2 PIAAC Cycle 2 assessment framework: Literacy

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Literacy skills play an essential part in adults' personal, social and professional life. In addition, the spread of digital technologies further emphasises the importance of reading literacy. As a set of cognitive abilities, literacy involves: accessing texts, or passages within texts, that match readers' tasks and needs; understanding the literal contents of text(s) and drawing adequate inferences both within and across texts; and evaluating texts and their sources for accuracy, soundness, and relevance, as well as reflecting on authors' purposes and strategies. The PIAAC assessment of literacy draws from a broad range of contexts and text types, from personal narratives to descriptions and arguments. It is designed as a set of scenarios involving one or several texts and a set of questions using various response formats. The main factors expected to drive item difficulty and to define proficiency levels are identified in this framework document.

Introduction

The term literacy (from the Latin "litera": letter, written sign) refers to one's ability to comprehend and use written sign systems. Literacy may be defined both as a set of generalised abilities [e.g., decoding words and comprehending sentences; (Perfetti, 1985[1])] and a set of cultural practices and values that vary across human groups and communities (Street and Street, 1984[2]). Thus, the literate individual is both a person who is able to make use of a broad diversity of written materials in the service of wide range of activities, and a person who is knowledgeable of the cultural standards of their communities of practice (Rouet and Britt, 2017[3]).

Since the invention of written sign systems some five thousand years ago, written communication has played an increasing role in societies throughout the world. The percentage of humans who can read and write has increased steadily over the past centuries, even though an estimated 750 million adults still cannot read and write fluently, with the highest rates of illiteracy matching the lowest levels of economic development (UNESCO, 2017[4]). In countries where people are given a chance to become literate, teenagers' and adults' actual levels of mastery vary to a remarkable extent. Furthermore, individual levels of literacy are usually associated with better living conditions, jobs, and health (Morrisroe, 2014[5]; OECD, 2013[6]).

One reason why literacy has become so important is that, in the modern world, written communication pervades most aspects of people's lives, whether personal, social, or professional. A study found that typical American adults read on an average of nine occasions per day, slightly more on working days than on weekends and holidays, and mostly in relation with practical tasks (White, Chen and Forsyth, 2010[7]). Depending on the context and purpose, reading may take a wide diversity of forms. Adults sometimes read extended pieces of continuous texts for the sake of enjoyment or just to comprehend an author's main points, but they more often scan pages to search for information that matches specific needs or questions. To serve these purposes, adults read a wide variety of texts ranging from e-mails to leaflets to timetables and instruction manuals. While doing so, they use a broad diversity of strategies and tactics, which all belong to the construct of literacy (Alexander and The Disciplined Reading and Learning Research Laboratory, 2012[8]; Britt, Rouet and Durik, 2018[9]; Goldman, 2004[10]).

The spread of computers and Internet access over the past two decades has further exacerbated the importance of literacy skills in contemporary societies (Leu et al., 2017[11]). There is little that an illiterate person can do with a smartphone, a tablet or a laptop. Written signs are ubiquitous in most computer applications, including the most widely used video sharing platforms. Digital reading is increasingly important for people to access jobs, services and goods, and to participate in communities.

For these reasons, acquiring valid and reliable estimates of what adults can do with printed texts has become a prominent target for public institutions. Several rounds of studies have been conducted at an international level over the past decades.

The second PIAAC study in the context of past international literacy studies

Since the early 1990s, three large-scale cross-country assessments of literacy and basic skills of the adult population have taken place. The first was the International Adult Literacy Survey (IALS) (Murray, Kirsch and Jenkins, 1998[12]), which was conducted in 22 countries and regions over the period 1994-1998. The second, known as the Adult Literacy and Life Skills Survey (ALL) (OECD/Statistics Canada, 2005[13]; 2011[14]), was undertaken over 2002-2008 in 11 countries. A successor to IALS and ALL – the Programme for the International Assessment of Adult Competencies (PIAAC Cycle 1) (OECD, 2013[6]) was administered in 39 countries and regions over the period 2011-2019 (National Center for Education Statistics (NCES), n.d.[15]).

IALS, ALL and PIAAC share a common conceptual framework and approach to the assessment of literacy skills, covering the conceptualisation of literacy, the approach to measurement, data quality and reporting of results (Kirsch and Lennon, 2017[16]).

Developments between IALS and PIAAC

One of the major areas in which there has been a change between the three assessments concerns the skill domains assessed. IALS included three separate domains of literacy: prose literacy, document literacy and quantitative literacy. The major change between IALS and ALL was that a new numeracy scale replaced the quantitative scale, while the prose and document scales were kept.

The measurement framework for literacy in PIAAC Cycle 1 was heavily based on those used in IALS and ALL, but in PIAAC literacy was assessed on a single scale rather than on two separate scales (prose and document literacy in ALL). PIAAC Cycle 1 also expanded the kinds of texts covered by including electronic texts in addition to the continuous (prose), non-continuous (document) and combined texts of the IALS and ALL frameworks. In addition, the assessment of literacy was extended to include a measure of reading component skills. This was designed for people with low levels of literacy competence and focused on assessment of the foundational skills needed to gain basic meaning from texts. The skills tested were print vocabulary, sentence processing and passage fluency.

PIAAC Cycle 1 also differed from IALS and ALL in that it mainly was an integrated computer-based assessment. The majority of respondents were assessed using a laptop computer. A pen-and-paper version of the literacy (and numeracy) assessment was available for respondents who had insufficient familiarity with computers or preferred the paper-and-pencil version for other reasons (26%).

Information technology and the changing nature of literacy

During the past 10 years, the use of internet has grown rapidly all over the world. According to a recent estimate (ITU, 2017[17]), more than half (53.6%) of the world's households has internet access – a dramatic increase from just less than 20% of the households having internet access in 2005, and just over 30% in 2010. The number of individuals using the internet has naturally grown as the internet access has become more common. It is estimated that there are 3.5 billion internet users today, representing almost half (48%) of the world's population (ITU, 2017[17]).

The rapid growth of the use of internet means that in today's world, reading often takes place in digital environments: people search and read timetables, maps and calendars online, they look for products and product reviews and purchase them on the internet, look up information in Wikipedia, read newspapers and blogs online, and participate in social media. The medium for accessing information is rapidly moving from print to screens to handheld devices, such as smartphones. As digital media affords different types of activities than traditional print media, reading in digital environments poses different cognitive demands and challenges to the reader than reading in print (Mangen and van der Weel, 2016[18]). While digital environments allow features that can support comprehension, recent evidence suggests that reading comprehension of informational texts may suffer when text material is presented in digital form in comparison to print (Delgado et al., 2018[19]).

One notable difference between print and digital media is that printed text is static and linear in nature, whereas digital texts often are hypertexts, which can include embedded hyperlinks to other sources, including multimedia. The ability to navigate within the interrelated network of documents, and the ability to locate relevant information among the potentially distracting information, are thus crucial aspects of skillful digital reading (Salmerón et al., 2018[20]).

The current framework aims at describing reading literacy in the present day context, in which digital reading is a central aspect of active participation in society. Three core sets of abilities are required for skilful reading in the complex information environments readers interact with: 1) ability to navigate within

and between networked documents, 2) ability to comprehend and integrate multiple and sometimes disparate sources of information, and 3) ability to critically evaluate the information presented (Britt and Gabrys, 2001[21]; Rouet and Potocki, 2018[22]; Salmerón et al., 2018[20]).

Evolution of the PIAAC Cycle 2 Literacy domain in comparison with previous frameworks

As a consequence of the increasing uses of digital communication, there is a need to expand the construct of literacy to account for the advanced skills that enable people to interact with complex repositories of information. These include an ability to identify relevant items within sets of texts, and to scan the selected texts in order to locate information of interest. During their search for relevant information, readers use a range of criteria to discard irrelevant or inadequate information while identifying the most helpful resources. In addition, proficient readers need to comprehend information not just from one text, but also across multiple texts potentially containing fixed or animated graphs, still pictures and video segments in addition to written information. As evidenced in research studies, integrating information from multiple documents requires specific mental processes that come on top of the more traditional comprehension processes (Rouet, Britt and Potocki, 2019[23]). Finally, being literate increasingly requires readers to distance themselves from the information they are processing, questioning the accuracy, completeness, actuality of the information, as well as the competence, perspective and potential biases of the authors and publishers. These validation processes (Britt, Richter and Rouet, 2014[24]; Singer, 2013[25]) rest on specific types of knowledge and heuristics that any assessment of literacy should give due consideration.

As the domain expands to represent more sophisticated strategies, care must also be taken to describe the skills of those who only have a limited ability to comprehend and use written texts. Studies like PIAAC have found that in many countries a substantial proportion of adults still experience difficulties with the foundational processes that support any kind of literate activities: identify written words or symbols, make sense of simple sentences, draw basic inferences. There have been calls to increase the precision of the assessment at the lower end of the proficiency scale. The PIAAC framework acknowledges the role of these foundational skills and aims to provide satisfactory coverage of their distribution in the population.

Finally, an assessment of literacy must also consider people's active engagement in literate activities both at work and in their daily life. Exposure to written texts has been found to be a factor of children's acquisition of literacy skills (Stanovich and West, 1989[26]). Likewise, adults who encounter frequent opportunities to use texts are likely to develop better skills and to maintain them over time. Therefore, information about individual exposure to and engagement with texts may provide helpful information to understand the links between skill use and proficiency.

Definition of literacy

PIAAC Cycle 2 uses a parsimonious definition of literacy that aims to highlight a set of core cognitive processes involved in most, if not all literate activities. At the same time, the definition acknowledges that literate activities "do not happen in a vacuum" (Snow and the RAND reading study Group, 2002[27]). Instead, they are done in the service of one's goals, one's development and participation in society. These diverse purposes and contexts contribute to shaping the way individuals make use of written texts, hence their inclusion in the definition.

> "Literacy is accessing, understanding, evaluating and reflecting on written texts in order to achieve one's goals, to develop one's knowledge and potential and to participate in society."

We elaborate on each part of the definition below, emphasising some important theoretical advances in the domain, as well as evidence from the first PIAAC cycle and former research studies.

"Literacy…"

Although the etymology of the word literacy directly points to written language, in past decades the term has been used to refer to an increasingly broad array of domains and interests, for instance in "health literacy", "financial literacy" or "computer literacy". In some definitions, the activities denoted by these phrases have only remotely and incidentally to do with written language. In the present framework, the word is taken in its broadest but also most literal sense, to describe the proficient use of written language artefacts such as texts and documents, regardless of the type of activity or interest considered. This characterisation of literacy highlights both the universality of written language (i.e., its potential to serve an infinite number of purposes in an infinite number of domains) and the very high specificity of the core ability underlying all literate activities, that is, the ability to read written language. As demonstrated in neuroscience research, learning to read is a very special experience with consequences on the organisation of some areas of the brain (Dehaene, 2009[28]).

"is accessing…"

Proficient readers are not just able to comprehend the texts they are faced with. They can also reach out to texts that are relevant to their purposes, and search passages of interest within those texts (McCrudden and Schraw, 2007[29]; Rouet and Britt, 2011[30]). Searching text is cognitively distinct from reading for comprehension (Guthrie and Kirsch, 1987[31]). When searching, the proficient reader makes use of text organisers (such as tables of contents and headers) in order to inform relevance decisions; the proficient reader can also adjust the pace and depth of processing, alternating phases of quick skimming with phases of sustained, deep reading for comprehension. Finally, proficient readers are parsimonious: they may decide to quit a passage upon realising that it does not contain helpful information. In the PIAAC literacy framework, these processes are subsumed under the term "accessing".

"understanding…"

Most definitions of literacy acknowledge that the primary goal of reading is for the reader to make sense of the contents of the text. This can be as basic as comprehending the meaning of the words, to as complex as comprehending the dispute between two authors making opposite claims on a social-scientific issue. Whatever the context, any literate activity (including accessing a piece of text or a passage within a text) requires some level of understanding. Theories of text comprehension (Kintsch, 1998[32]) usually distinguish the literal understanding of the message from a deeper level of understanding in which the reader integrates their prior knowledge with the text contents through the production of various types of inferences (i.e., a situation model). Prior knowledge of the domain has a strong (usually positive) impact on the deeper level of understanding.

"evaluating and reflecting…"

Readers continually make judgements about a text they are approaching. They evaluate whether the text is appropriate for the task at hand and whether it will provide the information they need. Readers also make judgements about the accuracy and reliability of both the content and the source of the message (Bråten,

Strømsø and Britt, 2009[33]; Richter, 2015[34]). They attempt to detect and explain any biases and gaps in the coherence or persuasiveness of the text. And, for some texts, they must make judgements about the quality of the text, both as a craft object and as a tool for acquiring information.

"on written text…"

In the context of PIAAC Cycle 2, the phrase "written text" designates pieces of discourse primarily based on written language. Written texts may include non-verbal elements such as charts or illustrations. However, pictures, video and other visual media are not considered written texts per se.

A text typically includes two broad components: a source and a content. The source of the text is a set of parameters that identify the origin and dissemination of the text. The most typical source parameters are a description of the author (for instance, "Alfred Nobel, a Swedish chemist and businessman"), the publication medium and date of the text. But source information sometimes includes more specific details about the text, for instance "second edition", or "confidential". Although all texts have a source, source information is not always provided together with the content. In addition, emerging practices of online publishing and social media have tended to make it more challenging for the reader to identify the source of the text.

As in the first cycle of PIAAC (and in related studies such as PISA), the assessment of literacy will include a wide variety of <u>text types</u>, such as narrative, descriptive or argumentative. Texts in various <u>formats</u>, such as continuous, non-continuous or mixed will be included. Just as in the real world, some of these texts may be presented in a static way, meaning that the reader has only a limited opportunity to navigate through them,[1] whereas others, especially in digital environments, contain <u>interactive navigation tools</u> such as interactive tables of contents, hyperlinks and other devices. The PIAAC definition of written texts encompasses both static and interactive materials.

"in order to achieve one's goals,"

Just as written languages were created to meet the needs of emergent civilisations, at an individual level, literacy is primarily a means for one to achieve their goals. Goals relate to personal activities but also to the workplace and to interaction with others. Literacy is increasingly important in meeting those needs, whether simply finding one's way through a building, or negotiating complex bureaucracies, whose rules are commonly available only in written texts (and increasingly only in digital forms). Literacy is also important in meeting adult needs for sociability, for entertainment and leisure, for developing one's community and for work.

"to develop one's knowledge and potential and to participate in society."

Developing one's knowledge and potential highlights one of the most powerful consequences of being literate. Written texts may enable people to learn about topics of interest, but also to become skilled at doing things and to understand the rules of engagement with others.

Written communication is primarily and ultimately a consequence of humans being a sophisticated social species. Texts are communication artefacts, they serve the purpose of transmitting information but also feelings and values to others. As such, literacy contributes to building, nurturing and preserving social cohesion.

Core dimensions of the literacy domain

The PIAAC literacy assessment aims to provide a complete and accurate description of what adults can do with texts in a broad range of contexts and tasks. To that aim, the literacy domain is organised along a set of dimensions that ensure a broad coverage and a precise description of what people can do at each level of proficiency. In this section we describe the most important dimensions, which will be used to help define the proficiency levels for literacy.

Cognitive task demands

Naturalistic reading is a complex and versatile process. Proficient readers can read systematically and intensely extended passages of texts, but they can also quickly scan a page in search for a single keyword. How readers approach texts is primarily determined by their reading goals, which themselves are informed by the reader's understanding of the context and the task demands (Britt, Rouet and Durik, 2018[9]). PIAAC identifies three groups of processes that support most reading activities: accessing text, understanding, and evaluating (Figure 2.1).

Figure 2.1. Three core cognitive processes supporting literacy
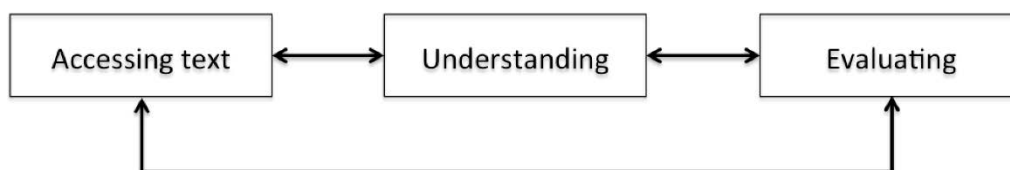
Note: These processes may unfold in any order and even in parallel.

The three processes correspond to those included in related assessments such as PIAAC Cycle 1 and PISA 2018. Table 2.1 shows the correspondence between the processes in these frameworks.

Table 2.1. Correspondence between the processes in PIAAC Cycle 2, PIAAC Cycle 1 and PISA 2018

PIAAC Cycle 2 (processes)	PIAAC Cycle 1 (aspects of tasks)	PISA 2018 (processes)
Accessing text	Access and identify information in the text	Locate information
Understanding	Integrate and interpret	Understand
Evaluating	Evaluate and reflect	Evaluate and reflect

Accessing text

Accessing text encompasses a number of literacy processes whereby readers examine the text(s) available, select the most relevant text, scan contents in search for specific pieces of information and locate these pieces through various types of cues. In addition, accessing conveys the sense of navigating across various texts or passages within texts as a function of task demands and the reader's progress towards their goal.

Ability to access information within and across texts is a core component of skilful reading in print and perhaps even more in digital environments (Salmerón et al., 2018[20]). Successful navigation means that the reader is capable of searching and locating relevant information within the texts, and this is influenced by the type of the question posed to the reader, as well as the nature of the materials. When searching, the proficient reader also calibrates their depth of processing of the information, merely scanning task-

irrelevant contents while pausing and engaging in deeper processing of passages they deem relevant to the task.

The task or the question the reader has in mind has a big impact on how readers navigate within and between text documents (McCrudden and Schraw, 2007[29]). Identifying what information is relevant is only possible if the reader has formed an appropriate task model that provides specific criteria and guides the strategies utilised in searching and locating relevant information (Britt, Rouet and Durik, 2018[9]). Theories of purposeful reading suggest that when reading with specific objectives in mind, the incoming text information is constantly processed in the light of the task model (Britt, Rouet and Durik, 2018[9]). When task-relevant information is detected, attention is zoomed in to meet the task demands (Kaakinen and Hyönä, 2014[35]). The complexity of the task model depends on the question posed to the reader: simple questions may only require the search for a match between the question item and information within the text, whereas forming an appropriate task model for a more complex question may require background knowledge and inferencing. Lack of related prior knowledge may thus make it harder to search and locate relevant information (Kaakinen, Hyönä and Keenan, 2003[36]), as the reader's task model might not specify what is relevant, and reader has to scrutinise all information in order to decide whether it is relevant or not.

The nature of the text materials obviously influences how easy or hard it is to access information from a text or set of texts. The PIAAC literacy framework distinguishes two types of search processes: identifying a relevant text from a set, and locating information within a single text.

Identifying a relevant text in a set. If the available material consists of multiple texts (for instance, several documents on the same topic), readers have to first search and select the text that is expected to contain the most helpful information, disregarding the other items. Then readers need to search and locate relevant information within that text (Britt, Rouet and Durik, 2018[9]). Searching a relevant text in a set often involves using lists such as a table of contents (Dreher and Guthrie, 1990[37]) or the page showing the results of a query in a search engine. In selecting an item in this type of list, readers often use very simple heuristics such as the ranking of the items [priority given to the first items in the list, see (Fu and Pirolli, 2007[38]; Pan et al., 2007[39]; Wirth et al., 2007[40]) for evidence from search engine tasks] or the presence of highlighted information (Rouet et al., 2011[41]). However, in some tasks these simple heuristics may lead to suboptimal selections. For instance, in the Rouet et al. (2011[41]) study, 5th and 7th grade students were more likely to select irrelevant items when the items contained capitalised keywords. Moreover, if the materials contain a lot of distracting (irrelevant) information, the reader has to work harder to reject that information, which poses extra demands on their reasoning and working memory skills (Kaakinen and Hyönä, 2008[42]), and may cause them to forget the question (Rouet and Coutelet, 2008[43]).

Locating information within a text. When readers need to locate a relevant passage within a single text, signalling devices, such as headings and highlighting, can be used to facilitate the visual scanning and the identification of the relevant passage (Lemarié et al., 2008[44]). Knowing the function of text signals and using them while scanning a text are characteristics of proficient readers (Garner et al., 1986[45]; Potocki et al., 2017[46]).

Readers' search and locate processes pervade the whole reading cycle, from readers' initial decision of which text or passage they want to focus on, to their post-reading assessment of whether the passage contributes to reaching their goal (see below, "Evaluate and reflect").

Understanding

A large number of reading activities involve the parsing and integration of one or several extended passage(s) of text in order to form a complete representation of what the text is about. Cognitive theories of text comprehension usually distinguish two levels of representation (Kintsch, 1998[32]): a representation of the literal content of the text (literal comprehension), and a representation integrating the literal content with the reader's prior knowledge through mapping and inference processes [inferential comprehension or "situation model"; (McNamara and Magliano, 2009[47]; Zwaan and Singer, 2003[48])]. In addition, theories

of multiple text comprehension (Perfetti, Rouet and Britt, 1999[49]; Britt and Rouet, 2012[50]) consider that text comprehension sometimes includes a representation of source features together with the respective contents.

Literal comprehension requires readers to comprehend the meaning of written words (e.g., "the kitten") and semantic propositions (i.e., small groups of words usually containing a substantive and a verb, adverb or an adjective, such as "the kitten is sleeping"). Propositions are then organised into hierarchies corresponding to one or a few sentences (Kintsch and van Dijk, 1978[51]). Literal comprehension tasks involve a direct or paraphrase type of match between the question and target information within a passage (for instance "what is the kitten doing?"). The reader may need to hierarchise or condense information at a local level in order to answer literal comprehension questions. Tasks requiring integration across entire text passages, such as identifying the main idea, summarising, or giving a title, are not considered literal, but rather inferential comprehension.

Inferential comprehension is the outcome of readers' integration of text information with their prior knowledge. The outcome is often labelled a "situation model" or "integrated text representation". Integrated text representations may be based on sentences but also on paragraphs or even on extended passages of text. As readers proceed through several sentences and paragraphs, they need to generate various types of inferences ranging from simple connecting inferences (such as the resolution of anaphora) to more complex coherence relationships (e.g. spatial, temporal, causal or claim-argument links). Sometimes the inference connects several portions of the text; in other cases, the inference is needed to connect the question and a text segment. Finally, the production of inferences is also needed in tasks requesting the reader to identify an implicit main idea, in order to produce a summary or a title for a given passage.

Multiple text inferential comprehension. When readers are faced with more than one text, integration and inference generation may be based on pieces of information located in different texts (Perfetti, Rouet and Britt, 1999[49]). Integration of information across texts poses a specific problem when the texts provide inconsistent or conflicting information. In those cases, readers must engage in evaluation processes in order to acknowledge and handle the conflict (Bråten, Strømsø and Britt, 2009[33]; Stadtler and Bromme, 2014[52]).

Evaluating

Competent readers can critically assess the quality of information in a text, even when the task does not explicitly require such an evaluation. The importance of evaluation as part of literacy has increased with the amount and heterogeneity of written information readers are faced with. Adult readers need to be able to evaluate to protect themselves from misinformation and propaganda and to make sense of conflicting information, such as political or scientific controversies. Evaluation can be based on attending to and assessing the accuracy, soundness, and task relevance of a text. The focus of these evaluations can be on the content or on the source of a text. Source evaluation plays a critical role when evaluating information from multiple texts, which sometimes provide discrepant or conflicting information (Bråten et al., 2011[53]; Leu et al., 2015[54]; Rouet and Britt, 2014[55]; Stadtler and Bromme, 2014[52]; Stadtler et al., 2013[56]). Handling conflict can require readers to assign discrepant claims to their respective sources and assess the credibility of the sources or believability of the claims (accuracy), to assess the relevance of the support or evidence provided for the discrepant claims (relevance), to evaluate the completeness of the provided perspectives and information from those possible (sufficiency), and to coordinate these outcomes to inform one's weight to make a decision about the conflict.

Evaluating accuracy. The information conveyed in written texts can be more or less accurate, ranging from agreed upon facts to intentionally false information. Even websites conveying science information often contain inaccurate or misleading information (Allen et al., 1999[57]). The evaluation of the accuracy of claims and statements can be based on the content or on the source of the text. Content evaluation includes validation against one's beliefs and knowledge (is the assertion true? Is it plausible? What

information is presented to support the claim?) (Richter, Schroeder and Wöhrmann, 2009[58]). Readers can also assess accuracy indirectly, by identifying and assessing the source of the information (sourcing) (Britt and Aglinskas, 2002[59]; Wineburg, 1991[60]). For instance, the reader may ask whether the author is competent, well-informed and benevolent. When reading from web sources, readers may also check whether the information offered was submitted to any kind of editorial control prior to its publication (i.e., academic institutions, professional journalism vs. personal blogs or sites).

When dealing with conflicting information, readers have to be able to assign conflicting claims to different sources and use the credibility of the sources to assess the quality of information (Bråten, Strømsø and Britt, 2009[33]; Stadtler and Bromme, 2014[52]). Readers of multiple texts can also evaluate accuracy by comparing information across different sources (i.e., corroboration) (Britt and Aglinskas, 2002[59]; Wineburg, 1991[60]).

Evaluating soundness. The modern reader has to deal with texts that vary on a continuum of internal quality or soundness (Magliano et al., 2017[61]). In this framework, soundness encompasses two characteristics of discourse, namely completeness and internal consistency (Blair and Johnson, 1987[62]). Readers have to identify the <u>completeness</u> of the set of facts or evidence that is presented and to identify what is not accounted for or considered. Readers also have to identify perspectives presented in a text and assess whether all the important perspectives are represented. They may also have to account for any biases they find in the text. Evaluating bias may be based on language (does the text use neutral, factual language or rather colourful, evaluative language), or on the source of the text (i.e., interpreting, explaining or resolving different author biases that may impact sufficiency).

When evaluating internal <u>consistency</u>, readers must identify the structure of a text (e.g., persuade, inform) and evaluate the quality of the information in achieving that goal (e.g., warranted or sound claim-reason connections or reasonable cause-effect relationships). Does the author provide the type of information that is expected given the structural organisation of the text and what is the quality of that information for achieving the goal of the text? The evaluation of internal consistency can be especially challenging for argumentative texts (those attempt to convince the readers to accept a proposition, or claim by presenting supporting reasons; (Galotti, 1989[63]) because consistency cannot be determined by formal logic (Toulmin, 1958[64]).

When facing multiple texts that contradict each other, readers need to become aware of the conflict, understand where the conflict comes from (e.g., texts reporting discrepant facts or proposing discrepant interpretations) and to find ways to deal with the conflict (Britt and Rouet, 2012[50]; Stadtler and Bromme, 2014[52]).

Evaluating task relevance. As discussed in the section on "Accessing text" above, evaluating task relevance takes place throughout the reading process, from the reader's attempt to locate a text or passage of interest, to their post-reading assessment of whether the text or passage they have read was helpful (i.e., post-reading task relevance assessment); (Rieh, 2002[65]). When evaluating task relevance after reading a passage, readers must reconsider the task or question using an activated schema to understand what is being asked for and how to achieve that goal state (Britt, Rouet and Durik, 2018[9]; Rouet, Britt and Durik, 2017[66]). They must then assess whether a text they have just read contributes to reaching the goal state.

Research considers that there are two main routes in assessing task relevance. One consists in evaluating the content of the text, the other consists in evaluating the source (i.e., the person or the organisation responsible for authoring and disseminating the text). Both content and source evaluation can focus on accuracy, soundness or task relevance (Table 2.2). For instance, a layperson may realise that the text comes from a specialised medium (e.g., an academic journal or institution) and that the level of language and details is not suited to their prior knowledge and goals. Importantly, task relevance evaluation requires task readers to interpret the task or question using activated schema to understand what is being asked for and how to achieve that goal state (Britt, Rouet and Durik, 2018[9]).

The PIAAC literacy assessment will include tasks involving multiple, possibly discrepant texts and a series of items assessing each of the evaluate processes.

Table 2.2. Summary of different types of evaluation processes

	Accuracy	Soundness	Task relevance
Content evaluation	Plausibility Quality of evidence	Completeness of facts or perspectives; bias in explanation or interpretation Internal consistency	Contribution to reading goals
Source evaluation	Author competence, bias Editorial control	Author's explicit or covert interests	Appropriateness of text type with respect to one's goals and abilities

Reflecting on the author's intent, purpose, and effectiveness. When evaluating texts, readers need to be aware of the author's intent or purpose for writing. Author purposes include to entertain, to inform, to explain or to describe, or to persuade. Author purposes generally have to be inferred from the structure and form of the text, although they are sometimes stated explicitly, for instance in a preface, an overview, or in a separate text, for instance a publisher leaflet or an interview with a journalist. Readers can also infer authors' purposes by acquiring information about the author's opinion, beliefs, attitude, assumption, or bias.

In addition to identifying the author's purpose and viewpoint, the reader can evaluate how the author conveyed their points and whether it was effective. The structure of the text as well as tone, word choice and writing style can provide cues to author purpose and perspective. In the context of the PIAAC literacy study, "Reflect" represents tasks in which the reader is explicitly asked about authors' intentions, purposes or effectiveness.

Because handling conflict across texts includes all aspects of evaluating and reflecting, it is important to include units involving multiple, discrepant texts to assess the extent to which adults can meet the challenges involved in contemporary reading situations.

Texts

Texts are vehicles that convey the ideas, beliefs and intentions of their authors. They are communication artefacts anchored in space and time (Wineburg, 1994[67]). Every text involves a source (where the text comes from: author, date and so forth) and some content (what is said in the text). Source and content information are both important for comprehending and making use of texts (Perfetti, Rouet and Britt, 1999[49]). Moreover, with the advent of digital technology, laypersons have access to a growing diversity of textual materials. In addition to traditional genres such as a novel, a newspaper article or a cooking recipe, new genres have appeared such as blogs, forums, or instant messaging systems (e.g. Twitter). Furthermore, text genres tend to be presented in combination, such as when readers react to an online article or offer their versions of a cooking recipe. The profusion of text genres represents new opportunities, but also new challenges for contemporary readers. In addition, readers are increasingly faced with multiple texts that they may have to read in parallel in order to achieve their purpose. For instance, a person who seeks advice about a health issue may look up a web forum and read several messages posted by different people. The person may then turn to the website of a hospital to seek further information, and so on and so forth. Therefore, modern text comprehension involves an ability to make sense of multiple and sometimes heterogeneous sets of texts.

In this context, ensuring the coverage of the literacy domain is a challenge, as there is no universal categorisation of text types, genres and formats. The PIAAC literacy framework rests on a distinction between single and multiple texts (as defined by a distinct source). In addition, the framework relies on distinctions made in previous assessments, such as text types (e.g., narration, description), text format

(i.e., continuous vs. non-continuous texts) and the presence of organising devices enabling readers to navigate within and across texts.

Text types

Text types describe the diversity of texts as prototypical representations of the world and communication acts. The most frequently encountered text types are description, narration, exposition, argumentation, instruction and transaction. Naturalistic texts are usually difficult to categorise, as they tend to cut across these prototypical categories. For example, a newspaper article might start with a specific story (narration), then engage in some definitions and context (explanation), and a critical analysis (argumentation). Nevertheless, it is useful to categorise texts according to the text type, based on the predominant characteristics of the text, in order to ensure that the instrument samples across a range of texts that represent different types of reading. The classification of texts used in the PIAAC literacy assessment is borrowed from that used in the previous PIAAC and PISA assessments.

Description is the type of text where the information refers to properties of objects in space. Descriptive texts are mostly meant to answer "what" or "how" type of questions. Descriptions can take several forms. Impressionistic descriptions present information from a subjective point of view reflecting the viewer's impressions of elements, relations, qualities and directions in space. Technical descriptions present information from a more objective and perspective-independent viewpoint. Frequently, technical descriptions use non-continuous text formats such as diagrams and illustrations. Typical examples of descriptions are a depiction of a particular place in a travelogue or diary, a catalogue, a geographical map, an online flight schedule or a description of a feature, function or process in a technical manual.

Narration is the type of text where the information refers to properties of characters and objects in time. Narration typically answers questions relating to "what", "when", "how" or "in what sequence". Why characters in stories behave as they do is another important question that narration typically answers. Narration can take different forms. Narratives present change from the point of view of subjective selection and emphasis, recording actions and events from the point of view of subjective impressions in time. Reports present change from the point of view of an objective situational frame, recording actions and events which can be verified by others. News stories intend to enable the readers to form their own independent opinion of facts and events based on the reporter's account. Typical examples narrations are a novel, a biography, a play, a comic strip and a newspaper report of an event.

Exposition is the type of text meant to communicate concepts, phenomena and other mental constructs involving a set of interacting elements. The text provides an explanation of how the different elements interrelate in a meaningful whole and often answers questions about "how" and "why" (referring to enabling conditions and causal relationships). Expositions can take various forms. Expository essays provide a simple explanation of concepts, mental constructs or conceptions from a subjective point of view. Definitions explain how terms or names are interrelated with mental concepts. In showing these interrelations, the definition explains the meaning of words. Explications are a form of analytic exposition used to explain how a concept can be linked with words or terms. Minutes are a record of the results of meetings or presentations. Typical examples of expositions are a scholarly essay about the metabolism of sugar, a diagram showing a model of memory, and a graph of population trends.

Argumentation is the type of text that presents factual or interpretive claims about a situation, together with supporting reasons and warrants. Argumentative texts often answer "why" (as in, for instance, "why did this happen?" or "why should we do this?"), but also "what if" questions. An important subcategory of argumentative texts is persuasive and opinionative texts, referring to opinions and points of view. A "comment" relates the concepts of events, objects and ideas to a private system of thoughts, values and beliefs. "Scientific argumentation" relates concepts of events, objects and ideas to systems of thought and knowledge so that the resulting propositions can be verified as valid or non-valid. Examples of text objects

in the text type category argumentation are a poster advertisement, the posts in an online forum and a web-based review of a book or film.

Instruction (sometimes called injunction) is the type of text that provides directions on what to do. Instructions present directions for certain behaviours in order to complete a task. Rules, regulations and statutes specify requirements for certain behaviours based on impersonal authority, such as practical validity or public authority. Examples of textual instruction are a cooking recipe, a series of diagrams showing a procedure for giving first aid and guidelines for operating digital software.

Transaction represents a written text that supports interpersonal communication, such as requesting that something is done, organising a meeting or making a social engagement with a friend. Before the spread of electronic communication, this kind of text was a significant component of some kinds of letters and, as an oral exchange, the principal purpose of many phone calls. Transactional texts are often personal in nature, rather than public, and this may help to explain why they do not appear to be represented in some of the corpora used to develop many text typologies. With the extreme ease of personal communication using e-mail, text messages, blogs and social networking websites, this kind of text has become much more significant as a reading text type in recent years. Transactional texts often build on common and possibly private understandings between communicators – though clearly, this feature is difficult to explore in a large-scale assessment. Examples of text objects in the text type transaction are everyday e-mail and text message exchanges between colleagues or friends that request and confirm arrangements.

Text format: Continuous, non-continuous and mixed texts

The building blocks of texts are written words, which can be organised according to the rules of syntax, coherence and cohesion, but also according to spatial dimensions such as in lists, tables and charts. In the PIAAC literacy framework, continuous texts are defined as sequences of sentences and paragraphs. These may fit into even larger structures such as sections, chapters and books. Non-continuous texts are defined as words, sentences or passages organised in a list or matrix format (Kirsch and Mosenthal, 1990[68]).

In both print and digital environments, written texts are often associated with non-verbal representations, such as graphics and pictures. The PIAAC assessment does not focus on these representations *per se*, but some tasks may involve the use of text in combination with graphics or pictures.

The PIAAC literacy framework also considers mixed texts, which involve both continuous and non-continuous components. In well-constructed mixed texts, the components (for example, a prose explanation including a graph or table) are mutually supportive through coherence and cohesion links at the local and global level. Mixed text is a common format in magazines, reference books and reports, where authors employ a variety of presentations to communicate information. In digital texts, authored web pages are typically mixed texts, with combinations of lists, paragraphs of prose and often graphics. Message-based texts, such as online forms, e-mail messages and forums, also combine texts that are continuous and non-continuous in format.

Text organisation: Layout, content representation and access devices

Naturalistic texts vary from a few lines to several hundreds of pages. Depending on the length and purpose, texts may include a range of devices aimed at representing content and facilitate access to passages of interest.

Organisation is primarily signalled by the sequence of sentences and texts, along with the use of different font sizes, font types such as italic and boldface or borders and patterns. Various types of discourse markers also provide information about how ideas are organised in the text. For example, sequence markers (first, second, third, etc.), signal the relation of each of the units introduced to each other and

indicate how the units relate to the larger surrounding text. Causal connectors (therefore, for this reason, since, etc.) signify cause-effect relationships between parts of a text.

Larger texts often come with titles and headers, paragraphs and sections. These markers also provide clues to text boundaries (with space and a new header showing section completion, for example). Yet longer texts are organised into chapters, they include a table of contents and one or several indexes. Readers' awareness and use of these devices is critical to their effectiveness when reading texts for specific purposes (Goldman and Rakestraw Jr., 2000[69]).

Digital texts also come with a number of tools that let the user access and display specific passages. Some of these tools are identical to those found in printed texts (e.g., headers), whereas others are more specific to the electronic medium. Examples include windows, scroll bars, tabs, but also embedded hyperlinks. There is growing evidence that the processes involved in reading printed and digital texts differ, partly because of differences in presentation formats and navigation tools (Delgado et al., 2018[19]; Naumann, 2015[70]; OECD, 2011[71]). Therefore, it is important to assess readers' ability to deal with texts featuring a diversity of content representation and navigation tools.

The PIAAC literacy assessment will implement texts that vary on a continuum of length (i.e., single vs. multiple pages), but also diversity and density of content representation and access devices.

Source: Single vs. multiple texts

As mentioned in the introduction to this section, a text is defined by its source and its content. The PIAAC literacy framework defines single texts as texts that originate in a single source, i.e., an author, a publication medium, and a date of publication [other dimensions of the complex construct of a "source" will not be discussed here; see (Britt et al., 1999[72]), for a more detailed analysis of the construct of a source)]. Multiple texts are defined by having different authors, or being published through different channels or at different times.

It is important to note that in this framework the distinction between single and multiple texts is in principle independent from the amount of information contained in the text(s). A single text can be as short as a single sentence and as long as a whole book or website, as long as it has a single author (or group of authors), publication medium and date. Conversely, multiple texts can take the form of a series of brief passages, for instance in a web forum where different people post messages at different times. A single text can also contain embedded sources, that is, references to various authors or texts (Rouet and Britt, 2014[55]; Strømsø et al., 2013[73]).

Items in a set of multiple texts may have different relationships to each other: some texts may corroborate, complete, support or provide evidence for other texts, whereas others may disagree, contradict or conflict with others. Readers' cognitive representation of a set of texts together with their respective sources and the network of intertext relationships has been termed a "documents model" (Perfetti, Rouet and Britt, 1999[49]).

Table 2.3 summarises the dimensions of texts that are considered in the PIAAC literacy framework.

Table 2.3. Main dimensions of texts considered in the PIAAC literacy framework

Dimension	Levels
Text type	Description, narration, exposition, argumentation, instruction, transaction
Text format	Continuous, non-continuous, mixed
Text organisation	Continuous dimension involving the amount of information (number of pages) and the density of content representation and access devices
Source	Single vs. multiple texts

Social contexts

Reading pervades all domains of an individual's life. Reading activities are normally situated in a social situation and may serve a range of purposes from personal to professional and civic. Both the motivation to read and the interpretation of the content may be influenced by the context. As a result, the PIAAC literacy framework defines three main types of contexts that will be represented in the assessment:

a) Work and occupation. Written texts play an important role in a wide range of occupations. Uses of text in an occupational context includes finding employment, finance, and being on the job (i.e., regulations, organisation, safety instructions). However, the materials used in the PIAAC literacy assessment do not include specialised job-specific texts, which obviously would pose the problem of prerequisite background knowledge.

b) Personal use. Reading is also important for personal purposes. Many adults engage in reading when dealing with interpersonal relationships, personal finance, housing, and insurance. They also increasingly make use of written materials in addressing health and safety issues (e.g., disease prevention and treatment, safety and accident prevention, first aid, and staying healthy). Adults also use texts in relation to their consuming habits: credit and banking, savings, and advertising, making purchases, and maintaining personal possessions. Finally, texts are important in organising leisure and recreation time, including travel, restaurants, and material read for leisure and recreation itself (games etc.).

c) Social and civic contexts. Finally, literacy is essential in adults' participation in social and civic life. Community and citizenship includes materials dealing with community resources, public services and staying informed. Education and training includes materials that deal with opportunities for further learning.

Assessing literacy

General organisation of literacy tasks

The construct of literacy encompasses what readers can do with texts and also what they comprehend and remember from the texts. This warrants the design of testing situations in which test-takers may be asked to complete tasks either with the text available or after they have read the text, based on their memory for text information. Research suggests that answering comprehension questions with or without text availability tap in part on distinct mental processes, and that assessment tasks without the text available might be more sensitive to the quality of the reading processes and less dependent from reader motivation and test-taking strategies (Ozuru et al., 2007[74]; Schroeder, 2011[75]). However, the PIAAC literacy assessment focuses on what adults can do with texts, and therefore it is based on scenarios involving questions and one or several texts that remain available throughout the task. This is arguably the most common scenario in adults' daily uses of text (White, Chen and Forsyth, 2010[7]).

The PIAAC assessment of literacy is based on test units in which participants are asked to make use of one or several texts in order to answer a set of questions. A short introduction usually provides some context and motivation for the unit. Each question elicits one of the core processes defined in the framework (see section on cognitive task demands). Questions are presented one by one in a blocked format in order to decrease the influence of test-taking strategies and to reduce variance in test completion time.

The texts used as stimuli reflect texts that test-takers may encounter in real life. Many of them are directly drawn from authentic materials with little, if any adaptation. This means that no effort is made to make these texts easier to read or to improve their organisation or presentation. Using naturalistic texts, sometimes even clearly suboptimal ones (for instance, poorly organised or using complex language),

ensures a high level of face validity. However, no artificial difficulty or flaw is introduced at the time of test design.

Response formats

Questions can be designed using a wide range of response formats, such as constructed (open) responses, true-false judgements, multiple choice, or responses based on filling a blank or highlighting a text passage, to cite just some of the most common types. Computerised test delivery also affords additional response modes, such as "drag and drop". The form in which responses are collected – the response format – varies according to what is considered appropriate given the kind of evidence that is being collected, and also according to the pragmatic constraints of a large-scale assessment.

Response formats can involve demands on specific cognitive processes. For example, multiple-choice comprehension questions are typically dependent on decoding skills, because readers have to decode distractors or items, when compared to open constructed response items (Cain and Oakhill, 2006[76]; Ozuru et al., 2007[74]). Conversely, constructed responses tap on written production as much as on comprehension skills. Several studies suggest that the response format has a significant effect on the performance of different groups (Grisay and Monseur, 2007[77]; Schwabe, McElvany and Trendtel, 2015[78]). Finally, participants in different countries may be more or less familiar with different response formats. Consequently, the use of a diversity of response formats is recommended to ensure precision and to reduce potential biases. However, consistent with the general guidelines for PIAAC Cycle 2, the assessment of literacy will not include any constructed response. Besides removing the need for human scoring, this reduces the confounding of comprehension and written production skills.

Adaptive testing design

The deployment of computer-based assessment in PIAAC creates the opportunity to implement adaptive testing. Adaptive testing enables higher levels of measurement precision using fewer items per individual participant. This is accomplished by targeting more items that are aligned to the ability range of participants at different points in the ability distribution.

Adaptive testing has the potential to increase the resolution and sensitivity of the assessment, most particularly at the lower end of the performance distribution. For example, participants who perform low on items that assess their ease and efficiency of reading (e.g. reading fluency) will likely struggle on highly complex multiple text items. Thus, there would be benefit in providing additional lower-level texts for those participants to better assess specific aspects of their comprehension.

Recommended distribution of items

The Literacy Expert Group recommends the following distribution of items based on a typology of cognitive task demands, text size and contexts.

Recommended distribution by cognitive task demands and number of sources

The rationale for the recommended distribution per cognitive task demands is as follows: a substantial number of items (45%) should involve text understanding, both literal and inferential, as this is considered a core process present in most if not all reading activities. Due to its increased importance in digital environments, the category "access" (which involves identifying texts in a set and locating information within texts) should also be broadly represented (35%). Finally, about 20% of the tasks should involve one type of evaluation or reflection about the text.

As regards text size, most tasks (60%) will involve texts presented on a single page, with the view that some of these need to be simple enough so as to describe basic levels of literacy. Some of these short texts may involve multiple sources (such as, e.g., a series of short messages on a web forum page). However, acknowledging that readers most often face texts distributed across multiple pages (either from one or from several sources), the test will also include multi-page units. It is expected that tasks focusing on the process of "understanding" will be proportionally more represented in single page units, whereas "access" and "evaluate" tasks should be more frequent in multi-page units.

Table 2.4 presents the recommended distribution of items as a function of text size (i.e., single vs. multiple pages) and cognitive task demands.

Table 2.4. Recommended distribution of items as a function of text size and cognitive task demands

Cognitive task demands	Single page	Multiple pages	Total
Access	20%	15%	35%
Understand	30%	15%	45%
Evaluate	10%	10%	20%
Total	60%	40%	100%

It is further recommended that a majority of the test units (goal: 60%) include single source texts.

Recommended distribution by context

A broad range of tasks drawn from realistic contexts is meant to help ensure that no group of respondents will be either advantaged or disadvantaged based on their familiarity with, or interest in, a particular context. The recommended percentage of tasks for work, personal, community and education types of contexts is 15, 40, 30, and 15%, respectively.

Distribution across other relevant dimensions

No specific recommendation is made regarding a distribution of tasks across dimensions of text types or response formats, beyond the general recommendation to ensure a broad diversity and a representation of as many types as possible.

The role of fluent reading, engagement and metacognition

Reading fluency can be defined as an individual's ability to read words, sentences and connected text efficiently (Kuhn and Stahl, 2003[79]), i.e. both quickly and accurately. Fluent readers master the basic reading processes of recognising written words, assigning meaning to these words, and establishing a coherent sentence meaning by way of syntactic parsing and semantic integration. They do so without using a large amount of working memory and attentional resources (LaBerge and Samuels, 1974[80]; Perfetti, 1985[1]). Therefore, fluent readers have more cognitive resources available to invest in higher-level comprehension processes such as inferences and reading strategies (Walczyk et al., 2004[81]). The differential allocation of mental resources to low- vs. higher-level processes in struggling vs. fluent readers accounts for the strong link between fluent reading and text-level comprehension outcomes found in many studies and in all age groups ranging from primary school to adult readers (García and Cain, 2014[82]; Klauda and Guthrie, 2008[83]; Richter et al., 2013[84]).

To better assess reading fluency, the PIAAC Cycle 2 assessment will again include a measure of reading component skills. The components assessment tasks are designed to inform our understanding of the basic reading skills that underlay proficient literacy performance levels. These tasks help describe what low literate adults can do and therefore form a basis for learning, instruction, and policy with respect to helping low literate adults achieve higher literacy levels (Sabatini and Bruce, 2009[85]). In response to the OECD's requirement that the results of the components assessment be generalisable to the overall population, the components tasks will be administered to a representative subsample of all individuals who take the full literacy assessment.

The reading components assessment will include two sets of tasks, both of which were administered in the first cycle of PIAAC. The first set focuses on the ability to process meaning at the sentence level. Respondents will be shown a series of sentences, which increase in complexity, and be asked to identify if the sentence does or does not make sense in terms of properties of the real world or the internal logic of the sentence. The second set of tasks focuses on passage comprehension. For these tasks, respondents are asked to read passages where, at certain points, they must select a word from two provided alternatives so that the text makes sense [see sample tasks in (OECD, 2019[86])].

Because PIAAC Cycle 2 will be administered on tablets, it will be possible to precisely record both accuracy and response times for the component tasks. The accuracy data in the sentence verification and passage comprehension tasks will serve as indicators of the mastery of basic reading comprehension processes. They will be included in the scaling of the items in the PIAAC literacy assessment, increasing measurement precision in the lower range of the scale. The response times will serve as an indicator of fluency in basic reading processes, allowing researchers to explore its potential contribution to the mastery of the more complex literacy tasks in the PIAAC literacy assessment.

The concept of reading engagement refers to the degree of importance of reading to an individual and to the extent that reading plays a role in their daily life. Empirical studies with children and adults have shown that differences in engagement are systematically related to differences in performance on assessments. In particular, studies with different age groups provide evidence for an upward causal spiral: more proficient readers will read more and the exposure to printed texts will promote their reading development and lead to higher proficiency (Guthrie and Wigfield, 2000[87]; Mol and Bus, 2011[88]). The construct of engagement encompasses objective aspects such as the amount and diversity of reading one experiences in daily life, and also subjective aspects such as one's interest in reading, perception of control over reading, and reading efficacy. The PIAAC literacy assessments will capture core aspects of the objective aspects of reading engagement as part of the background questionnaire.

Metacognition, or one's awareness, monitoring and control of their own cognitive processes, is also considered an important aspect of reading literacy (Baker, 1989[89]). However due to methodological and practical constraints the PIAAC literacy study will not include any specific assessment of metacognition in reading. Metacognition will be indirectly assessed through its contribution to the more complex reading tasks which require strategic decisions and self-regulation to different degrees.

Factors driving task difficulty

The difficulty of literacy tasks is expected to depend on three series of factors, namely a) characteristics of the text(s); b) characteristics of the question; and c) the specific interaction between a question and a text (or set of texts).

In addition, some of these factors affect the difficulty of the task regardless of the specific cognitive demands involved, whereas other factors are specific to a certain type of task demand. Table 2.5 lists the main text, task, and text-by-task factors driving difficulty in general, and then more specifically for each type of cognitive task demand.

Table 2.5. Text, task, and text-by-task factors driving difficulty as a function of cognitive task demands

	Text factors	Task factors	Text-by-task factors
Factors affecting all tasks	Longer, multiple texts are generally more difficult because they increase processing load and require readers to sustain their attention over a longer time span. Longer texts are also more likely to contain distracting (task-irrelevant) information. Text dealing with unfamiliar contents, using unfamiliar words and/or a complex syntax or organisation are also more difficult regardless of the task. Content representation and signalling devices such as tables of contents, headers, boldface, underlining, and bullet points generally decrease the text difficulty.	Tasks involving a longer stem and/or unfamiliar words are more likely to be forgotten en route, thus requiring the reader to re-read the question. Readers with low-levels of self-monitoring may fail to realise that they need to refresh their memory. The lack of explicit guidance regarding which portion(s) of the materials should be inspected increases the difficulty of the question, compared to questions that include instructions as to where to look the answer.	Tasks involving a direct match between the question and the text are easier than tasks that require the reader to infer the link between the question and the relevant portion of the text. Texts that contain a large number of distracting information (for instance, passages sharing keywords with the question though irrelevant content wise) are more difficult than those in which a single passage is related to the question.
Difficulty drivers for "Accessing" tasks	Texts distributed across multiple pages require multiple stages of selection: selecting the right text and then the right portion of that text. Multi-page texts that are organised in non-linear ways, with several levels of links, are more difficult to search through than texts organised linearly or in the form of more shallow hierarchies.	Questions requiring the reader to gather multiple pieces of information across texts are more difficult than questions involving a single piece of information.	Texts containing content organisers (e.g., headers) that match the topic of the question are easier to access than those in which the location of information remains implicit.
Difficulty drivers for "Understanding" tasks	In addition to the general factors listed above, texts involving an implicit and/or unfamiliar structure are more difficult to understand. In sets of multiple texts, the presence of inconsistencies add the burden of identifying and resolving them.	Questions that require a large amount of information are more difficult that those that can be answered based on a single piece of information. Simple, connecting inferences are considered easier to perform than elaborative inferences, which require using one's prior knowledge.	Comprehension questions that require the test-taker to draw an inference based on text information are more difficult than questions whose answers are explicit in the text. Questions that require the test-taker to relate several pieces of information located in distant portions of the text(s) are more difficult than those for which the relevant information is grouped within a single section.
Difficulty drivers for "Evaluating" tasks	Unfamiliar, incomplete or less salient source indications make accuracy assessment more difficult. Unusual argument structures and incomplete arguments are more difficult to evaluate.	For familiar contents, factual inaccuracies are easier to detect than flaws in an argument structure (connection of claims and supporting reasons).	Texts involving low-quality sources issuing topically-matching information make it more difficult for the reader to evaluate the relevance of the information.

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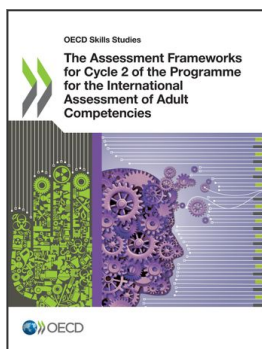
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Note

[1] Navigation in a static piece of continuous text is always possible by simply shifting one's focus of attention from one passage of the text to another, by skimming through passages, and by browsing through pages and sections in the case of long texts.