

# The Background Questionnaire of the Survey of Adult Skills (PIAAC)

This chapter describes the questionnaire that is part of the Survey of Adult Skills (PIAAC). The questionnaire collects information on the basic demographic characteristics of respondents; educational attainment and participation; labour force status and employment; social outcomes; the use of literacy, numeracy and ICT skills at work and in everyday life; and the use of a range of other skills at work.



The background questionnaire for the Survey of Adult Skills (PIAAC, 2010<sup>1</sup>) collects a comprehensive set of information designed to support the major analytical objectives of PIAAC, namely to:

- determine the level and the distribution of proficiency in key information-processing skills for certain subgroups of the adult population;
- better understand factors associated with the acquisition, development, maintenance and loss of proficiency over a lifetime: and
- better understand the relationship of proficiency in information-processing skills to economic and other social outcomes.

The development of the background questionnaire was overseen by the PIAAC Background Questionnaire Expert Group. The principles guiding the selection of the items included in the questionnaire can be found in the conceptual framework for the development of the background questionnaire (PIAAC, 2009). In addition to being relevant to the policy questions to which the Survey of Adult Skills was intended to respond, items were expected to measure concepts that had a strong theoretical underpinning, had been measured in other studies, and would be comparable across countries and groups within countries. In addition, efforts were made to maximise comparability with related surveys, such as the International Adult Literacy Survey (IALS) and the Adult Literacy and Life Skills Survey (ALL), as well as other cross-national surveys focusing on related topics, such as adult education and training, by using common items. Questions relevant to small subgroups were avoided. The target maximum duration of the background questionnaire (i.e. for an employed person who was participating in some formal education or training activity) was 45 minutes.

Participating countries were requested to adapt questions to reflect national circumstances in domains such as educational attainment and participation, labour-force participation and employment, where institutional structures were nationally specific or where there were national protocols for collecting data. Countries had the opportunity to add a small number of "national" questions to the national versions of the background questionnaire. These were expected to add no more than five minutes to the average duration of the questionnaire.

The background questionnaire collected information in five main areas:

- basic demographic characteristics and background of respondents;
- educational attainment and participation;
- labour-force status and employment;
- social outcomes; and
- literacy and numeracy practices and the use of skills.

The information collected is described below, together with the rationale for including it in the questionnaire.

#### THE CHARACTERISTICS AND BACKGROUND OF RESPONDENTS

Understanding the distribution of proficiency across key subgroups of the adult population is one of the major objectives of the Survey of Adult Skills. To this end, in addition to information on the basic demographic variables of gender and age, the background questionnaire collects data regarding language background, immigration status, and social background (the educational level of the respondent's parents and the cultural capital of his/her family). Data on household and family structure is also collected, given the potential importance of these variables in explaining observed proficiency and as indicators of individual well being (Table 2.1).

Table 2.1

Data collected concerning the characteristics and background of respondents

Domain	Specific data items	
Demographics	Age, gender, country of birth.	
Household and family structure	Number of persons in household, living with spouse or partner, activity of spouse/partner, number and age of children.	
Language background	First and second languages spoken when a child, language currently most often spoken at home.	
Immigration status	Age at which respondent immigrated, country of birth of parents.	
Social background	Highest level of education of parents, number of books in home at age 16.	
Residential location	Location of residence.	



#### **EDUCATIONAL ATTAINMENT AND PARTICIPATION IN LEARNING ACTIVITIES**

Participation in education and training activities, whether formal or non-formal,<sup>2</sup> is understood as both a factor explaining proficiency in the skills assessed and a possible outcome of having these skills. Literacy, numeracy and problem solving are, in part, developed through participation in education and training activities, such as schooling and other post-school education and training (e.g. vocational education and training, university, or workplace-based learning). At the same time, the level of proficiency in these skills is related to the probability of participating in learning activities following the completion of compulsory schooling.

The information collected on *formal* education and training experience covers the highest level of completed education, incomplete studies, and the age at which study was completed as well as participation in the 12 months preceding the interview. Information on participation in *non-formal* education and training during the 12 months prior to the interview is also collected. In line with most surveys of adult education and training, respondents are asked whether they face any barriers to participation in education and training (Table 2.2).

Table 2.2
Information collected regarding educational experience and current participation in learning activities

Domain	Specific data items	
Educational experience	Highest qualification, in which country qualification gained, field of study of highest qualification, age completed highest qualification.	
Current study	Undertaking formal study, level of course, field of study.	
Incomplete study	Has started but not completed a course of formal study, level of course, age at which left course.	
Formal studies in previous year	Undertaken formal studies in previous year, how many courses, level of last course, reason for undertaking study, employed while studying, study took place in or outside working hours, usefulness of course to work, type of employer support received.	
Non-formal courses in previous 12 months	Undertaken different non-formal learning activities in previous 12 months (open or distance courses, organised on-the-job training, seminars or workshops, other courses), how many activities of each type.	
Most recent non-formal activity	Type of activity, activity mainly job-related, main reason for participation, took place in or outside working hours, employer support provided.	
Volume of participation in education and training in previous 12 months	Total time in education and training activities, proportion of time in job-related activities.	
Barriers to undertaking education and training	Wanted to participate in learning activities in prior 12 months but did not, reasons preventing participation.	
Learning style	Interest in learning, approach to new information.	

#### LABOUR FORCE STATUS, WORK HISTORY AND JOB CHARACTERISTICS

The relationship of individuals' skills profiles to labour-force status, employment income and the characteristics of jobs is central to the Survey of Adult Skills. This information helps to establish the degree to which the assessed skills are related to labour force status and employment outcomes. In addition, an individual's activity status (e.g. work, unemployment, study) and, for those in employment, the characteristics of the workplace and the work the individual does, have a potentially significant impact on opportunities to maintain and develop the skills assessed.

The information collected concerning labour force status, work history, and job characteristics is presented in Table 2.3. Information on job characteristics is sought from both respondents in employment (their current job) and from those who are unemployed but who had been employed in the previous five years (their most recent job).



Table 2.3
Information collected regarding labour force status, work history and job characteristics

Domain	Specific data items
Current activity	Labour force status (ILO definition), main current activity.
Work history	Ever worked, had paid work in previous 12 months, age stopped working (if unemployed), total time in employment, number of employers in previous five years.
Current job	Industry, occupation, employee or self-employed, age started with current employer, establishment size, number of employees increasing or decreasing, part of larger organisation, (if self-employed) number of employees, management of supervisory responsibilities, number of subordinates, type of employment contract, usual working hours, extent of flexibility regarding job tasks, job satisfaction, gross wages or salary, (if self-employed) earnings from business.
Most recent job (if unemployed)	Industry, occupation, employee or self-employed, when left last employer, establishment size, (if self employed) number of employees, management of supervisory responsibilities, number of subordinates, type of employment contract, usual working hours, main reason for leaving last job.

#### **SOCIAL PARTICIPATION AND HEALTH**

Beyond the impact of proficiency in information-processing skills on labour market outcomes, such as employment, income and job satisfaction, there is growing interest in the relationship of proficiency to other "social" outcomes. The Survey of Adult Skills collects information on respondents' beliefs regarding society and the political process, participation in voluntary activities, and their self-reported health status.

Table 2.4
Information collected on social participation and health

Domain	Specific data items
Trust	Trust in others, perception of others' behaviour towards self.
Political efficacy	Influence on political process.
Volunteering	Frequency of voluntary work in previous 12 months.
Health status	Self-assessed health status.

#### THE USE OF SKILLS

The background questionnaire collects a range of information on the reading- and numeracy-related activities of respondents and ICT use at work and in everyday life, and on the generic skills required of individuals in their work. In addition, respondents are asked whether their skills and qualifications match their work requirements and whether they have autonomy over key aspects of their work.

These data are collected for a number of different but related reasons:

- Engagement in reading and numeracy practices and the use of ICTs are defined as important components of proficiency
  in literacy, numeracy and problem solving in technology-rich environments.
- The type and frequency of reading, numeracy-related activities and ICT use are important correlates of proficiency in the domains of literacy, numeracy and problem solving.
- There is considerable policy interest in obtaining information on a range of generic skills, in addition to literacy, numeracy and problem solving in technology-rich environments that are valued in the labour market.
- Policy makers are keen to learn more about the balance between the supply of and demand for skills and how to avoid skills mismatch.



#### Engagement as a component of proficiency

Engagement is an important element of literacy and numeracy in the Survey of Adult Skills. Literacy is defined as "understanding, evaluating, using and engaging with written texts". Similarly, engaging in numeracy-related practices is associated with proficient numerate behaviour (OECD, 2012a, p. 39). The mastery of foundation ICT skills is a prerequisite for proficiency in problem solving in technology-rich environments (OECD, 2012a, p. 51).

## The role of literacy and numeracy practices and computer use in maintaining and developing skills

The Survey of Adult Skills seeks not only to describe the level and distribution of proficiency in the skills it measures, but also to provide information on factors associated with the acquisition, maintenance and development of these skills and their outcomes. It is clear that proficiency in cognitive skills, such as literacy and numeracy, are not fixed for life, and that life paths, interests and individuals' circumstances have an impact on the patterns of skills gain and loss. Engagement in literacy and numeracy practices and the use of ICTs in work and everyday life is one way adults enhance or maintain their skills. Empirical studies (see Desjardins, 2003) show that literacy proficiency is strongly related to literacy practices in work and other contexts. Proficiency and practice are mutually reinforcing, with practice positively affecting the level of proficiency and proficiency having a positive impact on practice.

#### Comparative information on a broader range of key skills

Cognitive skills, such as literacy, numeracy and problem solving, comprise just one cluster among the many different generic skills and attributes that are believed to be of value to the labour market. A range of non-cognitive skills, such as the capacity to work collaboratively or as a member of a team, communication skills, and entrepreneurship, is also of importance in the modern workplace, and there is considerable interest in comparative information on both the supply of and demand for such skills.

Since it was not feasible to directly and comparably measure these types of skills in the first cycle of the survey, respondents were asked about the different types of generic tasks that they perform in their jobs. The types of skills required for these tasks were then inferred from the respondents' answers.<sup>3</sup> This alternative to a direct assessment provides a more objective measure of skills than an approach that relies on respondents' self-reports on the types and level of skills they possess.

#### **Demand for skills**

The measures of adults' proficiency in literacy, numeracy and problem solving in technology-rich environments provide information on the *supply* of these skills. While skills supply is clearly of central importance for government policies, it is also important to understand how skills are being used in modern workplaces and how the demand for different types of skills is evolving. Optimising the use of skills is a central theme of the recent OECD Skills Strategy (OECD, 2012b) and in the World Bank's framework for skills development (STEP) (World Bank, 2010).

Closely linked to the demand for skills is the issue of the match/mismatch between the qualifications and skills that workers have and those that they use in their jobs. Researchers and policy makers have become increasingly interested in this topic over recent years (Cedefop, 2010; Desjardins and Rubenson, 2011; OECD, 2011;, Skills Australia, 2010; UKCES, 2010).

The issue of match/mismatch has been investigated at a very broad level (e.g. at the level of qualifications) or by using respondents' perceptions (self-reports) of over- or under-qualification and over- and under-skilling. Combining information on the use of literacy, numeracy, problem solving and computing skills in the workplace with information on the proficiency of individuals provides a way of more objectively examining the incidence and consequences of match/mismatch between workers' skills and the demands of their jobs than has been possible previously, at least regarding the information-processing skills measured in the Survey of Adult Skills.

#### **Skills use: Task clusters**

Table 2.5 provides an overview of the clusters of tasks for which information is collected in the Survey of Adult Skills, the specific tasks included under each cluster, and the life domain (work or everyday life<sup>4</sup>) of the tasks. *Italics* indicate that information is sought both in work and in everyday life. Information is sought regarding the use of information-processing skills assessed in the survey (literacy, numeracy and problem solving), the requirements of jobs related to four clusters of "generic" job tasks (interaction, learning, organisation and planning, and physical/motor activity), and



technological skills as demonstrated by using information technologies. For work tasks, information was collected from both currently employed respondents and from those who had had a job in the previous 12 months. Respondents in the latter group were asked to give information about their most recent job.

Table 2.5
Information collected regarding tasks and activities in work and everyday life

Task cluster	Life domain	Component activities
Cognitive skills		
Reading	Work Everyday life	Read directions or instructions; letters, memos or e-mails; articles in newspapers, magazines or newsletters; articles in professional journals or scholarly publications; books; reference manuals or materials; bills, invoices, bank statements or financial statements; diagrams, maps, schematics.
Writing	Work Everyday life	Write letters, memos or e-mails; articles for newspapers, magazines or newsletters; reports; fill in forms.
Numeracy	Work Everyday life	Calculate prices, costs or budgets; use or calculate fractions, decimals or percentages; use a calculator (hand held or computer-based); prepare charts graphs or tables; use simple algebra or formulas; use advanced maths or statistics.
Problem solving	Work	Solve simple problems; solve complex problems.
Technology		
ICT skills	Work Everyday life	Use computer; e-mail; Internet for information; Internet to conduct monetary transactions; spreadsheets; word processing; write or prepare computer code; real-time discussions using Internet; overall level of computer use in terms of complexity.
Interaction		
Co-operation	Work	Time spent collaborating; sharing of information with co-workers.
Influencing	Work	Selling products or services; making speeches or presentations; advising; persuading or influencing others; negotiating; instructing, training or teaching others.
Learning		
Learning	Work	Learning from others; learning by doing; keeping up to date with new products or services.
Organisation		
Organisation and planning	Work	Planning own activities; planning activities of others; organising own time.
Physical		
Physical requirements	Work	Working physically for long periods; use of fine motor skills.

Note: Italics indicate that information is sought about the use of the skills concerned in both work and everyday life.

Literacy or numeracy practices, both in work and in everyday life, and work tasks can be described by their:

- incidence (whether or not a given task/activity is performed);
- variety (the diversity of tasks or activities that are performed or undertaken);
- frequency (the frequency with which a given task or activity is performed or undertaken);
- complexity/difficulty (the level of cognitive demand or competency required to perform the task/activity successfully);
- criticality (the importance of the task or activity to the performance of the job).

In each broad task cluster a number of specific tasks or activities are identified. For example, respondents are questioned about the extent to which they read different types of materials (e.g. instructions, diagrams, newspaper articles, books) and are also asked to cite the frequency with which they engage in each of these activities on a scale ranging from "never" to "every day". A similar approach is adopted for other generic work tasks. While an attempt is made to cover the range of practices in which individuals may engage in a given domain, differentiating practices according to complexity is not easy.



The complexity of reading tasks depends on many factors that are unrelated to the text type (e.g. a book or a scholarly article). Criteria such as the length of the text are also likely to be only loosely related to difficulty and complexity. The "criticality" of a task or its relative priority in meeting the performance expectations in a given job<sup>5</sup> is not examined.

Twelve skill use indices have been derived covering both cognitive and generic skills. These are detailed in Table 2.6. The methodology for their derivation is outlined in Box 2.1.

Table 2.6
Skills use indicators

Indicator	Group of tasks	
<b>Information Processing skills</b>		
Reading	Reading documents (directions, instructions, letters, memos, e-mails, articles, books, manuals, bills, invoices, diagrams, maps).	
Writing	Writing documents (letters, memos, e-mails, articles, reports, forms).	
Numeracy	Calculating prices, costs or budgets; use of fractions, decimals or percentages; use of calculators; preparing graphs or tables; algebra or formulas; use of advanced math or statistics (calculus, trigonometry, regressions).	
ICT skills	Using e-mail, Internet, spreadsheets, word processors, programming languages; conducting transactions online; participating in online discussions (conferences, chats).	
Problem solving	Facing hard problems (at least 30 minutes of thinking to find a solution).	
Other generic skills		
Task discretion	Choosing or changing sequence of job tasks, the speed of work, working hours; choosing how to do the job.	
Learning at work	Learning new things from supervisors or co-workers; learning-by-doing; keeping up to date with new products or services.	
Influencing skills	Instructing, teaching or training people; making speeches or presentations; selling products or services; advising people; planning others' activities; persuading or influencing others; negotiating.	
Co-operative skills	Co-operating or collaborating with co-workers.	
Self-organising skills	Organising time.	
Physical skills (gross)	Working physically for a long period.	
Dexterity	Using skill or accuracy with hands or fingers.	

## Box 2.1. Using Item Response Theory to derive skills use indicators in the Survey of Adults Skills (PIAAC)

Item Response Theory (IRT) is the most appropriate methodology to combine multiple items (i.e. multiple choice questions) from a questionnaire or an assessment exercise to derive measures of an underlying unobservable psychometric trait, such as the ability of the individuals, or how frequently individuals use certain types of skills at work.

The background questionnaire of the Survey of Adult Skills (PIAAC) includes two detailed sections with a set of items attempting to capture information to estimate latent scales related to generic and foundation skills used at work. The main characteristic of these items is the ordering behind the structure of the possible answers, whereby consecutive alternatives always indicate a higher frequency of performing a certain task (ranging from 0, corresponding to never performing the corresponding task, to 4, corresponding to performing the task every day).

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The generalised partial credit model (GPCM) is an IRT model developed for situations where the item responses are contained in two or more ordered categories. Items associated to a given latent trait are grouped together and the unobserved trait is estimated. The main ingredients for the estimation are (a) the unidimensionality of the latent construct or scale and (b) the parameterisation of the model allowing mapping each level on the latent scale to the probability of choosing a specific alternative among the item possible choices over the immediate precedent. The resulting scale is a continuous one-dimensional construct that explains the covariance among the item responses: people with a higher level on the derived scale have a higher probability of frequently performing the task detailed in a given item.

Individuals who report "never" performing any of the tasks included in each IRT scales are excluded from these scales. This is done for two reasons. First, a zero-inflated-count issue arises for some of these items. For instance, a large group of individuals report "never" performing any of the tasks underlying the reading, numeracy, and writing at work scales, these groups are so large that they cannot be reasonably included in the population of those who have a degree of skill use ranging from high to low. Second, the items used to calculate the scales related to ICT skills use at work and at home are only asked to people who report having used a computer before, thus few individuals report "never" using their ICT skills at work. As a result, including individuals reporting "never" performing tasks in other scales would have created a difference with the ICT scale.

The IRT methodology produces reliable skills measures only with a sufficient number of items and for some domains too few were available in the Survey of Adult Skills. As a consequence, 5 of the 12 skills use indicators were derived directly from one individual item of the questionnaire, namely problem solving, co-operative skills, self-organising skills, physical skills and dexterity. These direct measures take five possible values, ranging from 0, corresponding to never performing the corresponding task, to 4, corresponding to performing the task every day. All the other IRT-derived indices are continuous variables, which should be interpreted as representing the level of use of the underlying skill and, for easier comparisons, have all been standardised to have mean equal to 2 and standard deviation equal to 1 across the pooled sample of respondents in all countries (appropriately weighted). This results in indices for which at least 90% of the observations lay between 0 and 4, whereby values approaching 0 suggest a low frequency of use and values approaching 4 suggest a high frequency.

While the careful co-ordination of the survey design guarantees that results can be meaningfully compared across countries, the standardisation of the IRT-derived skills use indicators means that comparisons across skill domains should be taken as suggestive. Indeed, besides the metric, such comparisons are problematic for reasons that go beyond the choice of the indicators, as skills are often conceptually different notions and the forms of their interplay are difficult to ascertain. For example, when evaluating the productive returns to the use of skills one may wonder whether a moderate use of ICT is more or less productive than an intensive use of reading or writing.

In addition to questions relating to the tasks and activities that they perform in their work, respondents are asked some broad questions relating to the match of their skills, qualifications and experience to those needed to get and/or do their jobs. These cover both general skills and qualifications as well as computing skills (Table 2.7).

Table 2.7
Information collected on aspects of qualifications and skills match/mismatch

	Components
Self-assessment of match of skills and job requirements	Has skills to cope with more demanding duties; requires more training to cope with duties; level of computer use needed to perform job; possesses sufficient computer skills to do job well; lack of computer skills has affected chances of promotion or pay rise.
Match of qualifications to job requirements	Educational qualification needed to get current job; this qualification needed to do the job; related work experience needed to get the job.



In Chapter 4 of OECD Skills Outlook (OECD, 2013), a novel indicator of skills mismatch is derived combining information on self-reported skills match/mismatch, skills use and proficiency in literacy, numeracy and problem solving. The derivation of this indicator is described in Box 2.2.

#### Box 2.2. Deriving the survey's measures of skills mismatch in literacy, numeracy or problem solving

The Survey of Adult Skills (PIAAC) allows for producing a more robust measure of skills mismatch than the two commonly used in the literature, namely self-reported skills mismatch and measures derived by the direct comparison of skill proficiency with skills use at work. Indeed, both these methodologies are unsatisfactory and their limitations have been highlighted in the literature. When asked directly, workers in most countries tend to be highly over-confident: too many of them report being qualified to perform more demanding jobs, thus undermining the validity of skills mismatch measures based on self-reported information. On the other hand, the comparison of skills proficiency and skills use rests on the assumption that the two can be measured on the same scale, an assumption that is very difficult to defend for concepts that are so clearly distinct theoretically and that cannot be represented along the same metrics (Krahn and Lowe, 1998). Additionally, the measures of skills proficiency and skills use are based on structurally different pieces of information: indicators of skills use normally exploit survey questions about the frequency (and/or the importance) with which specific tasks are carried out in the respondents' work activities, whereas skills proficiency is usually measured through foundation tests.

Using the Survey of Adult Skills, it is possible to combine three pieces of information, namely self-reported skills mismatch, skills use and skills proficiency, into a novel indicator of skills mismatch derived as follows:

- Step 1. Identify workers who self-report being well-matched as those workers who neither feel they have the skills to perform a more demanding job nor feel the need of further training in order to be able to perform their current jobs satisfactorily.
- Step 2. For each skill dimension (literacy, numeracy and problem solving), define the minimum and maximum skill level required in an occupation as the minimum and the maximum proficiency of self-reported wellmatched workers (defined as in Step 1) by country and within each 1-digit ISCO code. To limit the potential impact of outliers on these measurements, it is useful to use the 5th and the 95th percentile instead of the actual minimum and maximum. Because of sample size, ISCO group 0 (armed forces) and ISCO group 6 (skilled agricultural workers) were dropped and ISCO group 1 was merged to ISCO group 2 for the purpose of calculating skill requirements.
- Step 3. For each skills dimension (literacy, numeracy and problem solving), classify workers as under-skilled if their proficiency is lower than the minimum requirement in their occupation and country and as over-skilled if their proficiency is higher than the maximum requirement in their occupation and country. All other workers are classified as well-matched.

The above procedure allows for calculating the shares of workers who are under-skilled, well-matched and over-skilled in each occupation and for each skill. In a further step, the skills use of workers who are over- and under-skilled is compared with that of equally-proficient workers – i.e. workers with similar proficiency scores – who are well-matched.



#### **Notes**

- 1. The international "master" version of the questionnaire used in the Survey of Adult Skills (PIAAC) can be accessed at: www.oecd.org/dataoecd/1/41/48442549.pdf.
- 2. "Formal" education and training comprises education that is institutionalised, intentional and planned through public organisations and recognised private bodies. "Non-formal" education is institutionalised, intentional and planned by an education provider. Non-formal education mostly leads to qualifications that are not recognised as formal qualifications by the relevant national educational authorities or to no qualifications at all (see UNESCO, 2011).
- 3. This draws on the approach pioneered in the UK Skills Survey the so-called Jobs Requirements Approach or JRA (see Felstead et. al, 2007).
- 4. "Everyday life" covers all non-work related activities, including study.
- 5. For an orthopaedic surgeon, tasks related to surgical interventions will be more critical for the definition of his or her job than tasks relating to communication, even if writing reports and sharing information with colleagues are frequent occurrences.

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