



Adult Literacy and Lifeskills Survey

Information and Communication Technology Literacy Assessment Framework

DRAFT

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Adult Literacy and Lifeskills Survey

ICTL Assessment Framework

1. Background and Purpose

1.1 The Adult Literacy and Lifeskills Survey

Several OECD countries have expressed an interest in fielding a comparative survey to measure the distribution in the adult population of a range of skills thought to be important to social and economic success. The Adult Literacy and Lifeskills Survey (ALLS) is being developed in response to this need. Modelled on the International Adult Literacy Survey (IALS), the ALLS will see the administration of direct performance tests and behavioural reports to representative samples of adults aged 16 to 65.

By using cognitive measures, the purpose of the ALLS is to directly assess, the performance of adults in the skill domains of *prose literacy*, *document literacy*, and *numeracy*. The study will also assess *information and communication technology literacy* and *teamwork* skills indirectly through the use of self-assessments and behavioural reports. These modules will be part of the ALLS Background Questionnaire. In addition, information on the respondent's work force participation, education and training, literacy activities, and job skill requirements will be collected in the Background Questionnaire.

ALLS will be administered at the household level utilising a paper and pencil-based instrument. It is estimated that the full assessment will take about 90 minutes and will consist of a screening questionnaire (where necessary), a background questionnaire, and sets of skill simulation tasks.

1.2 Document Purpose

The purpose of this document is to briefly outline a conceptual framework and question content for an information and communication technology (ICT) literacy module for the ALLS. Because both the framework and the measures have been developed through consultation with various ALLS research team members, content area experts, and National Project Managers, this process also is described. Based on a selective yet illustrative review of relevant literature, the paper provides a rationale for the need to include such a module within an international context and the factors that may influence ICT literacy skills of potential respondents.

2. Inclusion of Information and Communication Technology Literacy in ALLS

The incorporation of an ICT literacy component in the ALLS assessment recognizes that the ability to use ICT – essentially, computers and their diverse applications – is an important resource that influences an individual's economic and social participation and

human capital development. The policy goal of creating more knowledge-based economies and societies is transforming the skills required of citizens. The level and use of ICT-based services are therefore rapidly changing and the potential effects on individuals and societies are still largely unknown.

In terms of public policy, there is growing concern about the implications of a 'digital divide', whereby some social groups lack the means to access new ICT, while others reap labour market rewards for being on the cutting edge of these technologies (Hughes and Lowe, 2000; Dickinson and Ellison, 1999). Moreover, as governments increasingly rely on the Internet as a means to communicate and disseminate information, the notion of citizenship is being transformed. A comprehensive examination of computer use in workplaces, homes and community settings is therefore required.

Including an ICT literacy assessment module within the ALLS framework will provide a systematic analysis of ICT skills and use by the adult population of each participating country. Moreover, it will also allow for an international comparison of such skills and their use. The latter issue is of considerable policy importance in light of the fact that ICT has been linked to goals of economic development and a corresponding rise of knowledge-based industries. Unfortunately though, cross-national variations in the availability of computers and the Internet are becoming more pronounced (Angus Reid Group, 2000; Hedley, 1999).

By using self-reports it will be possible to develop indicators that will help highlight skill levels, use, and aptitudes that people have towards communication technologies. As a result, we will be able to compare the characteristics of users and non-users, and it will also become increasingly possible to gather more information on other important life skills, and on a range of individual outcomes. Distinctions between the levels of ICT literacy amongst countries and between sub-populations (i.e., gender and age) can also be analyzed.

3. Steps in Developing the ICTL Module

The basic purpose of the ALLS is to directly assess literacy and numeracy as essential life-skills, in addition to related skills in the areas of information and communication technology and teamwork. Based on these initial objectives, Statistics Canada developed a draft rationale and content for computer literacy (G. S. Lowe and J. McAuley, "Computer Literacy Assessment Framework," 26 October 1998). This framework set down three principles:

- 1) That the ICT literacy component of the ALLS be part of the Background Questionnaire;
- 2) That information and communication technology be viewed as a 'tool' or 'resource' that enables individuals to achieve other ends in their lives; and
- 3) That it would not be feasible for the ALLS to include competency tests that objectively measured proficiency, leaving us to rely on self-assessments and behavioural reports.

This Framework and its content were discussed at the ‘All-Hands’ meeting of the ALLS (then called the International Life Skills Survey) in Washington, January 1999. A ‘Computer team’ was formed at the meeting, comprising a number of experts who brought diverse policy, practical, and research perspectives to the discussions. As a result of a brainstorming session, this team recommended that the ALLS include a core component on Information and Communications Technology Skills. The team identified eight dimensions of ICT that are important to the daily lives of individuals: logic and critical evaluation; use; skills; applications; social context; motivation; adaptability; and knowledge. The Team suggested that the scope of ICT is broader than skills, or even literacy. Furthermore, it viewed ICT as more than just a tool that individuals can make use of to improve their social and economic conditions. However, there was no consensus on either the breadth of ICT competencies or how ICT is more than a tool.

Essentially, the suggestions arising from the Computer Team assembled at the Washington meeting significantly widened the scope and complexity of the ICT component. Several experts argued for proficiency testing and for extending the concepts of computer literacy to ‘information literacy’, ‘technological literacy’ and ‘e-literacy’. In a follow-up to the January 1999 Computer Team’s suggestions, Jean-Paul Reeff, of Luxembourg’s Ministry of Education, prepared a revised framework for ICT literacy. This framework took a different approach to these by proposing the use of ‘scenarios’ designed to assess an individual’s ability to apply ICT of varying complexity to solving problems.

Several months after the All-Hands meeting in Washington, Marilyn Binkley, Robert Sternberg, Stan Jones, and David Nohara, produced a document entitled “An Overarching Framework for Understanding and Assessing Life Skills” (Binkley et. al., 1999). This was intended to guide the development of the entire study and provide an integrative conceptual model, based on a synthesis of employability and psychological perspectives on life skills.

The framework posited four core domains for each skill area – crystallized, fluid, practical, creative – that are related to success in life, and identified the ability to use computers and other information technology as one skill set. The Overarching Framework suggests that the ALLS use self-report and behavioral measures of ‘crystallized skills’ for the use of technology. This framework document prompted a careful re-assessment of the much more ambitious (methodologically and conceptually) suggestions arising from the Washington meeting’s Computer Team and various follow-up documents.

Meanwhile, Statistics Canada had adapted many of the content items proposed in the 26 October 1998 “Computer Literacy Assessment Framework” for the 2000 cycle of the General Social Survey. This focused mainly on access and skills related to the use of computers and the Internet. The GSS 2000 draft questionnaire was subjected to extensive consultation with stakeholders and experts, and then piloted (n=359). Revisions to the ICTL module for the ALLS were made based on the pilot results. This revised version of

the module was reviewed by Swedish experts and by the National Project Managers, resulting in further revisions to both item design and content.

Field-testing of the combined ICTL and the Teamwork modules will take place in Spring 2000 in Ottawa and Rome, with revisions done in time to circulate the Pilot version of the ALLS instrument beginning in July.

As a result of the development work and consultations outlined above, there is a consensus that the objectives of the ALLS would be best served by the three principles, previously noted. However, substantial revisions to the design and content of the questionnaire items would be required.

The ICT module contains these revisions and is intended to take about five to seven minutes in the Background Questionnaire. It's intent is to efficiently document a range of ICT uses and skills within the general adult population of participating nations. The following draft of the content items cover seven key dimensions of ICT literacy:

- general use of information and communication technology;
- computer and Internet use;
- computer use and skills in work contexts;
- computer use in non-work contexts;
- development of computer skills;
- personal benefits of computer use; and
- receptivity to computer use among current non-users.

4. Computer Literacy

4.1 Selected Research on Computer Literacy

To date, a significant amount of research on computer literacy has been undertaken. This work has tended to focus on specific contexts and user groups. Much of this research has examined computer literacy and its use in educational settings. For example, one of the first comprehensive studies on computer literacy - COMPED – provides an international comparison of computer use in schools from both the perspective of educators and students. A goal of this study was to determine whether computer literacy meant the same thing for students in different countries (Collis and Anderson, 1994). A test (30 multiple choice questions) was developed for use cross culturally (in 13 countries) to measure computer related knowledge, skills and insights. The test had 3 themes: (1) computers as a part of information technology (i.e., what are computers? How do they operate?), (2) applications (i.e., what can you do with information technology?), and (3) user strategies (what are your computer handling skills?). The findings provided an outline of school children's computer use in an internationally comparative framework (Pelgrum et. al., 1993).

A second comprehensive study was conducted by the Educational Testing Service in the USA, which developed a computer familiarity questionnaire to accompany the Test of English as a Foreign Language (TOEFL). The test included 23 items grouped around

four aspects of computer familiarity that seem to be particularly relevant to international students enrolled in higher education: access to computers, self-assessment of attitudes and abilities, use of and experience with computers, and use of and experience with related technology. Answer choices are on descriptive scale ranging from one to four. The result was a set of items and a set of factors developed by analysing item responses from individuals taking the TOEFL. The resulting studies (Kirsch, Jamieson, Taylor and Eignor, 1997; Eignor, Taylor, Jamieson and Kirsch, 1997; Taylor, Jamieson, Eignor and Kirsch, 1997) indicate significant methodological advances in the creation of valid and reliable scales measuring computer literacy. However, the very specific population focus and objectives of this research limits these measures' applicability to general adult populations, rendering them unsuitable for the ALLS.

Many studies have focused on computer use among students (e.g., Miller and Varma, 1994; Levin and Gordon, 1989; Jegede and Okebukola, 1992) while others have examined aspects of computer use in the adult population (e.g., Oderkirk, 1996; Lowe, 1997). Some studies have examined experience with computers, while others have examined training issues and its relation to skills (e.g., Lowe and Krahn, 1989). These are but a few of the studies that have examined the concept of computer skills, familiarity and literacy in terms of experience, frequency and type of use, accessibility, and attitudes. The problem is that a variety of methodologies were implemented across these studies.

A few models have been constructed to assess various aspects of computer familiarity, acceptance, and experience. Davis (1986) constructed the Technology Acceptance Model (TAM) to combine an individual's perceived usefulness and ease of use with their intentions and attitudes towards technology. Lee (1986) constructed the Computer Experience Questionnaire (CEQ) consisting of five questions relating to completed computer courses. Both of these models have been expanded upon in similar research (Brosnan, 1996; Todman and Dick, 1993) to incorporate attitudinal elements of fun, usefulness and ease of use in the TAM model, and interval level scales in the CEQ (Mazzeo, Druensne, Raffeld, Checketts and Muhlstein, 1991; Moon et al., 1994). The Computer Attitude Scale (Loyd and Gressard, 1984) linked computer attitudes of confidence, anxiety and liking in an attempt to determine if a correlation existed.

While none of these models examine how computer literacy and skills are integrated into daily life, at least one Canadian province has proposed a framework for assessing a wide range of information technology learning outcomes (Alberta Education, 1997). The principles underlying the framework are that outcomes are progressive and sequential, reflecting knowledge, skills and attitudes that are integrated and applied within a wide range of learning and work settings. The overall thrust is that technology-based skills, knowledge and attitudes acquired by students will be useful for entry-level jobs, life-long learning, personal development and citizenship. While this design is very similar to the ALLS, the framework has not yet lead to the development of specific measures.

A review of the literature suggests that there will be many challenges surrounding the development of meaningful indicators to measure computer literacy in the adult population. While those that have been developed have assessed numerous aspects such

as computer use, familiarity and experience in a variety of populations, a comprehensive measure of computer skills has not yet been developed for general adult populations across national boundaries. Hence, the original development challenge is augmented. Yet the literature has shown that the following information is key to understanding computer literacy:

- what tasks people actually perform with computers¹ and in what contexts;
- how adaptable and receptive are individuals towards computers and related information technology;
- how computer skills are integrated into daily life, both on and off the job;
- implications of varying computer literacy levels on society and the economy; and
- how these skills enhance access to opportunities for self-development, education and training, and labour market success.

4.2 Definition of ICT literacy and its relationship to ALLS

Research has indicated that there is no general consensus on how to define ‘computer literacy.’ In other words, the term can mean different things to different people. Initially, the definition was based on the ability to program a computer. Computer science professionals felt that to be computer literate a person must be able to read and write computer programs in at least one of the common machine languages. For those not trained in computer science, computer literacy meant having the ability to use a computer for practical purposes (Paprzycki, Mitchell and Duckett, 1994). With the shift away from mainframe machines and towards the increased use of more user-friendly personal computers (PCs), the former definition was increasingly deemed as inappropriate whereas the latter definition increasingly became the basis for the plethora of computer literacy definitions currently found in the literature. For example, the term computer literacy has been used interchangeably with computer skills, technology literacy, and computer familiarity.

Given that the definition of computer literacy in the literature is vague, a generic definition must be created. For the purposes of the ALLS, computer literacy is viewed as being based around certain skill sets or a certain level of competency. However, the term but has also been expanded to include ‘information and communication technology’ in order to include a wider range of computer-based technologies, especially the Internet, e-mail and multi-media (e.g., information contained on CD-ROMS). Hence, ICT literacy can be defined as *the skills and abilities that will enable the use of computers and related information technologies to meet personal, educational and labour market goals.*

This definition reflects the growing emphasis in education to use computers as learning tools in an attempt to help students gain a level of competence in applying information technology to every day problem-solving (Lowther, Bassoppo Moyo and Morrison, 1998). Furthermore, conceptualising computer and information technology use in terms of skills makes it consistent with other forms of literacy (McMillan, 1996). This is

¹ Definition of a computer: a personal, desktop, portable, mainframe, or networked computer that can be programmed or use packaged software to do a variety of tasks, but excluding video game consoles, scanners, computerized sales terminals, machine monitors, inventory control systems.

essential if an integrated approach is to be developed within ALLS. While the ICTL module assesses skills in terms of self-reported use patterns (as opposed to actual tests, as for literacy and numeracy), these behavioural measures are broadly comparable to the measures of literacy and numeracy practices contained in ALLS. In this sense, the ICT use measures in the ALLS will have some predictive power to identify groups that are likely to adapt to, or be receptive towards, the continual evolution of computer applications. It will also help to determine whether computer literacy is an enabling skill, or a barrier, when it comes to education, labour market and citizenship outcomes.

Within the above definition of ICTL literacy, the following can be addressed:

- incidence of computer and related technology use;
- frequency of computer and related technology use;
- context of computer and related technology use;
- complexity of tasks performed;
- perceived barriers and receptiveness of non-users towards computers and technology; and
- development of computer skills.

4.3 Factors affecting computer literacy

Studies have indicated that many different factors can influence an individual's level of computer literacy. While the ICT literacy component of ALLS will be designed to measure the level of computer and related skills within the adult population, information must also be collected from respondents on their individual attributes.

As with prose and document literacy, ICT literacy is highly correlated with education and income, both key measure of socio-economic status (Nakhaie, 1998). The same relationships also hold for home computer ownership. However, it is important to note that computer ownership does not necessarily imply strong computer literacy skills. SES characteristics in turn are related to industry and occupation of employment, which have a major bearing on access to and use of ICT in workplaces (Hughes and Lowe, 2000). In the American research, race has often been examined as a possible determinant of ICT use and skills (e.g., Ervine and Gilmore, 1999); however, respondent's race will not be measured in the ALLS.

Gender differences in attitudes and behaviour related to information and communication technology is a major research theme. For example, males tend to have more positive attitudes toward computers regardless of their level of familiarity; female attitudes become more positive as the level of familiarity with computers increases (Sacks, Bellissimo and Mergendoller, 1993; Newman, et. al., 1995). However, women may be more successful than men in applying what they have learned in computing courses (Gattiker, 1990). The gendered dimensions of Internet and e-mail use have become subjects of debate (Green and Adam, 1998).

There also are notable age differences regarding ICT use and skills. For instance, young people are more likely to be ICT users and to be more ICT literate than older age groups.

This is likely the result of more ICT-intensive educational programs in schools. Also, older individuals are slower to respond to rapid change in technology and increased reliance on computers than younger individuals. However, with adequate training, older individuals can adapt to new information technologies (Linden and Adams, 1992; Kelley et. al., 1999). Such individuals may reap benefits in terms of improved well being and reduced social isolation (White et. al., 1999). Canadian data suggest that families with children, particularly young children in school, are more likely to own computers (Dickinson and Ellison, 1999).

Geographic location, particularly rural – urban differences may also be relevant. Results from the 1994 Canadian General Social Survey showed generally that persons living in rural areas are less likely to report that they could use a computer. However, young people living in rural areas were about as likely as their counterparts in urban areas to report this skill. (Oderkirk, 1996). Telework and other forms of ‘virtual’ work may have some potential to reduce the effects of distance from urban centres on access and use of ICT (Grimes, 2000).

There are other personal characteristics, not measured in the ALLS, also associated in the literature with the development of ICT skills. For example, individuals with low cognitive ability level may lack the opportunity to develop computer skills, or consciously opt not to become familiar with computers due to the perceived difficulty in learning about, and using, computer technology (Authur and Hart, 1990). However, these issues are outside the scope of the ALLS.

4.4 Challenges associated with measuring computer literacy skills

The computer literacy component of ALLS must provide a comprehensive picture of the levels of computer literacy in an international adult population. By developing an instrument that can be applied in all participating countries, information can be gained on the differing effects of ICT literacy at national and international levels. It is essential that information on the influencing factors be gathered to enhance data collected by the assessment.

Individuals responding to the survey will have varying levels of ICT literacy levels and experience. Levels of computer access and computer penetration differ between countries. In other words, citizens of some countries may not be provided with the opportunity to use computers in the workplace or have access to ICT in their daily lives. Furthermore, while companies such as Microsoft have become dominant in the world market, some countries may choose to rely on locally developed software packages for word processing or other computer-based activities. Knowledge and skills related to the Internet will also vary since its use is primarily concentrated in North America (and to a somewhat lesser extent in Western Europe and Japan). This is due in part to the dominance of English language content on the Internet, but may also be linked to less computer penetration in other countries as well as cultural differences. The instrument developed for ALLS must ensure that respondents are able to indicate their own culturally linked experiences with ICT within a pre-established framework.

5. Goal of the ICTL Component

The overall goal of the ICTL component of ALLS is to measure the level of the skill in an international adult population but also to provide information on four associated dimensions. These are *incidence* (i.e., Does a person use a computer, the Internet, and various forms of ICT?); *frequency* (i.e., How often does a person use a computer?); *complexity* (i.e., How complex are the tasks carried out?); and *criticality* (i.e., How critical, or useful, is the application of ICT to the main areas of daily life?).

At both the individual and national levels, we can assume that wide divergences exist in the use of computers and in related information and communication technologies. This is a reflection of different opportunities to develop and apply ICT literacy in one's job, education and daily life. Even if a nation has relatively low proportions of its adult population using a specific computer application, it can be positioned on an international continuum of emergent ICT literacy potential. Policy makers in countries involved in the ALLS study will be interested in how ICT literacy is distributed within their own countries and across countries.

6. Links to other sections of the ALLS

The ALLS is designed to assess a variety of core life skills. While there does not exist a coherent theory of life skills, the ALLS Overarching Framework strives to provide a basis for its development through its empirical findings. The framework defines life skills as “*skills or abilities individuals need in order to achieve success in life, within the context of their socio-cultural milieu, through adaptation to, shaping of, and selection of environments*” (Binkley et. al., 1999: 3). The approach taken to ICT literacy is consistent with this definition. Furthermore, given that in daily life a person's skills are integrated, there is natural overlap between ICT literacy (and barriers to it) and other sections of the ALLS instrument.

For example, accessing and reading material from the Internet is likely to be highly correlated with document literacy skills; sending and receiving emails or using a computer for word processing will likely be related to one's prose literacy; and using computers for spreadsheets and data analysis may be closely related to numerical skills. Similarly, the socio-demographic and labour market characteristics associated with high or low levels of literacy and numeracy will most likely have a bearing on access to and use of information and communication technology. Of course, these hypotheses must take into account an overriding contextual effect: the general availability of various forms of this technology, both regionally and nationally.

The integrated approach to the assessment of life skills should allow for the linkage between ICT literacy and other forms of literacy to be explored. This will contribute to a more empirically grounded understanding of how ICT literacy is embedded in a broader set of life skills.

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