**Briefing Note:** Programme for the International Assessment of Adult Competencies – short publications

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<th>To:</th>
<th>Hon. Chris Hipkins, Minister of Education</th>
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**Purpose of Report**

The purpose of this briefing note is for you to:

**Note** that the Ministry has produced five new short publications featuring results from the Programme for the International Assessment of Adult Competencies (PIAAC)

**Note** that these publications will be published on the Education Counts website on 13 December 2018.

**Note** that this briefing note will be proactively released.

**Summary**

- PIAAC provides a wide range of information on the skills of the adult population. New Zealand participated in 2014, with first results released in 2016.
- These short publications cover how people’s skills relate to their social and economic participation, the relationship of skills to social outcomes, the characteristics of people with strong skills, a regional profile of skills, and a technical note on measures of mismatch. They are designed for users of PIAAC data and to respond to media and other information requests.
- A key theme running through these publications is that higher levels of literacy and numeracy are related to improved social and economic participation and outcomes. However, the relationship is moderate and not necessarily deterministic.
Agree that this briefing note will be proactively released.

Agree / Disagree

Andy Jackson  
Group Manager, Tertiary Education  
Graduate Achievement, Vocations and Careers  
23/11/2018

Hon Chris Hipkins  
Minister of Education  
18/12/18
Background

1. The Programme for the International Assessment of Adult Competencies (PIAAC) is the most comprehensive international study of adult skills to date. It provides unique information that cannot be found from other sources. PIAAC helps us understand how adults' skills are developed, maintained and used over a lifetime. It provides information on the interaction between people's skills and their material and social well-being, educational attainment, employment, earnings, and socio-demographic characteristics.

2. The Survey of Adult Skills is the main activity of PIAAC. It involves the direct measurement of literacy, numeracy and problem-solving skills for the population aged 16 to 65. It also collects a broad range of information on how people develop and use their skills in work and everyday life.

3. New Zealand participated in the first cycle of PIAAC. Data for the survey was collected in 2014/15 and reported in 2016. The data from this survey is comparable with that of over 30 other countries, including most OECD countries. It is also comparable with the previous adult literacy surveys in 1996 and 2006, providing a 20-year view of the skills of the population.

4. Reports on the skills of the New Zealand adult population, skills and education, and skills and work were released by the Ministry of Education and MBIE in 2016. The Ministry of Education has since published reports on youth skills, financial literacy, the skills of Māori, and the skills of Pacific people.

Summaries of publications

5. The Ministry has produced five new short publications covering results from the survey.

How are skills related to social and economic participation?

6. This A3 provides an overview of how proficiency in literacy and numeracy is related to participation in New Zealand society and economy. There has been a misconception that data from PIAAC and previous surveys shows that people need a specific level of literacy and numeracy in order to participate in society and the economy.

7. This paper emphasises that while proficiency levels are related to participation, literacy and numeracy do not determine participation. People who scored at Level 1 or below on PIAAC are likely to have the most to gain from support in skill development. This group represents 12% of adults aged 16 to 65 for literacy and 19% for numeracy (see Annex 1).

Skills and social outcomes

8. This paper presents some key results on how skills relate to health, social participation and social trust. It draws together material that has been previously published in the OECD's Education at a Glance.

9. The Survey of Adult Skills shows that people with higher skills and higher education have higher levels of self-reported health, volunteer more often, trust others more, and feel they have more political voice.

10. This relationship holds almost without exception across education and literacy levels. It is stronger for health and say in government and less strong for trust and volunteering.

11. New Zealand has high levels of self-reported health, volunteering, interpersonal trust, and say in government. These are above the OECD average at each level of education and literacy. The difference in these measures between least and most skilled and
educated is comparatively smaller in the areas of health and interpersonal trust. However, it is larger than in many other OECD countries in the areas of volunteering and say in government (see Annex 2).

What are some characteristics of people with strong skills?

12. This A3 provides information on the 15% of adults aged 16 to 65 with strong skills in literacy and/or numeracy. It shows that these people are much more likely to have a higher level qualification, be employed, have high earnings, and better health. However, there are some people with high skills that do not have a degree-level qualification. Also, people in this group are not necessarily in employment or in excellent health (see Annex 3).

Regional profiles

13. We have developed a visual tool that shows the distribution of literacy, numeracy and problem-solving skills by region. Results for Auckland are shown by segments of the city. The tool also includes information on related variables, namely: qualification levels, use of ICT at work and having English as a first language. The last variable is important as the Survey of Adult Skills only tests skills in English.

14. It shows the region with the lowest skills is South and East Auckland, while Wellington has the highest skills. The low skill levels in South and East Auckland is largely driven by the high proportion of the population for whom English is not a first language. The higher skills in Wellington are largely related to qualification levels and a higher proportion of jobs requiring ICT use. Wellington is similar to North and Central Auckland on both of these variables. However, North and Central Auckland has a higher proportion of the population for whom English is not a first language.

15. Annex 4 provides the text that will be included on the webpage and illustrative screen shots from the tool. We plan to improve the range of information available in the tool based on user feedback.

PIAAC measures of qualification and skill mismatch

16. This technical note looks at the three measures of mismatch in the Survey of Adult Skills: qualification level, field of study and skills. It provides general comment on the strengths and weaknesses of each measure and how robust they are for policy purposes. It concludes that the qualification level mismatch is the most robust measure. The field of study measure has considerable methodological issues and should be used with caution. The skills mismatch measure is not suitable for use in analysis or international comparisons. The note was developed from discussions between the Ministry of Education, the Ministry of Business Innovation and Employment, and The Treasury (see Annex 5).

Further work

17. We are undertaking further analytical work using PIAAC data, including:

- further investigation of the relationship between skills and health, civic participation and social connectedness
- investigating measures of intergenerational transfer of skills and education

1 Level 4 or 5 on the PIAAC scales.
• an annotated bibliography of international research that references New Zealand's results

• the relationship between skills and qualifications, employment and income

• what PIAAC can tell us about the skills of parents with young children

• the alignment of the PIAAC literacy and numeracy scales with the Literacy and Numeracy for Adults Assessment Tool.

18. The Department of Internal Affairs is using some PIAAC findings on how often adults undertake IT-related activities to better understand digital inclusion. They plan to publish a post on the Digital Government blog about the importance of these skills, using the PIAAC data.

Release of the reports

19. The Ministry will publish the short reports on its Education Counts website on 13 December 2018. The reports will be proof read by an external editor before publication.
Annexes

Annex 1: How are skill levels related to social and economic participation?

Annex 2: What can the Survey of Adult Skills tell us about how skills and education relate to social wellbeing?

Annex 3: What are some characteristics of people with strong skills?


Annex 5: PIAAC measures of qualification, field of study and skill mismatch.
How are skill levels related to social and economic participation?

Key New Zealand findings from the 2014 Survey of Adult Skills

Proportions of those at different skill levels who have selected indicators of social and economic participation

<table>
<thead>
<tr>
<th>Literacy</th>
<th>Numeracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1 or below %</td>
<td>Level 2 %</td>
</tr>
<tr>
<td>Proportion with English-speaking background</td>
<td>56</td>
</tr>
<tr>
<td>Proportion with degree or higher qualifications</td>
<td>19</td>
</tr>
<tr>
<td>Proportion employed</td>
<td>61</td>
</tr>
<tr>
<td>Proportion of employed with top quintile earnings</td>
<td>6</td>
</tr>
<tr>
<td>Proportion with excellent self-assessed health status</td>
<td>16</td>
</tr>
</tbody>
</table>

What is the Survey of Adult Skills?

New Zealand participated in the OECD’s Survey of Adult Skills in 2014. The Survey measured 16-65 year olds’ literacy and numeracy skills in English.

What do proficiency levels mean?

<table>
<thead>
<tr>
<th>Below Level 1</th>
<th>Level 1</th>
<th>Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literacy</td>
<td>Reading brief texts on familiar topics to locate a single piece of specific information identical to what is given in the question, with seldom any competing information. Understanding sentences or paragraphs is not required.</td>
<td>Reading relatively short texts to locate a single piece of information that is synonymous with what is given in the question. Reading paragraphs of text is expected.</td>
</tr>
<tr>
<td>Numeracy</td>
<td>Simple processes such as counting, sorting, basic arithmetic operations with whole numbers or money, or recognising common spatial representations in familiar contexts with little or no text or distractors.</td>
<td>Carry out basic mathematical processes with little text and minimal distractors, including simple percentages, and identifying elements of common graphical or spatial representations. Tasks usually require only one step.</td>
</tr>
</tbody>
</table>

How are literacy and numeracy defined?

Literacy is understanding, evaluating, using and engaging with written texts to participate in society, to achieve one’s goals, and to develop one’s knowledge and potential.

Numeracy is the ability to access, use, interpret and communicate mathematical information and ideas, in order to engage in and manage the mathematical demands of a range of situations in adult life.

Proficiency levels describe the tasks that adults with a particular range of proficiency scores can successfully complete. They should not be understood as ‘standards’ or ‘benchmarks’ for particular purposes, for example access to post-secondary education, or fully participating in a modern economy.

When were literacy and numeracy previously measured?

In 1996 and 2006, New Zealand participated in two earlier adult skills surveys: the International Adult Literacy Survey and the Adult Literacy and Lifeskills Survey. Together with the 2014 Survey of Adult Skills, they provide comparable measures of literacy at three points in time, and of numeracy at two points. They show New Zealand 16-65 year olds’ literacy skills have increased since 1996, and numeracy skills are stable since 2006.

Annex 2

What can the Survey of Adult Skills tell us about how skills and education relate to social wellbeing?

Key message

The Survey of Adult Skills shows that people with higher skills and higher education have higher levels of self-reported health, volunteer more often, trust others more, and feel they have more political voice.

This relationship holds almost without exception across education and literacy levels, and is stronger for health and say in government, less strong for trust and volunteering.

New Zealand has high levels of self-reported health, volunteering, interpersonal trust, and say in government. These are above the OECD average, at each level of education and literacy. The gap in these measures between least and most skilled and educated is also comparatively smaller in the areas of health and interpersonal trust, but larger than in many other OECD countries in the areas of volunteering and say in government.

Introduction

The OECD’s annual report Education at a Glance (EAG) used data from the Survey of Adult Skills to explore the social impact of education. This builds on a growing body of research that shows a positive association between higher levels of education and skills, and a range of social benefits. This short paper summarises indicators from the 2016 report and shows where New Zealand sits compared with other OECD countries.

In EAG 2016, four questions from the Survey of Adult Skills were mapped to an OECD wellbeing framework\(^1\) as shown below.

How the Survey of Adult Life Skills (SALS) questions have been analysed under the OECD wellbeing framework

<table>
<thead>
<tr>
<th>Domain</th>
<th>Topic</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>Self-reported overall health status</td>
<td>Percentage of adults reporting that they are in good health, by educational attainment, gender and literacy and numeracy proficiency levels</td>
</tr>
<tr>
<td>Social connections</td>
<td>Volunteering</td>
<td>Percentage of adults reporting that they volunteer at least once a month, by educational attainment, gender, literacy and numeracy proficiency levels</td>
</tr>
<tr>
<td>Social connections</td>
<td>Inter-personal trust</td>
<td>Percentage of adults reporting that they trust others, by educational attainment, gender, literacy and numeracy proficiency levels</td>
</tr>
<tr>
<td>Civic engagement and governance</td>
<td>Believe you have a say in government</td>
<td>Percentage of adults reporting that they believe they have a say in government, by educational attainment, gender and literacy and numeracy proficiency levels</td>
</tr>
</tbody>
</table>

It is important to note that these indicators only show associations or correlations. They do not show causality or the extent to which an outcome can be attributed to education or skill level. As a PIAAC Round 2 country, the first results for New Zealand were available from 2016. Earlier editions of EAG (2014 and 2015), covering Round 1 countries, included additional analysis exploring what educational impacts might be after adjusting for key differences in household income, age and gender. These showed that education still had a positive effect on the outcomes, after adjusting for these variables.

\(^1\) For more information about the OECD’s wellbeing framework see e.g. [http://www.oecd.org/statistics/measuring-well-being-and-progress.htm](http://www.oecd.org/statistics/measuring-well-being-and-progress.htm)
Education and health

The research on the links between education and health are perhaps the most developed of the research on the social outcomes of education. On average, people with more education live longer and have healthier lives than those with less education. But the links are complex—and tied closely to factors such as income, demographics, and the social and economic opportunities that people have to lead healthy lives in their communities. Given the significant and growing resources spent on healthcare, the extent to which education contributes directly to better health outcomes may suggest significant economic benefits as well.

Figure 1 shows the association between health and education and skills (in this case literacy). Across participating countries, the proportion of adults aged 25 to 64 years reporting they were in good health correlates well with educational attainment level and with level of literacy proficiency. In New Zealand, the difference in self-reported health between those with the highest levels of education and literacy levels and those with the lowest level of education and literacy skill was small at 22 percentage points. The average difference across the OECD was 33 percentage points.

Figure 1: Percentage of 25-64 year-old adults reporting they are in good health, by education and level of literacy

Notes: See technical note at end of report for source reference and definitions.

New Zealanders with low education and skills had relatively good health compared with similarly educated and skilled people in other countries. Of this group, 73% reported that they were in good health, the third highest in the OECD and higher than the 59% OECD average.

Education and volunteering

High levels of social cohesion is generally recognised as an essential element for well-functioning societies. “Low levels of civic and community participation and trust can pose a challenge for the maintenance of well-functioning democratic institutions and political processes. Education may play an important role in ensuring social cohesion by fostering the cognitive skills, self-efficacy and resilience that underlie social and political interaction.”

Volunteering is considered a strong marker of social cohesion, given it is typically an altruistic service benefiting others for no financial gain. The economic value to societies of volunteering has been shown to be very significant.

Figure 2 shows the relationship between literacy and education and volunteering. While the relationship is not as strong as it is with health, a clear association remains between higher education and skills, and higher levels of volunteering. Adults with a tertiary qualification and strong literacy reported higher levels of volunteering compared with adults with lower qualifications and literacy.

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New Zealand has some of the highest levels of volunteering across all levels of education. However, the difference in volunteering levels between the least skilled and educated and the most was larger than many (two-thirds of) other OECD countries.

New Zealanders with low education and low skills had highest rate of volunteering compared to people with similar education and skills in other countries. New Zealanders with degrees and high skills had the second highest rate of volunteering.

**Figure 2: Percentage of 25-64 year-old adults reporting they volunteer at least once per month, by education and level of literacy**

![Graph showing percentage of 25-64 year-old adults reporting they volunteer at least once per month, by education and level of literacy.](image)

- Below upper-secondary & low literacy
- Upper-secondary or level 4 & medium literacy
- Diploma or above & high literacy

Notes: See technical note at end of report for source reference and definitions.

**Education and interpersonal trust**

Numerous studies have identified trust — both trust in institutions and trust in other people — as a key ingredient of social and economic progress. It has been linked to income per capita and economic growth, health status and health-related behaviour, crime rates and subjective well-being⁴. It is a key component of social capital and cohesion.

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⁴ OECD [2018] Trust and its determinants [http://www.oecd.org/mw/internal/de5fs23hu73ds/progress?id=m3cWhtnTnPn5evyEOH7whbam488WniVssAXfl7ywaRA,dl](http://www.oecd.org/mw/internal/de5fs23hu73ds/progress?id=m3cWhtnTnPn5evyEOH7whbam488WniVssAXfl7ywaRA,dl)
Figure 3: Percentage of 25-64 year-old adults reporting that they trust others, by education and level of literacy

- Below upper-secondary & low literacy  □ Upper-secondary or level 4 & medium literacy  △ Diploma or above & high literacy

Notes: See technical note at end of report for source reference and definitions.

Figure 3 also shows a strong association between trust and education and skills. Across all countries, adults with higher qualifications and literacy also had higher levels of interpersonal trust. In New Zealand, the proportions of adults reporting that they trust others were above average (in the top third of countries). However, unlike health, or voice in government, the gap between the least skilled, least educated and most skilled, most educated was larger than it was for many other OECD countries (in the bottom third). Part of this is likely due to cultural or rather than education reasons, especially in countries with low overall levels of trust.

Education and believing you have a voice in government

Democratic societies are founded on the principle that government reflects the will of the people, where everyone has an equal right of say. The extent to which some groups feel marginalised or disenfranchised in this respect can mean that government is no longer fulfilling this principle.

The Survey of Adult Skills shows a strong relationship between education and skills and whether you believed you had a say in government. Adults with higher levels of literacy and qualifications reported higher levels of belief that they had a say in government compared with adults with lower skills and qualifications.

In New Zealand, the gap in belief between least educated and most educated was larger than it was for interpersonal trust, and volunteering, and about the same as between education and health.
Figure 4: Percentage of 25-64 year-old adults reporting that they believe they have a say in government, by education and level of literacy

Notes: See technical note at end of report for source reference and definitions.

Technical Note:

The material in this report comes from the Survey of Adult Skills data as analyzed and reported in OECD’s Education at a Glance 2016. Specifically, online tables for indicator AS. http://dx.doi.org/10.1787/88893387355. The reference year is 2012 for all countries, except for six countries including New Zealand, for which the reference year is 2015. “Low literacy” as used in this report relates to level 1 and below on the PIAAC literacy proficiency scale. “Medium” literacy relates to level 3 on the PIAAC literacy proficiency scale. “High” literacy relates to levels 4 and 5 on the PIAAC literacy proficiency scale. Data on numeracy is also available on the OECD website but has not been analyzed here.

For information on the Survey of Adult Skills see the OECD’s website. http://www.oecd.org/skills/piaac/. This also includes full technical report including country-specific technical information that may affect the country comparisons shown in this report.
Annex 3

What are some characteristics of people with strong skills?
Findings from the 2014 Survey of Adult Skills

Strong skills are clearly related to positive social and economic outcomes...

The stronger people’s literacy and numeracy skills, the more likely they are to have higher level qualifications. And the more likely they are to have positive work, social and wellbeing outcomes. This includes being more likely to be employed and have high earnings, and have excellent self-rated health status.

The slightly increased likelihoods of employment and high earnings for people with both strong literacy and strong numeracy skills suggest employers value this combination.

... but do not determine them

About 20% of people with strong skills do not have a degree qualification. Of these, 85% have at least upper secondary education. About 1 in 10 people with strong skills are not employed. About half of these people are students, and the main activities of another 20% are looking after children or domestic duties.

About 15% of people with strong skills had a non-English speaking background, even though the Survey measured literacy and numeracy skills in English. Three-quarters of these people had at least degree level qualifications.

Proportions with at least degree level highest qualification by skill level

![Proportions with at least degree level highest qualification by skill level](image)

The proportion of New Zealand 16-65 year olds with Level 5 skills was too small to analyse separately, so we have combined them as Levels 4 and 5.

Proportions of employed people with top quintile earnings

![Proportions of employed people with top quintile earnings](image)

What is the Survey of Adult Skills?

New Zealand participated in the OECD's Survey of Adult Skills in 2014. The Survey measured 16-65 year olds' literacy and numeracy skills. 16% of all 16-65 year olds have strong literacy skills, 15% have strong numeracy skills, and 10% have both strong literacy and strong numeracy skills.

What do strong literacy and numeracy levels mean?

<table>
<thead>
<tr>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literacy</td>
<td>Multiple-step operations to integrate, interpret, or synthesise information from complex or lengthy texts. Complex inferences and applying background knowledge may be needed. Many tasks require identifying and understanding one or more specific, but non-central ideas in the text in order to interpret or evaluate subtle evidence-claim or persuasive discourse relationships. Conditional information is frequently present in tasks at this level and must be taken into consideration by the respondent. Competing information is present and sometimes seemingly as prominent as correct information.</td>
</tr>
<tr>
<td>Numeracy</td>
<td>Understanding a broad range of mathematical information that may be complex, abstract or embedded in unfamiliar contexts. These tasks involve undertaking multiple steps and choosing relevant problem-solving strategies and processes. Tasks tend to require analysis and more complex reasoning about quantities and data; statistics and chance; spatial relationships; and change, proportions and formulas. Tasks at this level may also require understanding arguments or communicating well-reasoned explanations for answers or choices.</td>
</tr>
<tr>
<td>Numeracy</td>
<td>Searching for and integrating information across multiple, dense texts; constructing syntheses of similar and contrasting ideas or points of view; evaluating evidence-based arguments. Applying and evaluating logical and conceptual models of ideas may be required. Evaluating reliability of evidentiary sources and selecting key information is frequently a requirement. Tasks often require respondents to be aware of subtle, rhetorical cues and to make high-level inferences or use specialised background knowledge.</td>
</tr>
</tbody>
</table>

How are literacy and numeracy defined?

Literacy is understanding, evaluating, using and engaging with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential.

Numeracy is the ability to access, use, interpret and communicate mathematical information and ideas. In order to engage in and manage the mathematical demands of a range of situations in adult life.

Proficiency levels describe the tasks that adults with a particular range of proficiency scores can successfully complete. They should not be understood as 'standards' or 'benchmarks' for particular purposes, for example access to post-secondary education, or fully participating in a modern economy.

Annex 4

Survey of Adult Skills – regional profiles

The Survey of Adult Skills measures the skills of New Zealand adults in literacy, numeracy and problem solving in technology rich environments. It is part of the OECD’s Programme for the International Assessment of Adult Competencies (PIAAC).

The survey was undertaken in New Zealand in 2014 with a nationally representative sample of 6,177 adults aged 16 to 65. It was conducted in English and included an extensive background questionnaire covering education, employment, and the use of skills at work and in everyday life. The respondents were then tested on their skills.

The survey measures skills on continuous scales which show the range of abilities from being able to deal with simpler through to more complex tasks. The survey does not measure whether people ‘pass’ or ‘fail’ certain standards, nor whether people are ‘literate’, ‘illiterate’, ‘numerate’ or ‘innumerate’.

The scales can be divided into levels to group people within similar ranges of ability. These levels help describe the kinds of tasks these groups of people can do. However, the levels, on their own, do not describe benchmarks or thresholds for participation in society and the economy.

Key findings

South and East Auckland has the lowest English-language based skills in the country, with nearly double the proportion of the population with low skills than all of New Zealand. This is largely a result of the high proportion of the population who do not have English as a first language. South and East Auckland is only slightly below the national average for educational achievement and ICT use at work.

The Wellington region has the highest skills in the country. The proportion of the population with high skills is around 50% higher than all of New Zealand. This is largely a result of the higher proportion of the population with degrees or above.

North and Central Auckland is similar to Wellington in terms of education and ICT use. However, North and Central Auckland has a higher proportion of the population for whom English is not a first language. This results in lower average skills in English.

Outside of Wellington and Auckland, differences in skill levels between regions are largely a result of the education levels and skill levels of jobs (as indicated by the use of ICT at work).

Regional profile tool

The regional profile tool provides results from the survey by regional council, and larger areas within the Auckland region. Some regions have been combined due to the relatively small sample sizes in those regions. The larger areas within Auckland are based on community boards and follow a grouping adopted by the Auckland Council in their PIAAC report (Clark & Huang, 2018).

The tool provides both maps and bar charts. The bar charts show the regions in descending order of the selected indicator and include the margin of error for each region. The result for all of New Zealand is included in the bar charts.

The following views of the data are available:

- Proportion of population by skill levels: this view shows the proportion of the population in each region that has low or high skills in literacy, numeracy or problem solving.
• Average skills score: this view shows the average score for each region on the continuous skill scale.

• Other variables: this view shows the proportion of the population in each region with low and high levels of education, low and high levels of use of ICT at work and not having English as a first language. These are were identified in previous research as factors strongly related to literacy and numeracy in English (Lane, 2010).

• Compare skill levels with other variables: these two views provide comparisons of skill levels with other variables – one using maps and the other using bar charts. You can choose a skill domain and level on the left hand side and look at how this relates to one of the other variables on the right hand side.

• Compare regions with all of New Zealand: this view shows all of the skill and other indicators for a selected region and compares them with all of New Zealand. It illustrates the extent to which the related variables differ across regions.

The notes page in the tool includes information on the definitions used for low and high skills and other variables.

Other related research

The Auckland Council has produced a comprehensive analysis of literacy, numeracy and problem solving skills using the Survey of Adult Skills (Clark & Huang, 2018). Their report provides an overview of the results for Auckland, and outlines the differences in skill proficiencies between Auckland and the rest of New Zealand, as well as differences across geographic areas within Auckland.

The Ministry of Education explored the geographical distribution of literacy and numeracy skills among people aged 25 to 65 using data from the previous 2006 adult skills survey (Lane, 2010). The report found that three key factors provided a good account of the distribution of high and low literacy and numeracy: computer use, especially at work; completed education and first language (English or not).

The OECD has undertaken work to further develop methods for small area estimation (Krenzke et al., 2018). These approaches use multivariate models to provide more reliable estimates of skills levels in small population based on the survey results. New Zealand has been part of this development and we plan to publish information using these methods in the future.

Data limitations

The sample for the Survey was designed to be representative of 16 to 65 year olds across New Zealand. It was not designed to be to be fully representative of people within each region. It is possible that some groups may not have been sampled to the same extent in each region and this could affect the results.

The size of the sample means that there is a fairly large margin of error at a regional level. This needs to be taken into account in drawing conclusions about the differences between regions.

Each region shown in this tool is reasonably large and is likely to have variation within it. There are likely to be areas of lower and higher skill within each region, which are averaged out in the regional results.
References


Proportion of population by skill levels

Source: Survey of Adult Skills 2012 (see notes page for further information)
Choose other variables from the survey

Pre-langauge not English

- South and East Auckland
- West Auckland
- North and Central Auckland
- Total
- Wellington Region
- Canterbury Region
- Bay of Plenty Region
- Taranaki/Whanganui/Maranui
- Waikato Region
- Northland Region
- Great Barrier's Bay
- Rest of South Island
- Otager South Island

Percent of population

Source: Survey of Adult Skills 2014 (see notes page for further information)
Compare skill levels with other variables

Choose skill domain and level
High problem solving

Choose other variables from the survey
High ICT use at work

Source: Survey of Adult Skills 2012 (see notes page 9 for further information)
Compare skill levels with other variables

Choose skill domain and level

- Low literacy

Regions:
- South and East Auckland
- West Auckland
- Waikato Region
- Otago/Makaurau’s Bay
- Total
- Auckland Region
- Otago/Southland
- Taranaki/Wairarapa/Maranui
- Rest of South Island
- North and Central Auckland
- Canterbury Region
- Bay of Plenty Region
- Wellington Region

Proportion of population

0% 10% 20% 30% 40% 50%

Choose other variable from the survey

- No or level 1 qualification only

- North Island Region
- Gisborne/Whanganui’s Bay
- Waikato Region
- East of South Island
- Otago/Southland
- South and East Auckland
- West Auckland
- Taranaki/Wairarapa/Maranui
- Total
- Bay of Plenty Region
- Canterbury Region
- Wellington Region
- North and Central Auckland

Proportion of population

0% 10% 20% 30% 40%

Source: Survey of Adult Skills 2014 (see notes page for further information)
PIAAC measures of qualification, field of study and skill mismatch

The Survey of Adult Skills (PIAAC) provides three different measures of qualification and skill mismatch. The measures vary in definition and robustness. This note provides general comment on the strengths and weaknesses of each measure and how robust they are for policy purposes. The first section summarises the strengths and weaknesses of each measure. Further details are then provided on each measure.

This note has been developed from discussions between the Ministry of Education, the Ministry of Business, Innovation and Employment and The Treasury.

Strengths and weaknesses of each measure

Qualification level mismatch

This measure compares the level of education a person has achieved with his/her self-assessment of what would be the level of education needed to get his/her job.

This is the strongest and most robust of the three measures.

This measure can be used for international comparisons, although it does need to be interpreted carefully. Differences between countries may be due to differences in qualification and occupation structures, as well as labour market differences.

In interpreting this measure, regard needs to be given to age group and level of qualification. Other variables that may be useful to explore are differences by field of study and length of time the person has been in employment.

Field of study mismatch

This measure compares the field of study of the highest level of qualification attained with the occupation that the person is employed in. For each broad level of study, there is a list of occupations that are considered to be ‘matched’.

There are considerable methodological issues with this measure and it should be used with caution.

There are a number of issues with the matching methodology that are set out in the accompanying notes. As with qualification level mismatch, regard needs to be given to age group and level of qualification in any interpretation of the measure. In particular, if it is being used to assess the performance of a particular part of the education sector (e.g. school, vocational or university level), then the aggregate statistic is an inappropriate measure, and the field of study mismatch should be calculated for that level alone.

International comparisons based on this measure should be treated with extreme caution, as differences are likely to reflect the structure of qualifications and occupations in each country, as well as any real differences in labour market efficiency.
Looking at qualification level mismatch by field of study (that is, without also attempting to match to occupation) is likely to provide a better measure of over and under supply of qualifications.

Further developments of this measure are planned for the next cycle of PIAAC.

Skills mismatch

This measure attempts to identify people whose literacy, numeracy and/or problem solving skills are clearly much higher or much lower than required for their job.

There are considerable methodological issues with this measure, as set out in the accompanying note. It should be regarded as a developmental measure and not suitable for use in analysis or international comparisons.

Work is underway to significantly improve this measure in the next cycle of PIAAC.

Strength of the measures in explaining wages across countries

The figure below compares the effect of the three mismatch measures on explaining the wage differences. It compares the wages of a person who is over-qualified, over-skilled or with field of study mismatch with the wages of well-matched person with the same level and/or field of study. Age, experiences and other factors have been controlled for in the models.

The effect of qualification level mismatch is shown by the height of the bars. The results show that people who are over-qualified have lower wages than people with the same level of qualification in well-matched jobs. This effect varies across countries and is around the OECD average for New Zealand. All results are statistically significant.

The effect of field of study mismatch is shown by the circles. The grey circles indicate that the effect is not statistically significant. For most countries, including New Zealand, the effect of field of study mismatch on wages is not statistically significant, once qualification level mismatch is taken into account. This suggests that the field of study mismatch on its own does not affect worker productivity.

The relationship between the skills mismatch measure and wages varies considerably across countries. It would appear that in some countries it is beneficial to be in a job for which one is over skilled, compared to a job where one is well matched. This reinforces concerns about the credibility of the measure.
Effect of qualification, literacy and field-of-study mismatch on wages

Percentage difference in wages between overqualified, overskilled or field-of-study mismatched workers and their well-matched counterparts

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 recognises 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 other 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 of the Republic of Cyprus.

Notes: Coefficients from OLS regression of log hourly wages on mismatch directly interpreted as percentage effects on wages. Coefficients adjusted for years of education, age, gender, marital status, working experience, tenure, foreign-born status, establishment size, contract type, hours worked, public sector dummy, proficiency in literacy and use of skills at work. The wage distribution was trimmed to eliminate the 1st and 99th percentiles. The regression sample includes only employees. The analysis excludes the Russian Federation because wage data obtained through the survey do not compare well with those available from other sources. Hence further checks are required before wage data for this country can be considered reliable. The analyses exclude Australia because field-of-study mismatch due to the unavailability of ISCO 3-digit information for Australian workers in the Survey of Adult Skills (PAAc). Statistically significant values (at the 10% level) are shown in a darker shade.

Countries and economies are ranked in ascending order of the effect of overqualification on wages.

Source: Survey of Adult Skills (PAAc) (2012, 2015), Table A5.12.
Qualification mismatch measure

Qualification mismatch, as used in the OECD Skills Matter 2016 report is based on a sample of employed participants in the Survey of Adult Skills (PIAAC), excluding those who were in self-employment or in multiple jobs.

To measure this type of mismatch, the OECD compared the level of education a person effectively achieved with his/her self-assessment of what would be the current usual level of education needed to get his/her job.

This approach aggregates the highest qualification level attained and the education level needed to get the job into comparable categories to define over-qualification, under-qualification and well-matched qualification.

A person is classified as over-qualified if his/her qualification level is higher than that required to get the job; he/she is classified as under-qualified if lower; well-matched if the same.

Question D_Q21a (If applying today, what would be the usual qualifications, if any, that someone would need to GET this type of job?) and the EDCAT6 from the PIAAC dataset were used to replicate the qualification mismatch rates presented in the OECD report, and confirm the methodology the OECD used to estimate the prevalence of qualification mismatch in the participating countries (refer to Table 1).

We find that the OECD approach is consistent with measures used in the literature on over-education, and has the advantage of being job-specific.

Based on how qualification mismatch is defined and measured in the OECD report, persons who are qualification mismatched refer to persons in employment who are in jobs whose qualification requirements do not correspond to their highest qualifications.

Overall, we find that OECD’s qualification mismatch indicator is useful and informative when we refer to people in employment who are mismatched by level of qualification. When defined and measured this way, this indicator is readily implementable, and allows for international comparison. Compared to the other indicators of mismatch (skills and field of study), the qualification mismatch indicator is more robust and can provide insights for policy analysis and development.

Analysis

We investigated the qualification mismatch indicator reported for New Zealand in the OECD Skills Matter 2016 report. The investigation aimed at replicating the prevalence of qualification mismatch reported in the OECD report, and testing whether the prevalence is sensitive to what measure was used in the calculation.

We compared three qualification mismatch measures:

- Mismatch by Qualification levels (QM1): Compares the level of education a person effectively achieved with his/her self-assessment of what would be the level of education needed to get his/her job. The OECD adopted this approach, which aggregates the highest qualification level attained and the education level needed to get the job into comparable categories.
- Mismatch by imputed years of education (QM2): Compares the years of formal education a person achieved with the years of formal education required to get his/her job.
- Self-report (QM3): this measure is similar to what was used in the Skills and Work 2016 report, and is based on the question: Thinking about whether this qualification, or level of schooling, is NECESSARY for doing your job satisfactorily.

Given that mismatch compares the characteristics of the job with individual characteristics, the above methods were applied to an analytical sample (n=3,328) that included those who were employed, and excluded those who were self-employed or in multiple jobs.
Table 1 summarises results from applying the three approaches to the analytical sample of paid employees. The second column lists the PIAAC variables used to estimate the rates of qualification mismatch for the New Zealand sample.

**Table 1: Prevalence of qualification mismatch (% of paid employees, n=3,328)**

<table>
<thead>
<tr>
<th>Qualification mismatch measures</th>
<th>PIAAC Variable used</th>
<th>Under-qualified</th>
<th>Over-qualified</th>
<th>Qualification-matched</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualification level (QM1)</td>
<td>EDCAT6</td>
<td>10.8 (0.65)</td>
<td>33.6 (0.91)</td>
<td>55.6 (0.87)</td>
</tr>
<tr>
<td>(OECD’s methodology)</td>
<td>D_Q12a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imputed years of formal education (QM2)</td>
<td>YRSQUAL</td>
<td>17.1 (0.75)</td>
<td>53.6 (1.05)</td>
<td>29.3 (0.92)</td>
</tr>
<tr>
<td></td>
<td>YRSGET</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-reported (QM3)</td>
<td>D_Q12b</td>
<td>8.9 (0.62)</td>
<td>28.9 (1.21)</td>
<td>62.2 (1.33)</td>
</tr>
</tbody>
</table>

Note: Yrsqual: highest level of education obtained imputed into years of education (derived); yrsget: imputed years of formal education needed to get the job (self-reported – derived)
Field of study mismatch measure

How field of study is collected and coded

Where a person’s highest qualification is equivalent to NCEA level 1 or higher, they are asked for its main field of study. The New Zealand question text ran: What was the main subject for your highest qualification? If there was more than one, please choose the one you consider most important.

The international version of the questionnaire had nine response options – the broad levels of the Eurostat field of education and training classification:

1. General programmes
2. Teacher training and education science
3. Humanities, languages and arts
4. Social sciences, business and law
5. Science, mathematics and computing
6. Engineering, manufacturing and construction
7. Agriculture and veterinary
8. Health and welfare
9. Services

Countries were allowed to ask an open question in order to code responses to a national field of study classification, or the detailed levels of the Eurostat one. In New Zealand, we took the open question option and coded the text strings to the detailed level of Statistics New Zealand’s NZCED Field of Study Classification. These codes were mapped to the above nine categories for the OECD to create our international variable.¹

How field of study match and mismatch are derived

For those working, the OECD has listed sets of occupation codes (3 digit ISCO codes) that are deemed matched occupations for each of the field of study codes 2-9. If a person’s occupation isn’t in the list for their field of study they are deemed mismatched. Some occupations are matched under more than one field of study.

Coded to missing are:

» no school qualifications
» field of study is General programmes
» employment status is self-employed
» occupation is armed forces, legislators, senior officials, refuse workers and other elementary workers.

¹ The two classifications are dissimilar. For example some services and science fields of study are spread across the NZ classification but collected together in Eurostat’s. And the reverse for some categories of management.

The New Zealand classification’s broad categories are:

1. Natural and Physical Sciences
2. Information Technology
3. Engineering and Related Technologies
4. Architecture and Building
5. Agriculture, Environmental and Related Studies
6. Health
7. Education
8. Management and Commerce
9. Society and Culture
10. Creative Arts
11. Food, Hospitality and Personal Services
12. Mixed Field Programmes
Differences across countries

Countries’ field of study mismatch rates differ by level of qualifications. The graph below compares New Zealand with the UK\(^2\), Korea and Slovenia.

Figure 2: Field of study mismatch rate by highest qualification, selected countries

Some comments on this analysis are:

- New Zealand, the UK and Korea have similar overall field of study mismatch rates, with Slovenia lower.
- For NZ and the UK, the higher someone’s qualification the less likely they are to have a field of study mismatched occupation.
- Compared to NZ, the UK has a much higher proportion of people with a lower secondary qualification\(^3\) who report General Programmes as their main field of study; therefore their field of study mismatch is set to missing. Despite this, NZ and the UK have similar rates of mismatch for lower secondary qualifications.
- Korea has a similar overall field of study mismatch rate, but much less variability across qualification level. (Korea has zero rates of mismatch for lower secondary and tertiary less than degree qualifications because it apparently has no qualifications at these internationally defined levels.)
- Slovenia has a contrasting pattern – an overall lower mismatch rate which is highest for upper secondary qualifications.
- If we look at field of study mismatch rates for the subgroup with post-school highest qualifications, compared to the total mismatch rate, we see similar differences in New Zealand and the UK. About

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\(^2\) In the UK, only England and Northern Ireland participated in PIAAC.

\(^3\) For New Zealand, the level of lower secondary schooling for which field of study mismatch is derived is NCEA Level 1. Upper secondary is NCEA Level 2 or 3.
40% compared to a half. However, Korea and Slovenia have similar rates of mismatch for those with post school qualifications compared to everyone.

Further comments

Validity of the OECD’s occupation/field of study mapping

The OECD deems a wide range of occupations to be matched under each broad field of study category. Therefore it includes many field of study mismatched individuals. For example the field of study category: Humanities, languages and arts maps to the occupations: librarians, archivists, authors, journalists, architects and teachers. It’s a mapping that is more mismatch-not-proved than match-proved.

On the other hand, it’s the same for all countries, so a difference in match rate across countries might still represent a real difference in their education systems or labour markets.

Someone’s occupation may be matched to a secondary field of study for their highest qualification rather than its main field of study. Or matched to the main field of study of a qualification lower than their highest qualification. PIAAC collects no data to check this.

Countries have different proportions of workers for whom field of study match is missing

New Zealand PIAAC respondents with highest qualification NCEA Level 1-3 or equivalent have field of study quite spread across the nine categories. Eighty percent of these people got their highest qualification at school. They appear to have reported their field of study as one of their school subjects – frequently English – which seems reasonable enough. English field of study is mapped to Humanities, languages and arts which has a wide range of occupations in their education systems as treated as matched.

A review of a few other countries’ data shows quite a lot of records for people with school qualification as their highest have General programmes as their field of study. For example in the UK, 33% are General programmes compared with 4% in New Zealand. Several reasons could account for this, including (a) this reflects a real difference in countries’ education systems, (b) countries coded open responses to a local classification then mapped back to the nine International responses in a different way from us, (c) where countries just used the closed question, General programmes might seem a logical response for a school qualification.

This means that mismatch rates are not very comparable across countries. The small proportions of New Zealanders with only school qualifications who are coded to field of study General programmes is a case in point. It means that a relatively small proportion of our school qualifications people are set to missing whereas a much larger proportion in the UK are missing.

In addition, countries with lower employment rates, or higher proportions of self-employed people will have greater proportions of their population missing from their field-of-study match rates.
The four selected countries have large and variable proportions of employed people for whom field of study mismatch is not derived. New Zealand and Slovenia have much smaller rates than Korea where 6 in 10 people have field of study mismatch set to missing. The rates are therefore calculated for widely different sized subsets of the employed.

**Table 2: Proportions of the employed who are neither field-of-study matched nor mismatched**

<table>
<thead>
<tr>
<th>Country</th>
<th>Proportion of the employed who are neither FOS matched nor FOS mismatched</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand</td>
<td>31</td>
</tr>
<tr>
<td>England &amp; Northern Ireland</td>
<td>38</td>
</tr>
<tr>
<td>Korea</td>
<td>57</td>
</tr>
<tr>
<td>Slovenia</td>
<td>29</td>
</tr>
</tbody>
</table>

**Analysing qualification mismatch by field of study**

This may be more useful for understanding mismatch in the labour market than looking at field of study mismatch according to the current OECD definition. It may also be more useful than attempting a finer grained ANZSCO/field of study mapping.
Skill mismatch measure (literacy, numeracy or problem solving)

How is skill mismatch defined?

Two questions in the background questionnaire are used:

"Do you feel that you have the skills to cope with more demanding duties than those you are required to perform in your current job?"

"Do you feel you need further training in order to cope well with your present duties?"

People who answered "No" to both questions were considered to be well matched. The minimum and maximum observed proficiency for these people was considered to be minimum or maximum skills required for the job. To avoid outliers, the 5th and 95th percentile are used to set the minimum and maximum. This range is set by occupation and country, using the first digit level of ISCO4.

When a worker's proficiency is above the maximum they are considered over skilled. When a worker's proficiency is below the maximum they are considered under skilled.

How was occupation collected and coded?

Respondents were asked to describe their occupation and what their main tasks were. The survey company coded these responses directly to the lowest levels of both the ISCO and ANZSCO classifications.

Comments

The identification of the 'well matched' group relies on self-completed questions which are open to interpretation. In particular, the questions do not require participants to think about 'how much'. Also, there interpretation of 'skills' in these questions is likely to quite broad and not specific to literacy and numeracy.

The proportion of 'well-matched' workers in each occupation is small, ranging from 2.7% for service and sales workers to 8.5% for elementary workers. A much higher proportion in each occupation answered 'yes' to both questions – which appears to be a contradictory response (from 16 to 32%, or between 2 and 9 times the number answering 'No' to both).

The range of proficiency levels for 'well-matched' workers is wide and does not appear to clearly differentiate the skill requirements of different occupations. For example, the literacy skill range for crafts and trades is almost the same as that of elementary workers.

Looking at the range of proficiency for each question combination within occupations, the questions do not appear to show consistently differentiated groups by skill levels. And, in some occupations, these groups are not much different from the overall 5th and 95th percentile for that occupation.

The use of this measure for international comparisons is questionable. It is very dependent on the way in which people understand the questions within countries and occupations. It provides little real difference from

* The first level groups for ISCO are:
  1. Managers
  2. Professionals
  3. Technicians and Associate Professionals
  4. Clerical Support Workers
  5. Services and Sales Workers
  6. Skilled Agricultural, Forestry and Fishery Workers
  7. Craft and Related Trades Workers
  8. Plant and Machine Operators and Assemblers
  9. Elementary Occupations
  0. Armed Forces Occupations

Due to sample size, groups 6 and 0 were dropped, and 1 and 2 were merged.
simply using the overall skill distribution for each occupation. It is not surprising therefore that the amount of differentiation across countries is limited (most countries being in the 10-20% range for total mismatch).

**Alternative approach**

An alternative approach to this measure would be to simply look at those who are below or above the 5th and 95th (or 10th and 90th) percentiles for their occupations. This would focus on people with unusually high or low skills compared to their occupational peers. It may be possible to do this at level 2 of the classification (with some grouping).

However, this approach would not provide any meaningful international comparisons, or comparison over time. It would only be useful as a way of understanding the characteristics of high and low skilled workers by occupation.

**Table 3: Frequency of observations who were 'well matched' and range of literacy and numeracy scores**

<table>
<thead>
<tr>
<th>Number</th>
<th>Percent</th>
<th>Min</th>
<th>Max</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Managers and professionals</td>
<td>122</td>
<td>7.7%</td>
<td>228</td>
<td>364</td>
</tr>
<tr>
<td>3</td>
<td>Tech. and ass. professionals</td>
<td>36</td>
<td>5.8%</td>
<td>179</td>
<td>355</td>
</tr>
<tr>
<td>4</td>
<td>Clerical</td>
<td>25</td>
<td>5.9%</td>
<td>182</td>
<td>321</td>
</tr>
<tr>
<td>5</td>
<td>Services and sales</td>
<td>20</td>
<td>2.3%</td>
<td>159</td>
<td>318</td>
</tr>
<tr>
<td>7</td>
<td>Craft and trades</td>
<td>23</td>
<td>5.8%</td>
<td>120</td>
<td>310</td>
</tr>
<tr>
<td>8</td>
<td>Plant and machinery</td>
<td>18</td>
<td>7.8%</td>
<td>170</td>
<td>306</td>
</tr>
<tr>
<td>9</td>
<td>Elementary</td>
<td>25</td>
<td>8.5%</td>
<td>112</td>
<td>294</td>
</tr>
</tbody>
</table>

We shape an education system that delivers equitable and excellent outcomes

He mea tīrāi e miōto te miāuenga kia rangetira e, kia mana taurite ai ona huanga
Figure 3: 5th to 95th percentiles of literacy proficiency across all 4 question combinations and total, for occupation groups