The education system should not be perceived as a public space of people employed as teachers and school leaders, but as an ecosystem that brings together the outside and the inside innovators.

Countries that will be first to relate to the 21st century dimension and redesign the learning environment are going to benefit from huge advantages.

The paradigm shift is not happening on a large scale, due to the fact that universities are based on the traditional system.

Session 3: Educational technology

Technology is the service of a stronger education system. Harnessing the potential of technology to support the learning process requires partnership between the education system and the industry.

The education system, which is very complex system with many stakeholders and moving towards more voice given to parents, local communities and even students, should mobilise the wide variety of people who invest in schools in many different ways. The industry needs to build strong relationships with entrepreneurs and philanthropists, in order to create an ecosystem that delivers on the ambitious goals set for the education system.

There is a difference between the product of ed-tech start-up and the product of traditional education technology. It differs in the value it presents, the content and the pedagogy embedded in the solutions offered.

Start-ups suggest alternatives to the existing reality. The lean start-up process, which identifies the user's needs through constant movement between the field and the development, creates better products. In the education system, there are two additional elements to this process: 1. Learning from teachers' experience. Teachers involved in policing and in the development process approach technology in a very active position. 2. The need for new pedagogy based on the radical changes in literacy, memorizing and expressing ourselves. This new pedagogy will be evolving to the encounter between educators who understand the needs and the entrepreneurs who use the language of the internet culture. Start-ups also have the ability to narrow the gap between the old learning paradigms and the rapid technological developments.

On the other hand, start-ups might address just a part of the curriculum and are sometimes time consuming.

Governments encourage ecosystems in various systems, other than education. They face the question of how to move the education system without jeopardizing equality of opportunities, quality and social interactions. The mindset should be changed in the way of encouraging educational technology and start-ups to enter schools.

Schools should adopt a bottom-up revolution, implementing not a very structured process which includes open technological platforms, in order to allow teachers to adapt the content and design. It is important for schools to use sustainable technology which are scalable and not very complex.

In order to build an effective innovative system it is important to measure and understand how students, teachers and parents feel about schools. Assessment is a driver, but if not used appropriately, it may not serve its purpose.

Session 4: Technology in education as a tool for developing innovation

The change brought by the fourth industrial revolution is inevitable, therefore the educational system needs to adapt the new environment of disruptive innovation; with less structured curriculum.

The alternative methods of delivering quality education in open educational resources, available in the internet space, opened up new challenges and opportunities to school education. The education system needs to address the challenge of how schools should function in the coming decade, given the fact that people can learn more and better through informal and on-line learning, but at the same time students being together in the same physical location is an essential part of the learning experience.

Technology must be central to education reform and should be enablers of transformative teaching and learning practices, but it cannot replace human action. It does not offer the social factor and cannot provide sensitive belonging to students.

Schools should use tools built for the consumer in business world and improved for education, that provides access, encourages collaboration, promotes creativity and frees up time for educators to be more connected with their students.

One of the most powerful education technology is the internet itself. An open internet test, for example, can be very challenging for the teacher and student, for finding knowledge.

Many educational systems teach programing from young age. Programing equals thinking. The aim is to change students from the costumers of the internet content to the creator. There is a need to collaborate with the industry sectors in order to train teachers for teaching programming.

Formative assessment can bet administrated via technological tools with better research and applicable. It should not be an activity which is an end point but a continuum that is led back into implementation.

Parents are very important stakeholders of the educational ecosystem. In order to build a sound productive ecosystem, there is a need to consider the role of parents seriously. They should be involved at the first stage concerning any change brought into education, especially when related to technology.

There is a need to create a set of incentives for driving stakeholders to invest energy and creative design for a system that is open for innovation. This requires specifying the criteria to be met, building good measures and concentrating on outcomes, not on inputs.

Conclusion:

- There is a need to build a long-term vision of how to move education systems forward in the future, combined with action.
- Bringing innovation into education is a risk and builds messiness. Educations systems have the responsibility of taking risks in a clever and sensible way, while checking all consequences.
- Change in education is building on trust and combining it with courage.
- The education system needs to implement disruptive changes in order to move the system forward, along with providing incentives to risk takers.
- Many directions of change in education is about empowering learners, along with building a feedback loop that gets students to steer their own learning process.
- The change in the education system, needs also to be about “what” and not only “how” (What kind of skills, attitudes, mindset, soft skills, etc.)
- Innovation should be the profit of all students, which requests inclusive growth and cohesion of the education system.
- There should be a smart combination of using tradition and history of revolutions together with change and innovation.

There is a continuous need of establishing the dialogue between all stakeholders in education, governments, policy makes and education industry leaders, which believe that revolutionary change is needed as early as possible

The next stage of the summit is to respond to the following questions:

- How can we mobilise actors and stakeholders ?
- How can we build the incentive system ?
- How can we build the R&D functions, which is essential to innovation in any system.?

- The role of universities or academia.
- The role of experts.
- How can we make sure that all schools become the accelerators of change and innovation?

Facilitators' notes:

The education system is trying to create an encounter between two cultures that are in conflict by definition. From the one hand, there are the policy makers who are dealing with reality from a perspective of systems, structures, process and metrics that should be addressed. From the other hand' there are the entrepreneurs who are looking for short cuts have open ended solutions instead of a structured roadmap. The main challenge is to create conditions for significant pilots that will create trust and hands-on understanding of the implications of this kind of encounter. It is suggested to create a "Global Ed-Tech Start-ups Friendly Zone", which can include a community of schools and pilots of start-ups, and will shape (together with the entrepreneurs) a new discourse of education.

Reform and reinvention are different components. The education system needs to be reinvented. Education should be flipped to focus on skills and through the gaining of skills to gain more knowledge as well.

The role of the government is to promote the sustainability of the educational ecosystem with the educational industries. Government policy has to be practiced to create sound partnership between schools and industries. Governments can stimulate new needs in education which can open up a new market for the educational industries. Without strong educational industries it is difficult to develop effective good education.

There are two possible ways in which government policy can provide its impact: to the schools directly or to the industries directly. Providing resources to schools enables schools to choose educational service from the market. Industries will try to meet the needs of the schools rather than develop their own educational services. Providing resources to industries can allow industries to develop and offer various services. Each country can choose the policy within their own context of urgency and public requirements, but it is important for the role of government to consider developing and implementing the policy to create and maintain the sustainability, which is the market.

Governments cannot provide the support for technology at schools for long and at the right way as it is rapidly changing. Private sectors can be more flexible and fast to adapt the changes. Government need to support industries to create the market and guide the educational services for the goals of good education and equity. Creating markets can take longer time to see the results of the policy and the equity in education is not met immediately.

Sustainability of educational technology is essential to see results of the policy. Government policy is only a seed to create the sustainability and it comes from the sound market.

Finally, from an organisational level it is apparent the Summit provides an answer to the need of education ministers to discuss and share the challenges they each face individually.

For the following sumzmits we recommend:

- Maintaining the structure of a two-day summit, with an optional third day in the field, visiting the host countries unique educational facilities.
- Keeping the sessions behind closed doors, with Chatham House rules of discussion.
- Consider elective sessions in smaller working groups to allow ministers to further engage specific topics raised in the plenary.

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Education Innovation and Research

Schools at the crossroads of innovation in cities and regions

Many people would not consider schools among the most innovative institutions of modern societies. This perception is not entirely accurate, since education is innovating in many ways in order to meet the demands of the 21st century economies and societies. But teachers and schools cannot do it alone. They should be seen as actors and partners in broader ecosystems of innovation and learning at local and regional level. Schools are networking organisations, making important contributions to the regional economy and local community. Businesses, industry, organisations and communities can help and support schools, and can also benefit from their roles in learning, knowledge development and innovation.

This report serves as the background report to the third Global Education Industry Summit which was held on 25-26 September 2017 in Luxembourg. On the basis of recent OECD analysis, it discusses innovation in education, schools driving progress and well-being in communities, the role of industry and employers in supporting schools and suggests policies towards better ecosystems of learning and innovation. The report argues for better networking and partnerships between schools, regional industries and local communities.

Consult this publication on line at ***http://dx.doi.org/10.1787/9789264282766-en***

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