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Three focal points for skill formation systems in the 21st century

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### Three focal points for education systems in the 21<sup>st</sup> century<sup>1</sup>

Richard Desjardins

#### Introduction

Strong and shared growth increasingly depend on the capacity of nations to develop, deploy and upgrade the skills of their citizens. Within this context, the following places an emphasis on three focal points for education systems in the 21<sup>st</sup> century. The first focus is on essential skills. The second focus is on the effectiveness of impact of education on economic and social outcomes. The third focus is on the dynamic elements of skill formation and skill use.

#### Focus on essential skills

In responding to the question: *what is expected from education in the 21<sup>st</sup> century?* – an emphasis is placed on the need for education systems to focus on the essential skills required by non-routine job tasks that are cognitive and communication based. In reality, however, many things are expected from education in the 21<sup>st</sup> century. Accordingly, it is worthwhile to point out a couple of things before proceeding.

Firstly, education is not a panacea that can solve all the worlds problems. Nonetheless, education is certainly a promising lever because policy makers have a direct hand in its design and implementation. Moreover, the interdependence of education with work, social and cultural practices that occur in multiple contexts over the entire lifespan should not be underestimated.

Secondly, a more comprehensive answer to the question: *what is expected from education in the 21<sup>st</sup> century?* – could be *'to foster the desire and capacity for lifelong learning'*. Education has the key role of instilling a sense of curiosity, and to awaken the scientist in all of us as Jean Piaget suggested, so that all can continue to discover and learn new things as they age. But even such a brief answer is loaded. At least three things could be unpacked in such an answer:

- *Learning for what?* Education is very much about values: To help people identify what matters to them, to enable them to identify the resources necessary to enable them to achieve what matters to them, and to enable people to learn how to acquire and use those resources to do just that.
- *The desire to learn is a value in itself.* Perhaps this desire has something to do with genetics but almost certainly it has something to do with socialization too, including both at home and in the school, especially in early childhood.
- Finally, there is *the capacity to learn.* This is about the skills needed to learn, namely foundation skills which are part an parcel of the essential skills set.

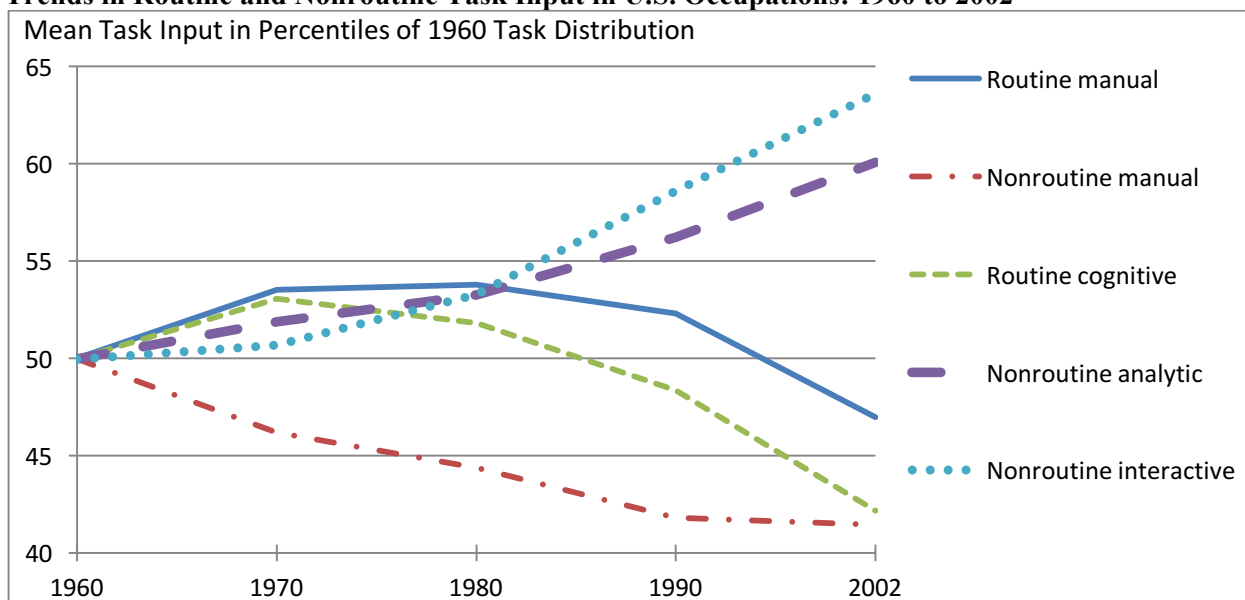
While the focus of the response provided here is on essential skills, it is worthwhile to highlight that this does not mean that the socialization function of education is thought to be any less important. Values and attitudes are difficult to measure as outputs of education but they are no less key outcomes because of it. In fact, it might be argued that in the 21<sup>st</sup> century, schools and teachers should strengthen their socialization function because they are a key element in the battle against a growing number of forces that are impacting identity and value formation processes in the digital age. This means an enhanced role for school ethos and for teachers. Something for which they might be neither prepared nor willing to do. This issue is difficult to deal with for a variety of reasons including very much on the political front. As a consequence, many people are happy to leave this as an implicit issue and avoid it by focusing on skills even if it is difficult to neatly separate skills from values and attitudes.

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<sup>1</sup> This paper is a write up of a presentation made at the conference entitled 'Labour Market Dynamics and Human Capital' held at the Research Centre for Education and the Labour Market (ROA), Maastricht, November 18, 2011.

Despite this narrower perspective, a key focus for education in the 21st century should indeed be to develop essential skills, particularly of the kind that are relevant to a growing number of non-routine jobs tasks that are analytic and interactive in nature.

**Figure 1. How the demand for skills is changing over time**  
**Trends in Routine and Nonroutine Task Input in U.S. Occupations: 1960 to 2002**



Source: Autor, Levy and Murnane, 2003.

It is important that we consider at the demand for skill in a dynamic framework to obtain insights on the kind of skills needed in the 21<sup>st</sup> century. Some evidence suggests that the kind of skills needed for success are rapidly evolving. As an example, Figure 1 shows how the composition of the job tasks needed to be performed by the US work force changed between 1970 and 2000.

Work involving routine manual input, the jobs of the typical factory worker, declined significantly, which is probably the result of automation and outsourcing. Non-routine manual work, things we do with our hands, but in ways that are not so easily put into formal algorithms, declined too, albeit less so in recent years – and that is easy to understand because there will always be jobs that you cannot easily computerise or outsource (e.g., hairdresser). All that is not surprising, but here is where the interesting story begins: Among the skill categories in this chart, routine cognitive input, that is cognitive work that can easily be put into the form of a script saw the sharpest decline in demand over the last couple of decades. This means that schools are now challenged on where they have traditionally put much of their focus, and what has tended to be valued in multiple choice tests. The dilemma for education and training is, therefore, that the skills that are easiest to teach and test are also the skills that are easiest to digitise, automatise and offshore. Where are the winners in this process? Tasks requiring expert thinking are up 8% and those requiring complex communication are up almost 14%. Assuming these trends persist and are applicable in other countries, the US data suggests that in modern advanced economies, there are a growing number of non-routine jobs tasks that are analytic and interactive in nature.

Figure 2 displays different essential skills using the skills pyramid construct and links this to the changing demand for skills as seen in Figure 1. First, we have the foundational skills at the base of the pyramid which are part and parcel of the essential skills set. These are foundational in two distinct ways:

- One, they are foundational because they are basic building blocks. Performing higher order tasks well such as problem solving or other complex job tasks is increasingly dependent on the mastery

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of these foundation skills, not least because of the growing importance of text-based processing tasks.

- Two, they are foundational because they are transversal in a wide range of contexts and could be argued to be largely portable from context to context.

At the second level of the pyramid, there are some higher-order skills that could nevertheless be argued to be foundational because they are becoming increasingly transversal and needed for other higher order and complex job tasks. That is why the second level is split into two layers. The first layer of these higher-order skills includes some basic Information and Communications Technologies skills which are quickly becoming the norm in advanced and even in some developing societies. Together, these skills along with the other skills at the base of the pyramid can be considered as foundation skills that are fully portable.

In the second layer of the second level, we have the remaining essential skills but these could be argued to be less portable because they are developed in ways that make them relevant and applicable to a narrower range of contexts. Nevertheless, they can still be portable to a certain degree. Together, the lower and middle levels of the pyramid consist of the essential skills that are important for education to pay attention to. The top of the pyramid consists of the most firm or job specific skills that are difficult for education to deal with unless it is directly intertwined with practice and/or the workplace. Nevertheless, these skills certainly remain relevant in the context of secondary and post-secondary education pathways. Ideally, however, foundation skills such as literacy and numeracy would be mastered to a reasonably high level by the time adults reach post-secondary education. But there is lots of evidence to suggest that this is not necessarily the case (see Figures 3 and 4).

While essential skills are important for education to pay attention to, not all of them necessarily have the same degree of importance as was suggested in Figure 1. For example, the evidence shown suggested that the demand for routine and non-routine manual skills is declining. That does not make these skills completely unimportant, but it does reduce their significance and priority because the evidence suggests that the majority of job growth, if such a trend continues and applies across countries, might be found in areas requiring cognitive and communication skills for performing non-routine tasks.

It is difficult to gauge whether education systems have been effective in responding to the increased demand for communication-based skills because very little data exists on these types of learning outcomes.

The evolving demand for cognitive skills depends on the level of proficiency at which these are required. Jobs requiring proficiency at only lower levels are in decline – herein lies the dilemma for education since these skills at low levels are the easiest to teach. Low proficiency levels may have been sufficient in the past but this is not necessarily where future job growth is concentrated primarily because computers can easily substitute for routine cognitive input. At higher levels of proficiency, cognitive skills are increasing in demand, particularly for job tasks that are non-routine and analytic in nature. These are the cognitive based skills measured in PIAAC (Programme for International Assessment of Adult Competencies) and similarly in PISA (Programme for International Student Assessment), at both low and high levels of proficiency.

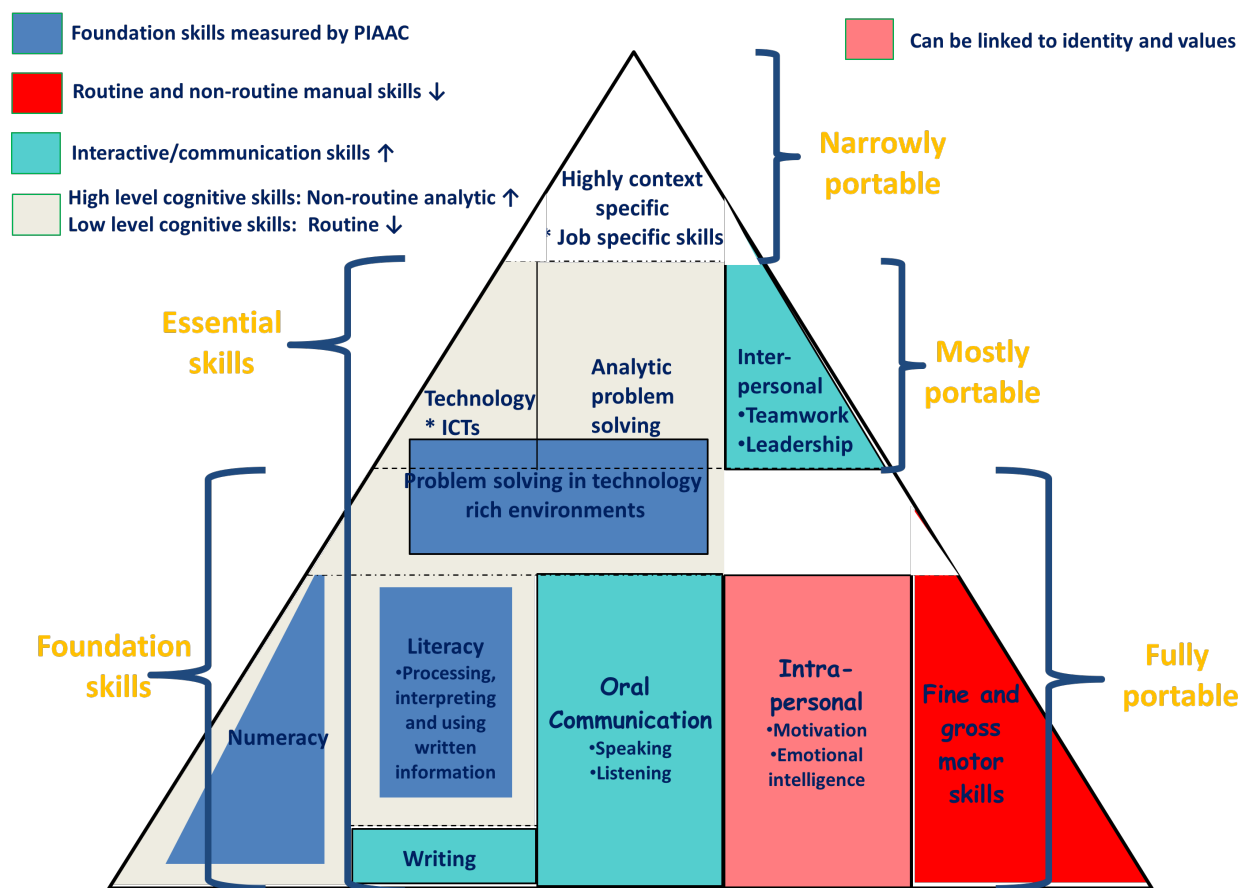
Finally, there are intra-personal skills which could be linked to identity and values mentioned earlier. These are certainly important but as mentioned, it is difficult to address these for a variety of reasons.

Figures 3 and 4 display comparative data based on OECD studies of cognitive foundation skills. These data provide some indication of how effective different education and training systems are at imparting certain cognitive skills which are deemed to be of increasing importance at higher levels of mastery.

Figure 3A displays the distribution of cognitive foundation skills of adults aged 16-65 in 1994. It can be seen that the Netherlands ranks high from a comparative perspective. The proportion of populations mastering these types of skills at only low levels of proficiency (Levels 1 and 2) is displayed below the horizontal axis, while the proportion who master them at medium- to high- levels of proficiency (Levels 3 and 4/5) is displayed above the axis. Even if the Netherlands has a fairly high ranking internationally, there is nevertheless about 40% of Dutch adults who were found to have these types of skills at only low levels of proficiency, namely Levels 1 and 2.

In Figure 3B, it can be seen that the Netherlands in 2007 again ranks comparatively high, albeit among a smaller range of countries. The situation however, seems to have deteriorated over time at the country level with a jump to 44% of adults performing at Levels 1 or 2. This does not control for recent immigrants or other factors, but points a concerning trend that needs careful attention.

**Figure 2. The skills pyramid construct**



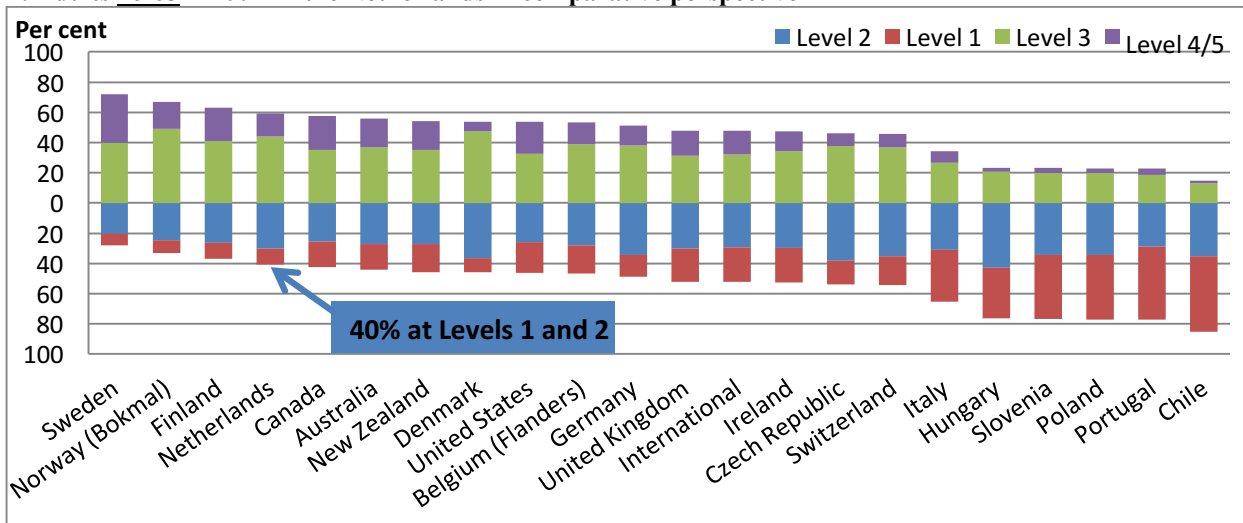
Focusing only on youths aged 16-25, a similar deterioration can be found. Figure 3C reveals that in 1994 about 30% of youths in the Netherlands performed at Levels 1 and 2. Figure 3D shows that this number increased to 36% in 2007. The situation is similar among students aged 15 with an apparent negative trend even in very recent years. The number of students who scored at Levels 1 or 2 on the PISA reading literacy scale increased from 36% in 2006 to 40% in 2009 (see Figures 4 A and B). These results point to a need

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for education to focus on doing a better job in ensuring that adults improve their level of proficiency in cognitive foundation skills which are argued here to be increasingly relevant on labour markets.

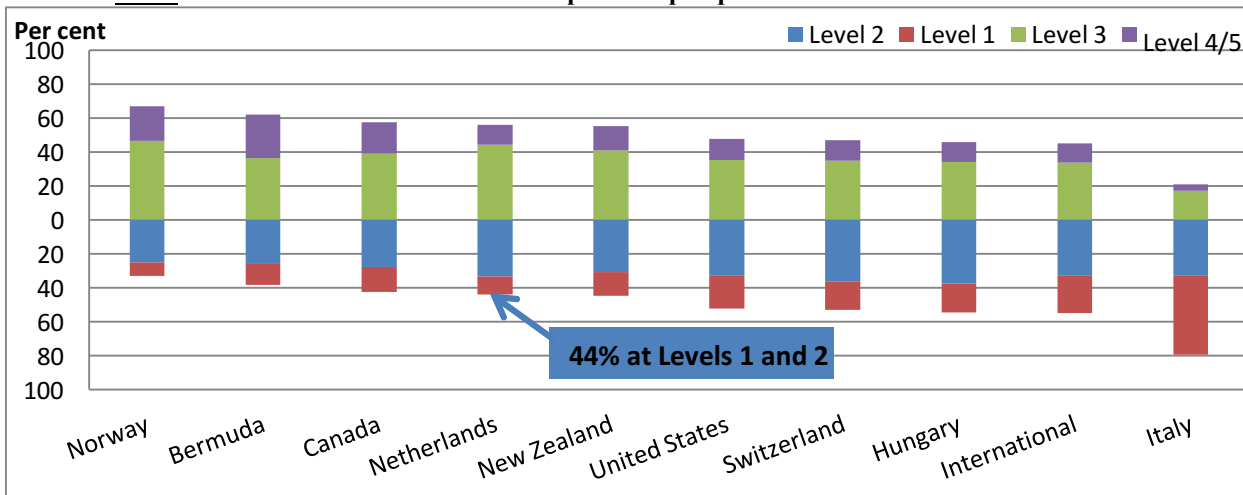
**Figure 3. Per cent of adult populations at each foundation (prose literacy) skill level**

**A. Adults 16-65 in 1994 in the Netherlands in comparative perspective**



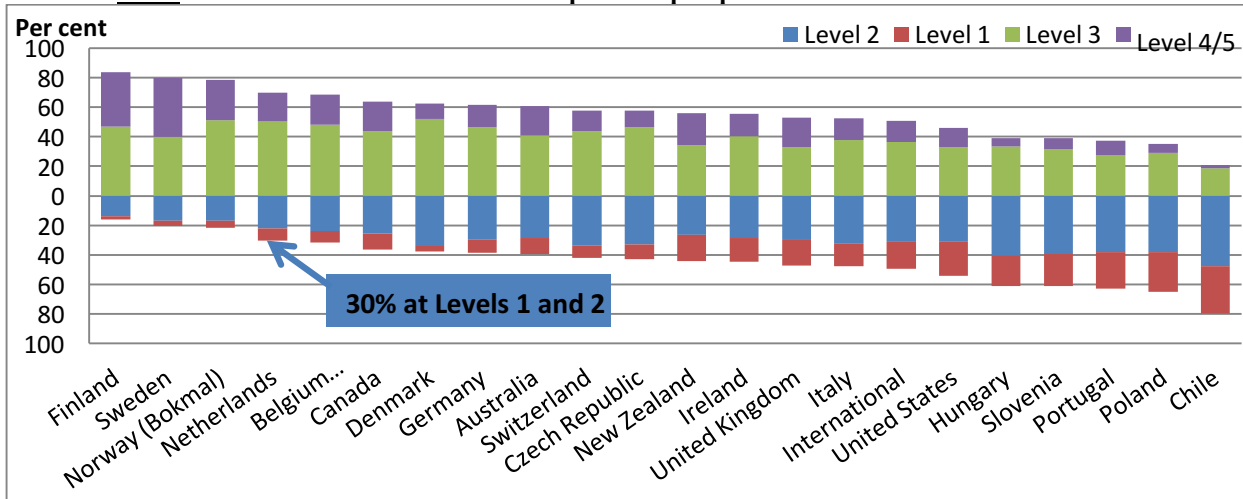
Source: International Adult Literacy Survey, 1994-1998.

**B. Adults 16-65 in 2007 in the Netherlands in comparative perspective**



Source: International Adult Literacy Survey, 1994-1998.

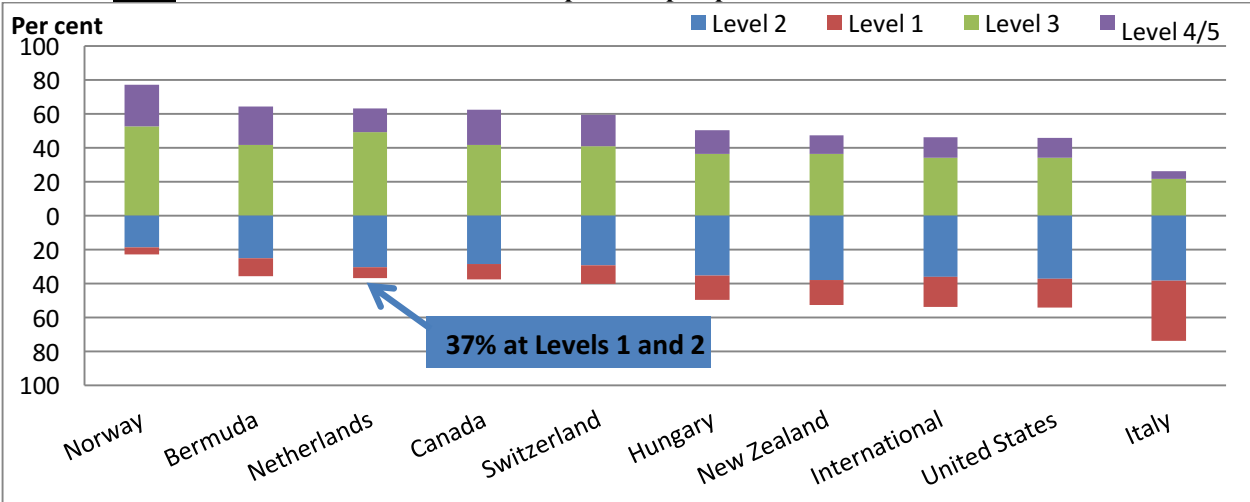
**C. Adults 16-25 in 1994 in the Netherlands in comparative perspective**



Source: International Adult Literacy Survey, 1994-1998.

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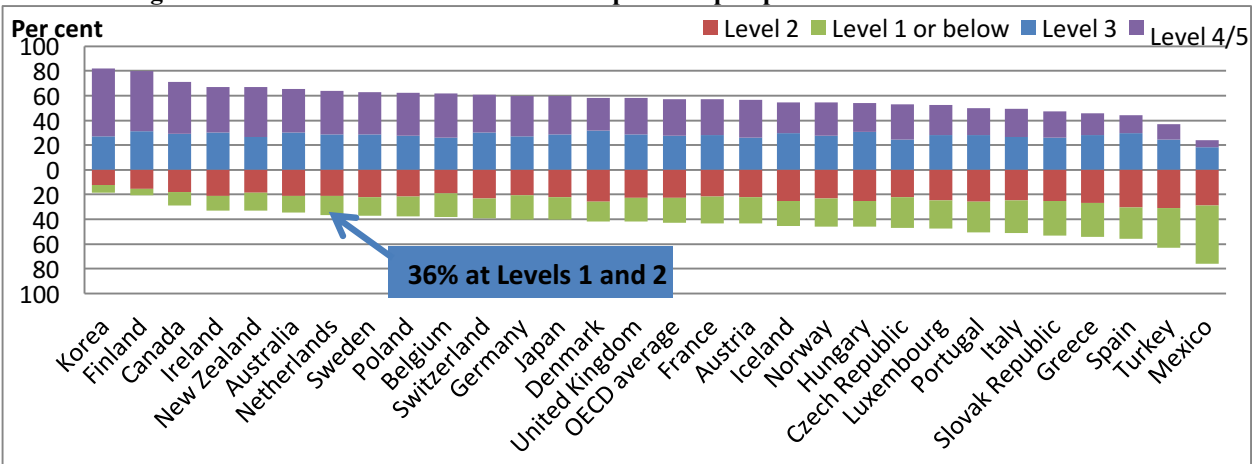
**D. Adults 16-25 in 2007 in the Netherlands in comparative perspective**



Source: *Adult Literacy and Lifeskills Survey, 2003-2007*.

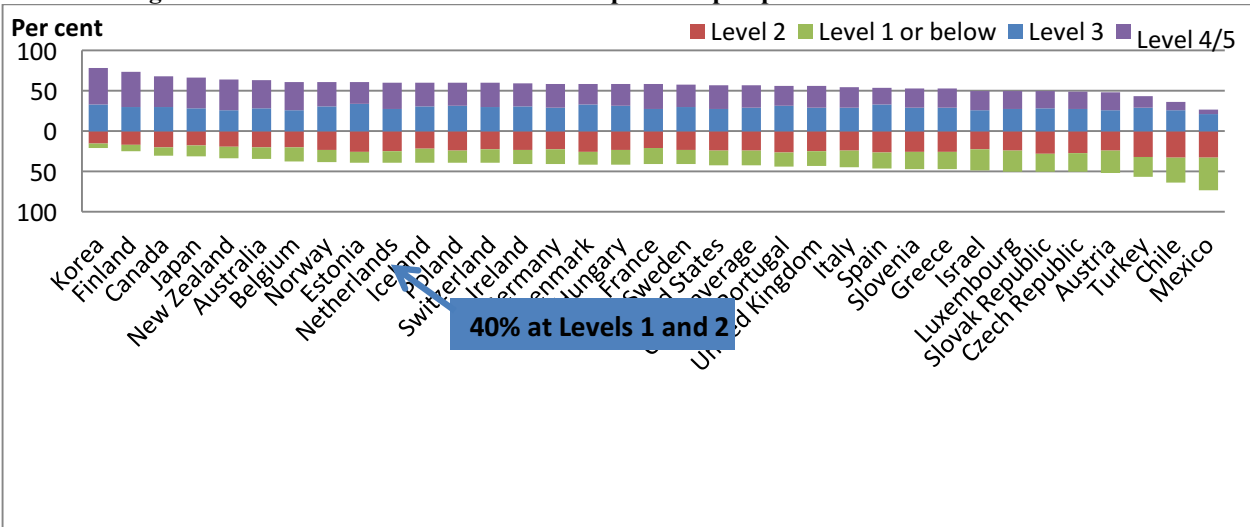
**Figure 4. Per cent of students aged 15 at each foundation (reading literacy) skill level**

**A. Students aged 15 in 2006 in the Netherlands in comparative perspective**



Source: *Programme for International Student Assessment, 2006*.

**B. Students aged 15 in 2009 in the Netherlands in comparative perspective**



Source: *Programme for International Student Assessment, 2009*.



## Focus on the effectiveness of the impact of education on economic and social outcomes

Another important challenge for education systems in the 21<sup>st</sup> century is to ensure its effectiveness in realizing a wide range of economic and social benefits. In emphasizing this point, it is necessary to address the question of *how does education contribute to economic and social outcomes?* To answer this question, it is useful distinguish between at least three mechanisms linking education and outcomes. Understanding better each of the three is necessary to foster good outcomes all the while aiming to contain inflationary pressures on education. These are also useful because they help to link different levels of analysis and provide a more complete picture.

The first mechanism is the *skill- or productivity-enhancing mechanism*. It involves a direct effect of education on the individual, by way of developing embodied resources and skills. In the economics literature, this mechanism is well-grounded in *human capital theory*. Alternatively, some political scientists have applied a similar logic to the civic and political outcomes of education under the banner of the *absolute model* (see Desjardins, 2008; OECD, 2007).

The second mechanism is the *productivity-identifying mechanism*. It involves a sorting effect, where labour market outcomes depend on an individual's level of education relative to others around them. In the economics literature, this mechanism is well-grounded in *signalling theories*. Alternatively, it could be called the *status-creating mechanism* and applied more broadly to pick up on the positional effects of education that may arise as a consequence of sorting people in the hierarchy of social relations. Essentially, education has its impact by influencing the relative position of individuals in society. Some political scientists have applied a similar logic to the civic and political outcomes of education under the banner of the *relative model* (see Desjardins, 2008; OECD, 2007).

The third mechanism is the *spillover mechanism*. In the economics literature, this mechanism is well-grounded in *externality theory*. It is similar to the productivity-enhancing mechanism but suggests that there are 'spillover' effects because peoples' higher levels of education can benefit others around them in terms of productivity (e.g., Moretti, 2004) and other outcomes (e.g., trust, see Helliwell and Huang, 2005). This has been alternatively labelled as the *cumulative model* (see Desjardins, 2008; OECD, 2007).

Higher levels of educational attainment in the population can be a good thing, but only if education actually enhances the skills needed to generate better economic and social outcomes and skills are optimally used to do so. Aside from the possibility that the added skills may not be used optimally and lost as a consequence (see Desjardins and Warnke, 2012), the expansion of education can be problematic for at least two other reasons. First, it can lead to qualification inflation by diminishing the productivity-identifying effect of qualifications and thus their discriminatory content or signalling value on the labour market simply because more people have them. Second, it may diminish the productivity-enhancing effect by leading to a deterioration in quality which can also spur qualification inflation.

A clear challenge for public policy is thus to maintain a balance between: improving the productivity-enhancing effect of education (by focusing on quality); ensuring wide access to education in order to optimize the spillover effects of education (in economic/social domains); meanwhile, containing inflationary pressures caused by the productivity-identifying effect.

There is lots of evidence to suggest that education does have an impact on a range of economic, social, civic and political outcomes (OECD, 2007). Most of this evidence however, is based on quantity-based measures of education. This inevitably leads to the unfortunate conclusion that more education is better. *But what is it about education that leads to better outcomes?* Less is known more precisely about what it is that education does that is good. *Is it skills? (what kind); is it values (what kind)?*

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Foundation skills are one specific outcome of education and training for which there is good data available. They cover only a narrow range of skills but are nevertheless key because their mastery to at least a minimum level of functionality:

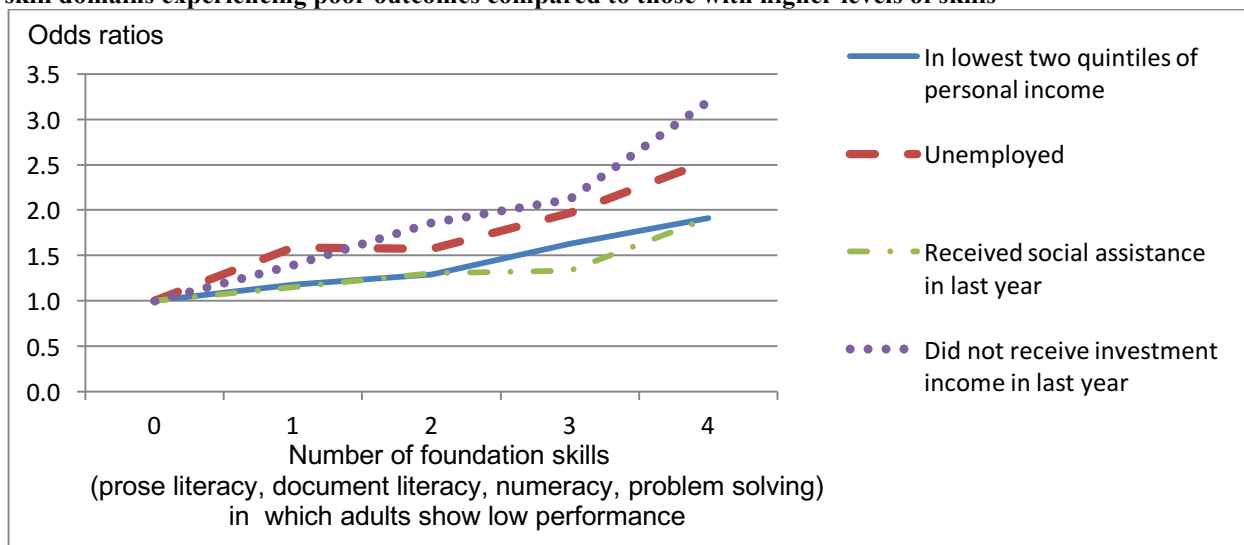
- Influences the potential to develop and maintain other higher order and job specific skills (as highlighted in Figure 2)
- Helps people to cope with text-based processing tasks which are relevant to a wide range of jobs and are of increasing importance in a wide variety of contexts (civic, social, political and personal life)

Figures 5 A and B help to confirm that these types of skills can have a substantial impact on a wide range of economic and social outcomes. Figure 5A depicts the correlation between low performance in one or more foundation skill domains and four economic outcomes, but this is after adjusting for other major correlates including education. The results show that the odds of being in the bottom 25% of earners increases with the number of foundation skill domains in which adults show low performance. Similarly, low performance in the measured skills is also clearly linked to a higher odds of being unemployed. The same can be said for those who receive social assistance of some kind and those who do not receive investment income. Looking at results vis-a-vis social outcomes in Figure 5B reveals a similar pattern, namely the relation between foundation skills and such outcomes is found to be positive. Poor performers are more likely to report a poor or fair health status and they are also more likely to not participate in any community or civic activities. These relationships are net of the potential effects of education, parental background, age, gender, and migration status suggesting that there may be a potentially substantive relationship between the foundation skills measured and a range of outcomes.

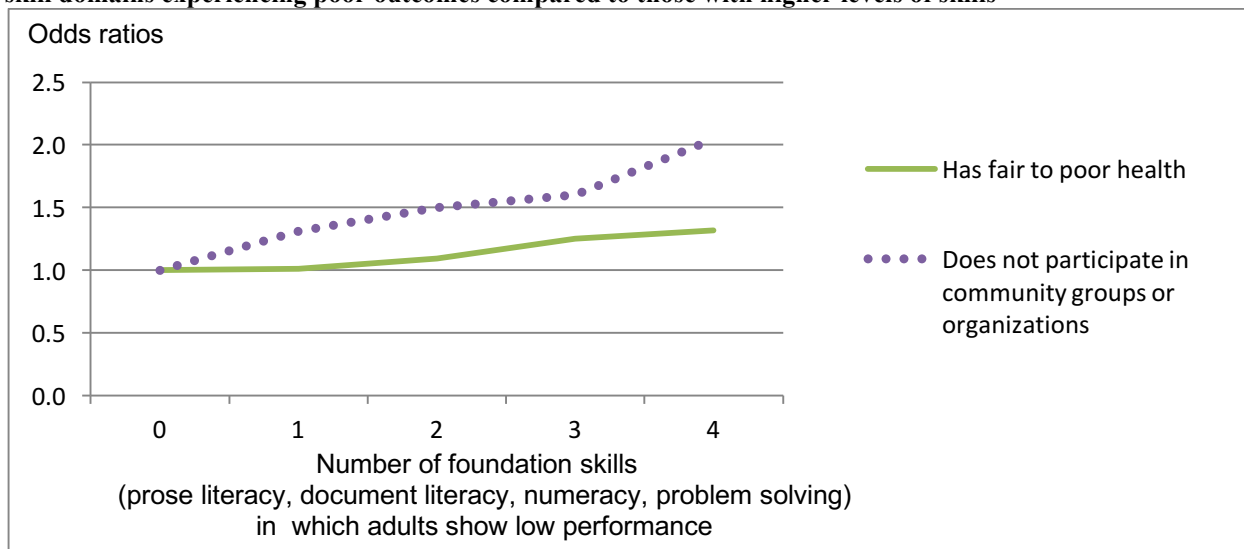
Recall however, that the Netherlands has up to 40% of adults who perform only at low levels of proficiency in these types of skills (see Figure 3B). Accordingly, there is a need to focus on the effectiveness of education to make real impacts on a wide range of economic and social outcomes. The evidence suggests that a focus on foundation skills may be an important part of increasing the effectiveness of education on outcomes.

**Figure 5. Foundation skills and economic as well as social disadvantage**

**A. Odds ratios showing the likelihood of adults with low levels of foundation skills (Levels 1 & 2) in multiple skill domains experiencing poor outcomes compared to those with higher levels of skills**



**B. Odds ratios showing the likelihood of adults with low levels of foundation skills (Levels 1 & 2) in multiple skill domains experiencing poor outcomes compared to those with higher levels of skills**



Source: *Adult Literacy and Lifeskills Survey, 2003-2007.*

Note: Adjusted for education, parental education, age, gender and migration status.

**Focus on the dynamic elements of skill formation processes and skill use**

Finally, there is a need for a more comprehensive and balanced view involving both the supply and demand sides of the labour market including their dynamic interactions to understand better skill formation, skill use, and not least skill mismatch.

It is fair to say that interactions between dynamic changes in skill supply and skill demand are poorly understood for policy purposes, sometimes leading to shortsighted arguments that the supply of educated adults should be scaled back or that it would be desirable to eliminate mismatch and have everyone efficiently pigeon holed in jobs that are commensurate with their skill set. Such efficiencies may sound good in principle but the problem is that these are conceived from a perspective that is firmly grounded in a partial equilibrium and static framework. For example, a certain degree of skill mismatch is perhaps not only inevitable due to the dynamic nature of supply and demand but may also be desirable because it might act as an important catalyst for productivity growth in the medium to long run.

Dynamics and interactions are a reality but very difficult to deal with analytically, both empirically and theoretically. Yet we know that skill supply is not fixed at the qualification point. Individuals experience skill gain and skill loss over the lifespan for a variety of reasons. We also know that skill demand is not fixed at job entry. Employers adopt technologies and practices in ways that can deskill or upskill certain jobs.

These points are intuitive yet they lack presence in the growing debate on skill mismatch. A recent shift can nevertheless be detected in academic and policy debates on skill mismatch. From a focus on over-education and skill shortages to a more nuanced overview of imbalances which incorporates skill gaps and skill underutilisation as major issues. Policy concerns now include an emphasis on the need for tackling the negative consequences of skill underutilization rather than just the need to scale back the supply of educated adults (Cedefop, 2010). Concerns about overeducation remain but are balanced by views that high levels of education are needed to meet the long run needs of the labour market and safeguard against rapid technical biased change and competition in the 21st century. A key concern is to ensure that work

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and organisational practices change in ways that make effective use of higher educated workers' skills so as to limit skill atrophy and wasted opportunities to increase productivity.

Recent evidence suggests that there is a need for a more comprehensive and balanced view involving not only both the demand and supply sides of the labour market but also their dynamic interactions when attempting to address mismatch (see Desjardins and Rubenson, 2011). Therefore, both sides should be considered carefully when interpreting observed imbalances and designing interventions to foster adjustment. However, this is not necessarily the case in practice.

There is a substantive distinction that is worthwhile noting at this stage which relates to the background debate (or perhaps lack of debate in some circles) on how best to model labour market functioning for the purposes of understanding better labour market outcomes such as earnings and training, and not least mismatch. Should it be primarily from the supply side view or should be rather more from a demand side view of the labour market. Some academic and policy approaches to interpreting imbalances place more emphasis on the supply side while other approaches place more emphasis on the demand side. This relates to the political economic contexts of different countries but also very much on different approaches to modelling labour market functioning for the purposes of understanding better outcomes such as earnings and training, and not least skill imbalances. It is informative to contrast two approaches to understanding imbalances viewed at their extreme even if this is not necessarily neatly distinguished in practice because they can lead to the formulation of very different policy responses.

At one extreme, approaches that are more closely aligned with an emphasis on the supply side of the labour market (e.g., neoclassical models, human capital theory) tend to:

- Portray mismatch as a phenomenon driven by supply side conditions
- Highlight inadequacies of education and training systems as a reason for mismatch
- Promote the reduction of number of qualifications (due to perceived over-education)
- Emphasize the need to ensure quality of E&T systems and their responsiveness to labour market needs
- Suggest that guidance/information in choosing qualification and job may mitigate incidence of mismatch

At the other extreme, approaches that are more closely aligned with an emphasis on the demand side of the labour market (e.g., new political economy of skills model, see Brown, Green and Lauder, 2001) tend to:

- Portray mismatch as a phenomenon driven by demand side conditions
- Highlight inadequacies of labour market practices as a reason for mismatch
- Promote the adjustment of work and organisational practices in ways that optimize skill use and skill gain, and avoids skill loss over time; as well as the need for employer training to include an emphasis on generic skills
- Emphasize that economies can remain competitive without upgrading skills, because the market does not necessarily provide the incentives consistent with a high-skills strategy or high-skills equilibrium
- Suggest that routes to high skill formation and policies required vary a lot between countries

Several researchers have noted that certain countries have had a tendency to place more emphasis on supply side policies while others have emphasized both (see Saar, in press; Green and Green, forthcoming; Lauder, Brown and Ashton, 2008).

Countries that are more closely aligned with a *market-based* approach have tended to emphasize skills-related policies that are supply-side oriented. The labour markets of these countries are characterized by less regulation and more emphasis on market-based solutions. In these contexts, the market mechanism is the

primary source of information exchange between market participants. A key concern in this context is to ensure that work and organisational practices change in ways that make effective use of higher educated workers' skills so as to limit skill atrophy and wasted opportunities to increase productivity. This is because the market may not necessarily have the incentive to adjust work practices to make the best use of existing skills.

In contrast, countries that are more closely aligned with a *coordinated* and *stakeholder-based* approach have had a tendency to emphasize skills-related policies that are both supply- and demand- side oriented. Labour markets in these countries are characterized by institutional relations between employers, employees and the state which are designed to *coordinate* the supply and demand sides of the labour market on the basis of a *stakeholder-based* approach. In some cases, the negotiated settlements among the partners include aspects of skill formation in formal and non-formal settings, as well as skill use in terms of work and organizational practices. A key concern to this approach is the formation of rigidities that are unresponsive to market needs as well as the imperfect information held by stakeholders regarding effective and strategic decision making.

Other countries that are more closely aligned with a *developmental-based* approach have also had a tendency to emphasize skills-related policies that are both supply- and demand- side oriented but with much stronger state involvement. Labour and product markets in these countries are characterized by state intervention designed to promote faster economic growth, for example, by emphasizing industry- and export- based policies that are predicated on ambitions to accelerate the climb up the international value-added chain of production – from labour-intensive to capital-intensive and technology-intensive production. The concern of imperfect information held by decision makers to set the course is exacerbated by the fact that fewer if any market participants, either on the labour or production side, are involved or have any say, which increases the risk of mismanaging the economy.

Another key distinction worthwhile noting is between qualification and skill mismatch. Most of the academic and policy analysis on mismatch so far has focused on qualification rather than skill mismatch. Some analyses have benefited from indirect or self reported measures of skill mismatch but few have been based on direct measures of skill. This is for a simple reason because this is what the nature of the available data has permitted. Recently however, efforts have been made to collect data that changes this. Using direct measures of skills and measures of skill use made available from a handful of studies including the upcoming OECD PIAAC study, it is now possible to approach the topic of skill mismatch with a different set of measures. These measures are not the same but are complementary and each has advantages and disadvantages.

For example, qualification mismatch measures (based on ISCED):

- Provide a less accurate reflection of actual skills at a given period of a worker's life
- Indicate a broader set of skills (covering a range of cognitive and non-cognitive skills) albeit indirectly
- Assume skills are fixed at the qualification point
- Ignore possibilities for skill gain or loss after qualification point
- Ignore quality differences in qualifications both within cohorts and over time and between countries
- May lead to the application of a static measure to a dynamic problem

In contrast, skill mismatch measures (based on direct skill and skill use measures):

- Provide a more accurate reflection of actual skills at a given period of a worker's life
- Indicate a narrower set of skills more directly (covering only a small number of foundation skills)
- Account for skill gain or loss after qualification point

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- Account for quality differences in qualifications

The distinctions are important because the measure used for analysis has a tendency to influence how concerns are framed and investigated. For example, the dynamic elements are more relevant in the framing of skill mismatch rather than qualification mismatch. Even if the skill mismatch measures used only deal with a small number of skills, it useful to recall that these are key foundation skills and are important for reasons already mentioned earlier.

To conclude, four key findings and implications from a recent analysis on skill mismatch using direct measures of skill are summarized but in very brief format (for more details, see Desjardins and Rubenson, 2011).

First, labour demand characteristics are found to be more important than labour supply characteristics in explaining earnings differentials. Workers with low levels of foundation skills who work in jobs requiring high engagement in tasks directly related to those skills (i.e., workers in a skill deficit situation) are found to earn a 21% premium over workers who also have low levels of foundation skills but do not need them at work. Results are not in line with what would be expected from human capital theory.

Second, skill supply characteristics are found to be important determinants of earnings, which is in line with human capital theory. The nuance however, is that this is not independent of skill demand characteristics. Thus skills matter but only if they are required by the job. This is intuitive but nevertheless most research on earnings functions and by extension discussion on education and training policy is dominated by a supply side view of the labour market, namely the human capital approach, and tends to underplay the role of the demand side in determining productivity.

Third, the extent of text-based processing tasks at work is found to be among the strongest determinants of earnings and skill formation. Employers invest in workers who have low levels of foundation skills and who need those skills for their job, but many workers in skill deficit situation still do not receive any kind of support. This may indicate a role for public policy in stimulating and targeting training effort.

Lastly, skill formation is not just a supply side issue; it is just as much a function of work tasks and work organisation on the demand side. The nature and structure of work are a strong driver of adult education/training. The demand side fo skills is thus key and should not be neglected in skill-related policies.

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