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DIGITAL LITERACY SKILLS AND SKILL USE OF ADULTS WITH LEARNING DISABILITIES

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ABSTRACT

Learning disabilities (LD) impact the lives of many U.S. adults, who may also have other disabilities and health conditions. Adults with LD face educational and employment challenges. Little is known about their skills in digital literacy and how they use those skills at work or at home. The study's objective was to investigate digital literacy skills and skill use for U.S. adults with LD. The study conducted descriptive and predictive analyses of 2012/2014/2017 U.S. PIAAC data. Findings are presented on assessed digital literacy skills, use of skills at work and home, relationships of use and skills in both locations, and use of skills among discrete groups of adults with LD. Adults with LD have lower mean digital literacy scores than adults in the general population. Use of skills at home or at work adds to variance explained in digital literacy skills. Using digital literacy skills appears to matter in gaining—or keeping—the skills themselves. Also, adults with LD indicate a desire for learning, yet their rates of uncompleted education are high. Knowing relationships of assessed skills with skill use helps educators identify and implement strategies with discrete groups of adults with LD. Further implications of findings are discussed for adult educators and policymakers.

Keywords: digital literacy skills, learning disabilities, PIAAC, skill use, adult basic skills

ASSESSING AND USING DIGITAL LITERACY SKILLS

An estimated 8% of U.S. adults overall have learning disabilities (Patterson & Paulson, 2016). LD is "a difficulty learning… stemming from differences in the brain structure that affect the way a person processes information" (Takemoto, 2017. p. 17). LD often coexists with other disabilities and health conditions. Moreover, adults with LD frequently experience educational and employment challenges. Little is known about assessed skill levels of adults with LD, their use of skills in digital literacy, and relationships of assessed skills and skill use in a context of adult and postsecondary educational activities (Patterson, 2019).

Having digital literacy skills benefits adults with LD in "using digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks" (Programme for the International Assessment of Adult Competencies [PIAAC] Expert Group on Problem Solving in Technology-Rich Environments, 2009, p. 9). For example, by applying digital literacy skills, adults with LD may access and interpret health information to manage any coexisting health conditions (Feinberg et al., 2016). As U.S. society increasingly relies on information and technology (Cummins et al., 2018), with average PIAAC:2014 scores of 274 in digital literacy skills and many adults unable to take computer-based PIAAC assessments (Rampey et al., 2016), investigating how digital literacy skills of adults with LD compare is important. This study investigates recently measured digital literacy skills and use of skills for U.S. adults with learning disabilities at all skill levels in U.S. PIAAC:2012/2014/2017 data. This article also offers implications for practice and policy. Ideas on program design may potentially increase skill levels and use, and instructional approaches may support strengthening skills.

LITERATURE REVIEW

Learning disabilities impact the lives of many U.S. adults. In PIAAC, the 2012 LD incidence for adults overall was approximately 8% (Patterson & Paulson, 2016), and in 2012/2014, approximately 12 million U.S. adults with low education attainment reported LD (Patterson, 2019). As National Research Council (2012) found, however, many adults likely remain undiagnosed and the true incidence of LD is undetermined. LD diagnosed in childhood persists into adulthood (Cortiella & Horowitz, 2014).

Alongside LD, a major concern is the incidence of other disabilities and health conditions (McKenna, 2010; Yamashita et al., 2018). The rates of fair or poor health for adults with LD and low education attainment tend to be higher, they have higher rates of permanent disability, and they cite higher rates of vision and auditory difficulties than adults without LD in PIAAC: 2012/2014, even after controlling for age (Patterson, 2019). Additionally, access to needed health information online is hampered in a digital divide experienced by people of color as well as adults with low education or income, poor health, and no health insurance (Millar et al., 2020). A question remains as to whether adults with LD and similar background characteristics also have low digital literacy skills that hamper online access. Additional research is needed to determine the extent of coexisting conditions and identify strategies that adult educators can implement to accommodate needs of adults as they guide them to gain skills and follow career pathways (Patterson, 2019).

Also, adults with LD often experience educational and employment challenges (Housel, 2020), including underachievement and underemployment (Cortiella & Horowitz, 2014). Having adequate digital literacy skills may benefit income (Nwakasi et al., 2019). Under pandemic conditions requiring work and learning to occur remotely, the need for digital literacy suddenly became acute. People with LD might have fewer digital skills because of challenges such as skill-building opportunities, low income, or other factors (Bergson-Shilcock, 2020).

A closely related area to skills themselves is use of skills. Practice engagement theory suggests that more use of skills predicts higher skill levels (Reder et al., 2020). Having strong skills in

digital literacy permits adults to access health information, understand health risks, make informed health decisions, and manage health conditions (Feinberg et al., 2016).

Limited information is available on characteristics associated with adults with LD and low educational attainment, who had digital literacy skill averages at *Level* 1 in PIAAC:2012/2014. These adults tend to leave high school early more frequently, to have lower rates of employment, to experience higher rates outside the workforce and as *not in employment, education, or training* (NEET), and to have low income at higher rates than low-skilled adults without LD. About one fourth of U.S. adults with LD and low education attainment attend formal education; two in five leave programs of education (at any level) uncompleted (Patterson, 2019).

Very little research has been done related to the postsecondary education (PSE) activities of transitioning adult learners with LD (Patterson, 2014). Completing PSE and even being overeducated for the available job market may be associated with parental education levels (Capsada-Munsech, 2020), however, this association has not been tested for adults with LD.

The objective of the study is to investigate digital literacy skills and skill use for U.S. adults with LD at all skill levels, employing U.S. PIAAC:2012/2014/2017 data, through conducting descriptive and predictive analyses. Research questions (RQs) are:

1. How do assessed skills in digital literacy differ for adults with LD, compared with the general population, and what is the role of coexisting health and disabling conditions?
2. How does digital literacy skill use *at work* differ for *employed* adults with LD, compared with the general employed population?
3. How does digital literacy skill use *at home* differ for adults with LD who are *employed* or *outside the workforce*, compared, respectively, with the general employed or outside-the-workforce population?
4. Controlling for selected demographic and background characteristics, what is the relationship of assessed digital literacy skills with digital literacy skill use, at work or at home, for adults with LD?
5. How does digital literacy skill use at work or at home of adults with LD differ among discrete groups based on covariates (from RQ4) and assessed digital skill levels?

METHODS

Data and Sample

PIAAC:2012 surveyed and assessed 5,010 U.S. adults ages 16 to 65 years using a complex sampling design. Supplemental data collected from 2014 and 2017 extended the U.S. sample to 12,330 adults up to age 74. In PIAAC, adults completed an extensive background questionnaire (BQ) and assessments in digital literacy. Digital literacy was measured by problem-solving in technology-rich environments (PSTRE) items in PIAAC. Replicate weights facilitate calculating unbiased estimates and standard errors. More technical detail on PIAAC is available in Hogan et al. (2016).

Employing a restricted-use PIAAC:2012/2014/2017 datafile permitted expansion of the power of analyses and ensured that accurate sample weights for all three years were employed in analyses. The full sample from PIAAC:2012/2014/2017 was limited for this article to 1,130 U.S. adults with LD and 10,820 adults with no LD (total *N* 11,950), as determined from a self-reported diagnosis of LD variable in PIAAC's background questionnaire, with all unweighted *n* rounded to the nearest 10. Although most adults with LD taking assessments (87.9%) took computer-based assessments, 12.1% took paper-based assessments, primarily due to not having computer experience.

PIAAC Variables

Plausible values are estimated in means analyses of assessed PSTRE skills, with 10 plausible values employed. Scores in PSTRE range from 0 to 500 and are classified into one of four levels. According to Rampey et al. (2016), PSTRE levels include *Below Level 1* (0–240), *Level 1* (240–290), *Level 2* (291–340), and *Level 3* (341–500). Analyses in this article rely on multiple PIAAC BQ items, including information on how often adults engage in seven digital literacy–related activities at home or in the workplace, as shown in Table 1. Responses range from *never* to *every day*.

Research Design and Analyses

Quantitative PIAAC data were analyzed through calculation of descriptive statistics, regression modeling, and examination of group differences for discrete groups representing digital literacy skill use at home or at work, with controls. Data were analyzed in SPSS 26 employing macro syntax from IDB Analyzer 4.0.35, with sample and replicate weights applied in all analyses. All analyses were descriptive or predictive, and causality should not be inferred.

To address RQ1, statistics were calculated for PSTRE skills. Mean scores of adults with and without LD were tested for statistical and practical significance, with Cohen's *d* as effect size. To determine the role of health and other disabilities in skill levels, PSTRE means were compared by health status, difficulty seeing print, difficulty hearing, medical insurance status, and an employment status variable indicating permanent disability. Cohen's *d* effects are interpreted as small (0.20 to 0.49), medium (0.50 to 0.79), or large (> = 0.80). In RQ2, means for composites of digital literacy skill use were compared for adults with LD who are employed. In RQ3, a similar means comparison occurred using composites for digital literacy skill use at home for out-of-the-workforce individuals with and without LD. Analyses of digital literacy skill use at home were then repeated for adults with and without LD who are employed.

Use of PSTRE skills at work or at home were also believed to be relevant predictors of skills that may add to the variance of models. To address RQ4, two linear regression models (A and B) were analyzed. For Model A, the file was limited to those with LD who are employed (unweighted *n* 570). For Model B, the full LD file was used (unweighted *n* 1,120). Model A included seven variables representing demographic and background characteristics (i.e., *age, gender, education attainment, health status, urban status, uncompleted education*, and *monthly earnings*). Model B contained the same variables as Model A except *monthly earnings* and added *ethnic status, NEET*, and *wanting more training but not starting it*. Next, a skill-use variable was added to the control variables in A or B to determine any added variance from

skill use at work or at home. Effect sizes, employing *r*, were calculated for *t*-test statistics as small (0.10 to 0.29), medium (0.30 to 0.49), or large (> = 0.50).

In addressing RQ5, seven discrete groups were identified from PIAAC data, based on regression model results from RQ4: digital literacy for employed adults with LD, in three groups, and digital literacy at home for all adults with LD, in four groups. Discrete groups were categorized based on education attainment and on PSTRE skill levels (i.e., *Below Level 1* and *Level 1 and higher*) for digital literacy skill use, and characteristics of each discrete group were described. Characteristics included *age, gender, monthly earnings, parents' highest education, uncompleted education, age leaving uncompleted education, participation in distance education, reason for not pursuing formal education* (if applicable), and *taking a class/tutoring in basic skills, GED®, or other HSE*. For employed adults, these nine variables were employed, and additional characteristics were *hours per week working currently, not feeling challenged at work, need for more training at work, use of a computer, level of computer use at work, computer skills needed at work,* and *current occupation and industry.* For adults at home, additional characteristics were *reason for the end of the last job* (if applicable), *hours per week working at last job* (if applicable), *social trust variables,* and *last job occupation and industry.*

FINDINGS

Assessed Skills

Adults reporting LD diagnosis have significantly lower mean scores in digital literacy than their counterparts without LD, although scoring in the same broad skill level (*Level 1*). PSTRE scores for adults with LD average 261.8 (*SE* 2.4, *SD* 42.9). PSTRE scores for adults without LD average 272.8 (*SE* 0.9, *SD* 44.6), indicating a slightly lower mean difference for adults with LD (*d* -0.25). As shown in Table 2, employed adults with LD—48% of adults with LD—and adults with no health issues and LD have higher mean scores in digital literacy than adults with LD and health concerns. Adults with LD and on permanent disability have the lowest scores (*d* 0.75 and 0.53). Adults with LD have approximately three times the incidence of permanent disability and approximately twice the incidence of fair/poor health, vision difficulties, and hearing difficulties as adults without LD. Medical insurance rates are similar by LD status. Adults with no LD on permanent disability status also have lower PSTRE scores than employed adults with no LD (*d* 0.89) and all others with no LD (*d* 0.72). Subgroup PSTRE score differences by LD status (see Table 2) are also small.

Skill Use at Work

In using digital literacy skills, employed adults with no LD have significantly higher average use (3.0, *SD* 1.6) than employed adults with LD (2.5, *SD* 1.7), though the difference is small (*d* 0.30). Employed adults with no LD tend to use digital literacy skills at least once a week. In contrast, those with LD use digital literacy skills at work at least once a month.

Employment also appears to provide a slight advantage in use of digital skills at home for both adults with and without LD who are employed, in comparison with adults with LD who are outside the workforce. Adults with LD who are outside the workforce report using digital

literacy skills at home significantly less often (2.6, *SD* 1.5) than employed adults with LD (3.1, *SD* 1.4); again, the difference is small (*d* 0.34). Adults with LD outside the workforce tend to use digital literacy skills at least once a month at home, while those who are employed do so at least weekly. Adults with no LD tend to use digital literacy skills at home at similar rates, and at least weekly on average, whether they are outside the workforce (3.1, *SD* 1.4) or employed (3.3, *SD* 1.3).

Relationships of Skills With Skill Use

As shown in Table 3, Model A results indicate that use of digital literacy at work, with controls, explains approximately 30% of the variance in digital literacy skills of employed adults with LD. Education attainment, digital literacy skill use, uncompleted education, and age are the strongest predictors of digital literacy skills for employed adults with LD, all with small effects. Monthly earnings, urban status, gender, and health status are not significant predictors in the model. Holding background predictors constant, for each increasing level of use of digital literacy skills at work, the PSTRE skill score of an employed adult with LD would be expected to increase 5 points.

Model B results (see Table 4) indicate that use of digital literacy at home, with controls, explains approximately 37% of the variance in digital literacy skills of adults with LD. Predictors of digital literacy skills for adults with LD with small effects are education attainment, use of digital literacy skills at home, and people of color. Age, urban status, gender, health status, uncompleted education, desire for more training, and NEET are not significant predictors in the model. Holding background predictors constant, for each increasing level of use of digital literacy skills at home, the PSTRE skill score of an adult with LD would be expected to increase nearly 9 points.

Skill Use for Discrete Groups

Three groups describing digital literacy skill use of employed adults are identified:

1. *minimal* digital literacy (high school attainment and *Below Level 1* PSTRE skills),
2. *expanding* digital literacy (high school attainment and *Level 1 or higher* PSTRE skills), and
3. *high* digital literacy (postsecondary attainment and *Level 1 or higher* PSTRE skills).

Similar descriptors are employed for four groups of adults with LD in identifying digital literacy use at home:

1. *low* digital literacy (less than high school attainment and *Level 1 or higher* PSTRE skills),
2. *minimal* digital literacy (high school attainment and *Below Level 1* PSTRE skills),
3. *expanding* digital literacy (high school attainment and *Level 1 or higher* PSTRE skills), and
4. *high* digital literacy (postsecondary attainment and *Level 1 or higher* PSTRE skills).

Characteristics of adults with LD by digital literacy group are displayed in Table 5. When adults with LD were employed, higher digital literacy skills and skill use tend to be associated

with higher monthly earnings, higher parental education attainment, increased distance education participation, and more computer use requiring moderate skills. At home, higher digital literacy skills are associated with increased monthly earnings, more participation in distance education, increased social trust, and a greater desire for pursuing more training yet not doing so.

All three digital literacy groups at work most frequently report daily use of email and the internet for work issues, as displayed in Figure 1. For all other digital literacy skill use statements at work in the *minimal* and *emerging* digital literacy groups, the most frequently reported use is *never*. In the *high* digital literacy group, respondents most frequently report using a spreadsheet and word processor *daily* at work, yet the mode for conducting transactions online, using programming language, and participating in online groups is *never*.

At home, all four digital literacy groups report *daily* use of email and going online to understand issues (see Figure 2). All four groups also report *never* as a mode for using spreadsheets, using programming language, and participating in online meetings at home. The *low*, *minimal*, and *high* groups most frequently report *never* conducting transactions online at home, yet the *expanding* group did so *weekly* as a mode. The *low* and *expanding* groups tend to use a word processor at home *weekly*, yet the mode for the *minimal* and *high* groups on using a word processor at home is *never*.

DISCUSSION

Although both adults with and without LD tend to have digital literacy skills at *Level 1*, adults with LD have slightly lower mean digital literacy scores. Adults with LD who are employed and have no health issues tend to have higher average digital literacy skills, yet adults with LD who have health concerns and other disabling conditions tend to score substantially lower. These findings are a concern with respect to health-related outcomes (Yamashita et al., 2018), particularly since just under half of adults with LD are employed, and the incidence of coexisting health or disabling conditions and permanent disability is high.

Implications of Health-Related Findings for Programs

A critical health-related finding is that adults with LD have twice the incidence of fair/poor health, vision difficulties, and hearing difficulties as adults without LD. Adults with diagnosed LD and health-related concerns may already be highly aware of how overall health, vision, and hearing interacts with their learning and, if they have disclosed their disability, have accommodations in place in the classroom or workplace. If they are not, they need access to supports that can enable equitable participation in learning and employment (as applicable). Examples of resources to support equitable technology access are websites such as https://www.w3.org/WAI or https://webaim.org. Use of color overlays, softer lighting, printing on colored paper, and other low-cost measures may benefit adults with vision difficulties in learning (Patterson, 2019).

Adult education programs may help adults with LD identify unrecognized health-related challenges by routinely screening new learners and referring them to health care or psychological service providers to learn more about coexisting conditions (Patterson, 2019).

Accessing supports, however, often implies that they can cover costs of a psychoeducational diagnosis or have sufficient health insurance (Housel, 2020). For adults with LD seeking employment, an important resource is vocational rehabilitation (VR) services (Patterson, 2019). If they face barriers to employment, including needs for further training to become employed, VR services are available to qualifying adults with LD from local or state agencies. VR counselors can access further diagnostic services and identify accommodations during training and on the job. In addition to making referrals, adult education programs need to meet with VR staff periodically to share resources and answer mutual questions.

Additionally, developing digital literacy skills and expanding access to technology can aid adults with LD in seeking, evaluating, and using online health-related information (Feinberg et al., 2016). Developing these skills may require access to and participation in adult education and/or PSE, particularly in programs geared toward health-related needs. Furthermore, if health promotion and education interventions and materials are developed at basic reading levels and offered online, adults can gain access to the information digitally (Feinberg et al., 2016).

Implications of Adult Digital Literacy Skill Use for Programs and Policy

With respect to use of skills, employed adults with LD have slightly lower average use of digital literacy than employed adults in the general population. Employment appears to provide a slight advantage in use of digital literacy skills at home for adults with LD, in comparison to adults with LD who are outside the workforce, who report using digital literacy skills at home slightly less often than employed adults with LD do. Furthermore, regression models indicate that using digital literacy skills at home or at work adds to variance explained in assessed skills. These findings suggest that using digital literacy skills matter in gaining—or keeping—the skills themselves (Reder et al., 2020). Adult education policies that support adults with LD to engage in more digital literacy activities can simultaneously encourage not only skill growth but also lifelong learning and access to PSE and career/technical opportunities (Reder et al., 2020).

Another important finding from the groups' analyses is that adults with LD appear to have a desire for learning, yet completing learning goals may be a challenge. A sizable percentage of adults with LD, including many that graduated high school, report participating in basic skills instruction (range of 11% to 28%). At home, a wide range of adults with LD, from 29% to 61% of discrete groups, reported wanting to pursue education or training in the past year but did not pursue it—a disheartening implication noted in previous work (Patterson, 2019). Major reported barriers include cost and, for adults in *high digital literacy* groups, being too busy at work. With generally low employment and low monthly earnings, except in the *high digital literacy* group, it is not surprising that many adults with LD indicate not being able to afford PSE. With high rates of uncompleted education, ranging from 22% to 63% per group, adults with LD clearly need support to start and finish education.

Knowing relationships of assessed skills with skill use has the potential to identify strategies adult educators and community service partners who also provide supports (Housel, 2020) can implement to support program completion. Even though PIAAC data predate the 2020

pandemic, these supportive relationships are highly relevant in today's primarily online learning environment. Policymakers need to consider enacting policies that can support adults with LD to find resources to attend and complete education or training that so many clearly want. In addition to making policies to offer financial resources, such as grants and loans for tuition costs, policymakers need to ensure that adequate resources are available to support adults in meeting needs associated with health and disabling conditions as they balance needs as individuals and as potential adult learners (Budd et al., 2016). Entering education should not add to their burdens or cause psychological stress that negatively affects their health (Madaus & Shaw, 2011).

The frustrated desire for learning has implications for basic skills recruitment and instruction. How then, to recruit and engage adults with LD? If adults see a basic skills program as offering them resources they are looking for to start or resume a career or gain knowledge for everyday life, it becomes much more appealing than entering a place where they may feel stigmatized or unwelcome because of low digital literacy skills. How a program brands itself and presents its welcoming message in recruitment materials for adults with LD is pivotal to their decision to enter and likely to remain. Many adult education programs are discussing how to recruit adults during and following the pandemic; including messaging that appeals to adults with LD is critical to that discussion.

Implications for Instruction

After recruitment to basic skills programming, adult educators need to think through their own assumptions about what adults with LD may recognize, understand, and be able to do (Housel, 2020) in digital literacy. They may need to check skill levels and digital behaviors of adult learners with LD. The questions in Table 1 are a starting point to confirm how often adult learners use digital literacy skills and can be used as part of a group activity with learners (without singling out adults with LD). Adult educators can check to see how employed learners' answers to the questions in Table 1 match up with characteristics/experiences of the *minimal* group at work (as shown in Figure 1 and Table 5) or how all learners' answers match up with characteristics/experiences of outside-the-workforce *low* and *minimal* groups at home (in Figure 2 and Table 5), as these are groups most likely to enroll in adult education. Learners can compare their answers to the questions and brainstorm ways to increase use of digital literacy skills, either during instruction, in the community, or at work/home.

As a follow-up to this activity, adult educators have an opportunity to explicitly encourage learner use of digital literacy skills at home or at work. Since both higher digital literacy skills and skill use of adults with LD at home or at work tend to be associated with higher monthly earnings, more parental education, and with increased distance education participation, employed adults with LD have plenty of opportunity to gain and use skills that might be able to secure them more hours of work, higher earnings, or more distance learning opportunities. At home, higher digital literacy skills tend to be related to a greater desire for pursuing more training, as well as with increased social trust. Encouraging use of digital literacy skills at home may offer potential benefits to their unmet goals for more learning and to social trust.

Use of digital literacy skills is critical to gaining and maintaining those skills. Practice engagement theory is supported in both regression models. Reder and colleagues (2020)

suggest that basic skills programs can foster increases in practice engagement, that is, use of skills that benefit skill levels in the long term. By referencing data findings on digital literacy skills and skill use from this article, adult educators have accurate, up-to-date information from which to plan digital literacy development and to involve adults already using those skills as leaders. For example, in the outside-the-workforce LD group with *minimal* digital literacy skills, approximately one third of adults use the internet to understand issues *daily*, and one tenth do word processing *daily* (see Figure 2). If adult educators plan units of instruction that involve learners looking up information online, using a technology device to type up what they learn, they can ask learners already using those skills regularly to help plan instruction and, as needed, tutor their peers among the majority never using those skills.

In another resource for adult educators, Vanek (2017) encourages explicit instruction on problem-solving processes. Vanek offers a step-by-step table for teaching a problem-solving process in technology environments (p. 14) and gives examples designed to help adult learners map problems to solve a technology challenge (p. 16). She also covers how to teach problem solving, including examples with different levels of complexity, and she offers guidance on creating learning activities (pp. 30–34). Vanek (2017) offers ways for adult educators to check assumptions, ask adults about their skills and skill use, plan approaches to instruction, and consider examples they could apply in their own classroom or tutoring environment.

Limitations of the Study and Planning for Future Research

As in previous PIAAC papers, some limitations occur. First, the PIAAC indicator for an LD diagnosis is self-reported and does not specify the type of LD. In this article, males and younger adults reported LD diagnosis significantly more, which appears to reflect traditionally strong identification of males with LD as well as psychoeducational testing emphases since 1976 occurring in U.S. schools (Cortiella & Horowitz, 2014). Differences in self-reported LD were not meaningful by ethnicity, income, or U.S. region, however.

Also, although several informative indicators are in PIAAC, limited information on coexisting health and disabling conditions was collected. Moreover, investigating literacy and numeracy was beyond the scope of this article; future researchers may wish to consider the relationships of LD with assessed literacy and numeracy skills and use of literacy and numeracy skills and how those relationships interact with findings presented here. Another limitation is that PSTRE scores are legitimately missing for adults who could not take this assessment. This limitation means that further analysis of data on adults with LD who were missing these scores would add important information.

Even with many important findings on this population, the paper does not fully represent qualitative experiences of adults with LD, such as why more than half are not employed or the circumstances behind them not completing the education they say they want. Nor does PIAAC explain many details of skill use at home and work. Future qualitative research with adults having LD could fill in the picture and potentially lead to further implications for practice and policy.

Another finding worth further investigation is that higher digital literacy skills of adults with LD at home or work tend to be associated with increased distance education participation. Researchers may wish to investigate this connection in future PIAAC data sets, particularly

since distance education is likely to continue as a major delivery method for the foreseeable future. ⌘

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Table 1

Items for Use of Digital Literacy Skills at Home or at Work

At Work Item	At Home Item	Wording: How often do you usually...
G_Q05a	H_Q05a	Use email?
G_Q05c	H_Q05c	Use the internet to better understand issues related to, for example, your health or illnesses, financial matters, environmental issues, or to your work?
G_Q05d	H_Q05d	Conduct transactions on the internet, for example, buying or selling products or services, or banking?
G_Q05e	H_Q05e	Use spreadsheet software, for example, Excel?
G_Q05f	H_Q05f	Use a word processor, for example, Word?
G_Q05g	H_Q05g	Use a programming language to program or write computer code?
G_Q05h	H_Q05h	Participate in real-time discussions on the internet, for example, online conferences or chat groups?

Note: Frequency of responses includes *never, less than once a month, less than once a week, at least once a week, every day.*

Source: U.S. Department of Education, National Center for Education Statistics, U.S. Program for the International Assessment of Adult Competencies (PIAAC), 2012/2014/2017.

Table 2

PSTRE Score Means by LD Status and by Coexisting Conditions

LD Status	Subgroup	Percent (%)	*SE*	Mean	*SE*	*SD*	*SE*	Unweighted n[a]	*d*
LD	Good Health	76.6	2.4	264.1	2.7	42.4	1.9	630	0.22†
	Fair/Poor Health	23.4	2.4	254.5	4.6	43.6	3.1	190	
	Vision Difficulty	16.8	1.4	250.1	5.0	42.7	4.3	130	0.33†
	No Vision Difficulty	83.2	1.4	264.3	27	42.5	1.8	690	
	Hearing Difficulty	17.6	1.9	251.4	5.6	42.0	4.0	130	0.30†
	No Hearing Difficulty	82.4	1.9	264.1	2.5	42.7	1.8	690	
	Medical Insurance	82.3	1.7	264.2	2.6	43.4	1.7	630	0.36†
	No Medical Insurance	17.7	1.7	249.5	4.6	37.4	3.4	180	
	On Permanent Disability	8.2	1.2	237.0	7.2	39.3	5.8	60	0.75
	Employed	55.7	2.1	267.4	3.1	41.3	2.2	380	0.53
	All Others	36.1	2.0	258.9	3.5	43.8	2.5	370	0.20
No LD	Good Health	88.5	0.5	275.2	0.8	43.7	0.7	7,850	0.47†
	Fair/Poor Health	11.5	0.5	254.1	2.3	46.3	1.4	1,070	0.01‡
	Vision Difficulty	9.0	0.4	252.9	2.2	44.7	1.5	790	0.49†
	No Vision Difficulty	91.0	0.4	274.7	0.9	44.1	0.7	8,140	0.06‡
	Hearing Difficulty	8.4	0.4	262.1	2.4	45.7	2.0	710	0.26†
	No Hearing Difficulty	91.6	0.4	273.7	0.9	44.3	0.6	8,220	0.24‡
	Medical Insurance	85.1	0.5	275.3	0.9	44.3	0.6	7,320	0.38†
	No Medical Insurance	14.9	0.5	258.6	2.3	43.7	1.4	1,570	0.22‡
	On Permanent Disability	2.9	0.2	237.5	4.0	42.7	2.6	230	0.89 0.01‡
	Employed	66.7	0.7	276.2	1.0	44.0	0.9	5,320	0.72 0.21‡
	All Others	30.4	0.7	268.6	1.5	44.1	1.0	3,380	0.17 0.22‡

Note: [a]Sample and replicate weights were applied in all analyses, and 10 plausible values were used to estimate score means. †magnitude of difference in mean scores between levels of a coexisting condition (e.g., adult with vision difficulty compared with adult with no vision difficulty). ‡magnitude of difference in mean scores of LD by a coexisting condition compared with no LD by the same coexisting condition (e.g., LD and fair/poor health compared with no LD and fair/poor health).

Source: U.S. Department of Education, National Center for Education Statistics, U.S. Program for the International Assessment of Adult Competencies (PIAAC), 2012/2014/2017.

Table 3

Regression Results for PSTRE Skills (Model A - At Work)

Predictor	*B*	*SE B*	Unweighted *n*[a]	R^2	*r*[b]
Constant (A1)	239.89	10.05	330	0.25	
Age	-0.50	0.26			0.07
Education Attainment	6.19	0.85			0.28*
Monthly Earnings	1.74	1.20			0.05
Urban Status	-0.40	0.22			-0.07
Gender (Female)	0.48	5.57			0.00
Health (Fair/Poor)	-0.27	7.78			-0.00
(No) Uncompleted Education	-16.25	6.08			0.10*
Constant (A2)	244.40	12.70	250	0.30	
Age	-0.56	0.28			-0.10*
Education Attainment	5.17	1.08			0.22*
Monthly Earnings	0.67	1.36			0.02
Urban Status	-0.27	0.29			-0.04
Gender (Female)	-1.34	6.50			0.01
Health (Fair/Poor)	-1.12	8.71			-0.01
(No) Uncompleted Education	-14.71	5.97			-0.11*
Digital Literacy Skill Use	5.17	2.15			0.11*

Note: [a]Sample and replicate weights were applied in all analyses, and 10 plausible values were used to estimate score means. [b]*r* represents the effect size for individual predictors, based on the standardized coefficient; *represents a small effect, **a medium effect, and ***a large effect for *r*.

Source: U.S. Department of Education, National Center for Education Statistics, U.S. Program for the International Assessment of Adult Competencies (PIAAC), 2012/2014/2017.

Table 4

Regression Results for PSTRE Skills (Model B - At Home)

Predictor	*B*	*SE B*	Unweighted n[a]	R^2	r[b]
Constant (B1)	259.94	8.73	600	0.31	
Age	-0.52	0.17			-0.09
Education Attainment	5.97	0.77			0.26*
Urban Status	-0.38	0.17			-0.06
Gender (Female)	-2.29	4.53			-0.01
Health (Fair/Poor)	-3.15	5.60			-0.02
People of Color	-19.39	5.81			-0.15*
(No) Uncompleted Education	-12.69	5.28			-0.07
(No) Desire for More Training	-11.88	3.53			-0.10*
NEET	-12.32	4.62			-0.07
Constant (B2)	245.70	11.01	490	0.37	
Age	-0.53	0.19			-0.09
Education Attainment	4.17	0.80			0.17*
Urban Status	-0.26	0.20			-0.04
Gender (Female)	-3.18	4.68			-0.02
Health (Fair/Poor)	-2.58	5.54			-0.01
People of Color	-20.88	5.67			-0.16*
(No) Uncompleted Education	-9.02	4.77			-0.06
(No) Desire for More Training	-8.11	3.71			-0.07
NEET	-7.06	4.88			-0.05
Digital Literacy Skill Use	8.73	2.02			0.14*

Note: [a]Sample and replicate weights were applied in all analyses, and 10 plausible values were used to estimate score means. [b]*r* represents the effect size for individual predictors, based on the standardized coefficient; *represents a small effect, **a medium effect, and ***a large effect for *r*.

Source: U.S. Department of Education, National Center for Education Statistics, U.S. Program for the International Assessment of Adult Competencies (PIAAC), 2012/2014/2017.

Table 5

Characteristics of Adults With LD by Digital Literacy Group

Location	Characteristic	Low Digital Literacy[a]	Minimal Digital Literacy	Expanding Digital Literacy	High Digital Literacy
At Work	Unweighted *n*	‡	140	120	130
	Age – mean years (*SD*)	‡	33.1 (11.5)	31.6 (10.6)	37.8 (12.7)
	Gender – male (%)	‡	61.3	51.7	54.3
	Monthly earnings – median decile	‡	7th	7th	5th
	Parent education – mode	‡	High School and Post-secondary	Post-secondary	Post-secondary
	Uncompleted education (%)	‡	33.3	62.6	22.7
	Age leaving uncompleted education – mean (*SD*)	‡	24.5 (6.7)!	22.9 (4.5)!	‡
	Distance education participation (%)	‡	13.1	21.7	29.1
	Basic skills participation (%)	‡	13.3!	7.5!	‡
	HSE participation (%)	‡	10.0!	0!	‡
	Weekly hours worked – mean (*SD*)	‡	36.9 (14.2)	32.2 (15.5)	37.3 (12.7)
	Not challenged at work (%)	‡	90.5	97.5	90.6
	Need more training (%)	‡	28.7	10.0	23.6
	Computer use at work is straightforward (%)	‡	70.9	47.3	28.1
	Computer use at work is moderate (%)	‡	25.3	45.1	59.6
At Home	Unweighted *n*	60!	90	220	160
	Age – mean years (*SD*)	20.4 (7.5)!	34.7 (13.8)	30.6 (11.8)	39.2 (14.1)
	Gender – male (%)	52.6	62.4	52.7	54.3
	Monthly earnings – median decile	‡	7th!	7th!	5th

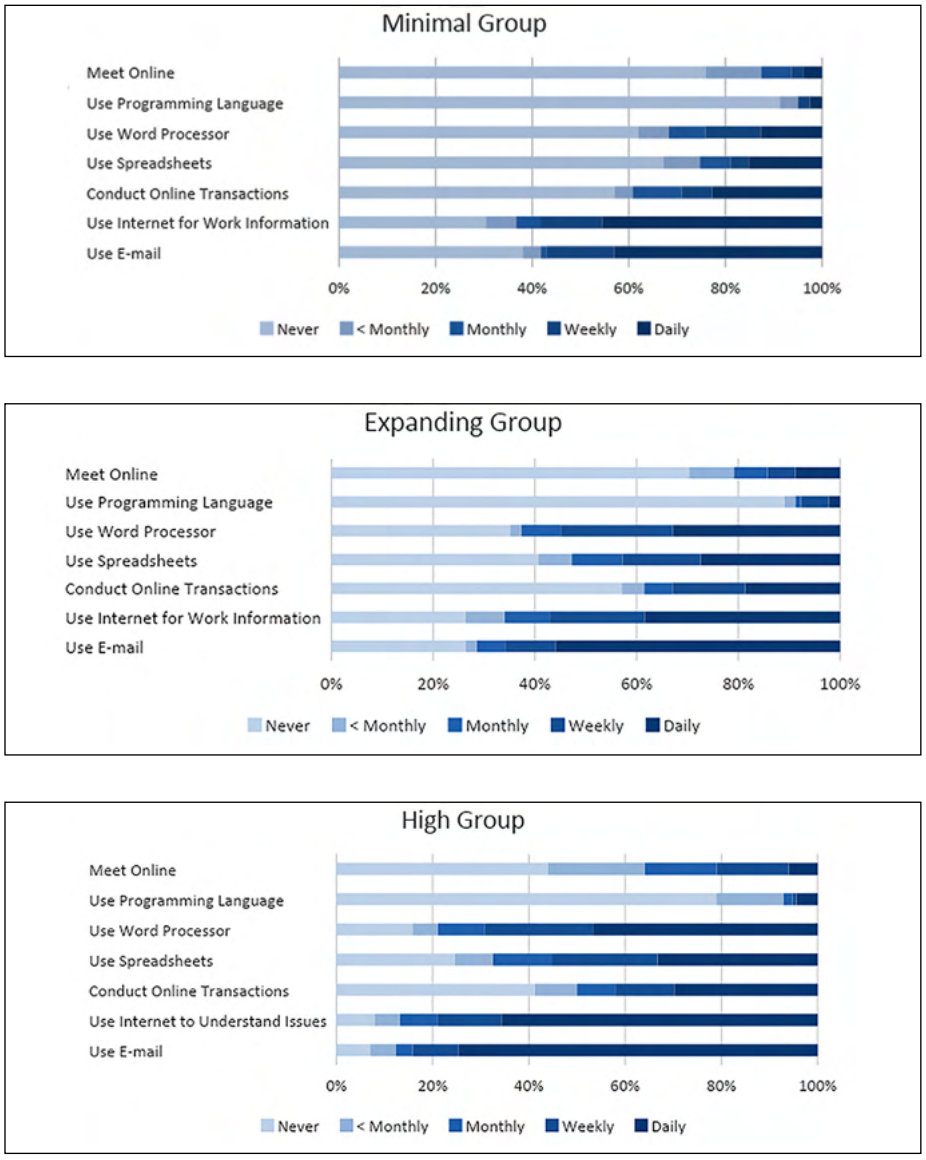
Location	Characteristic	Low Digital Literacy[a]	Minimal Digital Literacy	Expanding Digital Literacy	High Digital Literacy
	Trust only a few people (% *agree* or *strongly agree*)	75.5	81.7	71.9	54.9
	People take advantage of him/her (% *agree* or *strongly agree*)	82.5	86.0	81.1	68.7
	Parent education – mode	Post-secondary	High School	Post-secondary	Post-secondary
	Ever had uncompleted education (%)	‡	22.6	54.2	25.6
	Age leaving uncompleted education – mean (*SD*)	‡	‡	24.2 (6.8)	26.5 (8.2)!
	Wanted training last year but did not pursue (%)	‡	29.0	45.3	53.7
	Reason for not pursuing	‡	‡		
	Too expensive			32.7	11.4
	Childcare/family			9.9	15.9
	Unexpected event			5.0	1.1
	Too busy working			17.8	43.2
	Distance education participation (%)	‡	9.7	17.9	26.2
	Basic skills participation (%)	28.1	‡	13.5	‡
	HSE participation (%)	12.3	‡	2.8	‡

Note: [a]Low digital literacy group had sufficient unweighted sample size only in the at-home sample. !interpret with caution – unweighted cell size is below 62. ‡reporting standards not met because of low unweighted cell size.

Source: U.S. Department of Education, National Center for Education Statistics, U.S. Program for the International Assessment of Adult Competencies (PIAAC), 2012/2014/2017.

Figure 1

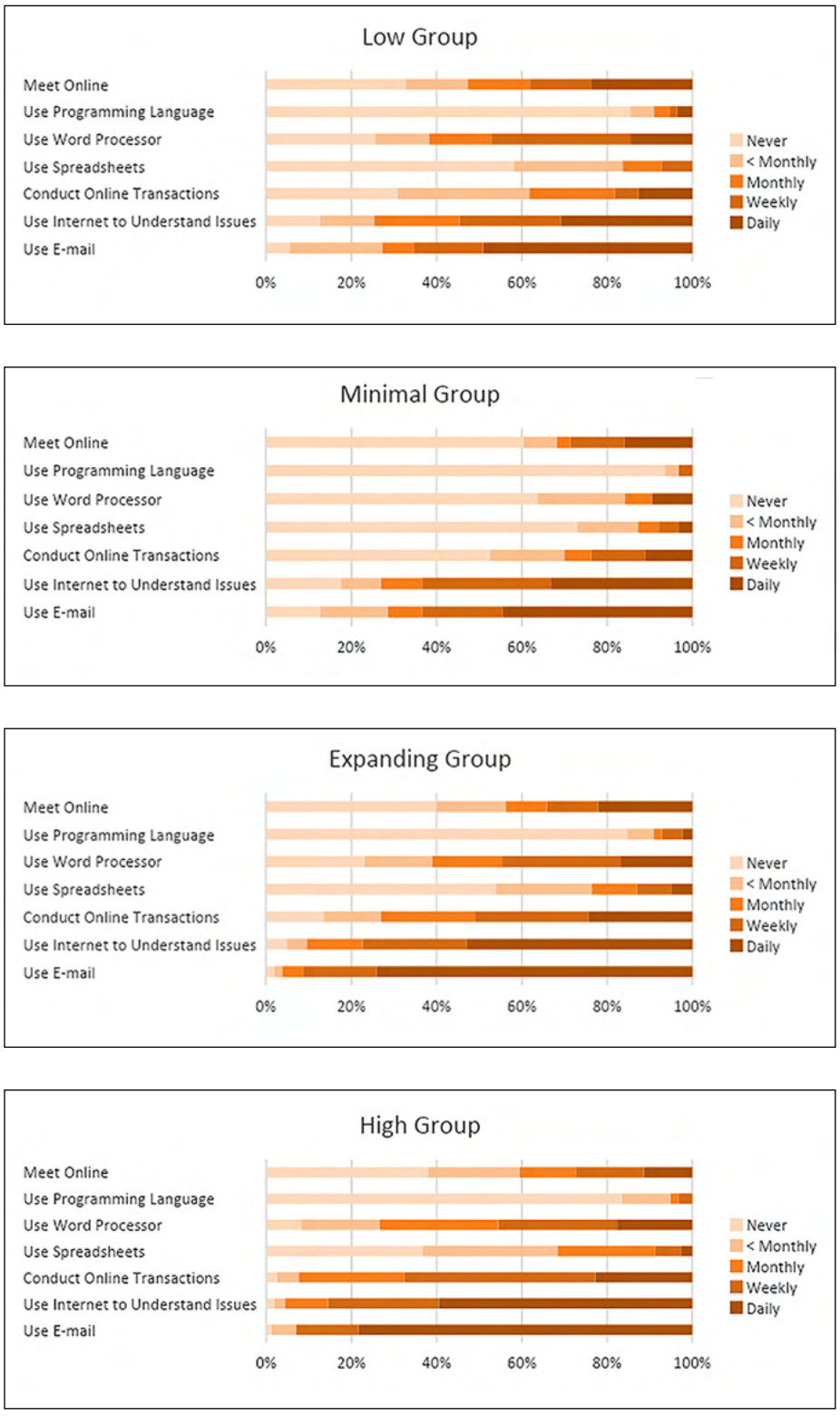
Digital Literacy Skill Use at Work by Digital Literacy Skill Group



Source: U.S. Department of Education, National Center for Education Statistics, U.S. Program for the International Assessment of Adult Competencies (PIAAC), 2012/2014/2017.

Figure 2

Digital Literacy Skill Use at Home by Digital Literacy Skill Group



Source: U.S. Department of Education, National Center for Education Statistics, U.S. Program for the International Assessment of Adult Competencies (PIAAC), 2012/2014/2017.