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Melissa R. Killian

Tennessee Technological University, melissakillian1985@gmail.com

George Chitiyo

Tennessee Technological University, GChitiyo@tntech.edu

Nancy J. Kolodziej Ph.D.

Tennessee Technological University, nkolodziej@tntech.edu

Ashley Akenson

Tennessee Technological University, aakenson@tntech.edu

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Examining the Underlying Structure of Adult Literacy Practices at Home and at Work

Melissa R. Killian, *Tennessee Technological University*

George Chitiyo, *Tennessee Technological University*

Nancy J. Kolodziej, *Tennessee Technological University*

Ashley B. Akenson, *Tennessee Technological University*

Abstract

Adults have similar literacy habits as children, such as reading to gain knowledge or for enjoyment. However, when workplace literacy skills are considered, these practices are not always book related and usually involve informal communication such as collaboration between workers. This study used data from the 2012 Program for the International Assessment of Adult Competencies to examine adults' literacy skills. A total of 39 adult literacy skills were examined to explore patterns among them, effectively reducing them to nine interpretable factors. Each factor focused on an area of literacy skills, such as work-related reading, educating others, and writing. The nine factors that consisted of 37 variables accounted for 59.2% of the total variance in the adults' literacy habits.

Keywords: *adult literacy, literacy skills, workplace skills*

Giordano Bruno stated, "If the first button of a man's coat is wrongly buttoned, all the rest are certain to be crooked" (as cited in Dechant & Smith, 1977, p. 1). Dechant and Smith (1977) added, "Reading is that first button in the garment of education" (p. 1). When the first author read these quotes, she imagined a young student who had just started the process of learning to read; but as she thought about her research, she decided that the coat of literacy skills has many buttons, zippers, and toggles. Some of these clasps must be fastened as a child begins learning how to read, and some of them must be adjusted throughout the coat's lifetime. This coat also includes many other literacy skills, including disciplinary literacy, writing, speaking, and listening. The analogy of literacy practices as fasteners leads to these questions: If childhood literacy practices continue into adulthood, is there a systematic pattern to these practices that would allow teachers to tailor instruction and provide each individual with an ideally fitted literacy coat? Using the Program for the International Assessment of Adult Competencies (PIAAC) data set, we sought to discover the underlying

structure of adult literacy practices with the hope that educators might be able to develop and provide tailored literacy instruction in adult educational programs.

Engaging in reading and writing practices throughout an individual's lifetime promotes ongoing literacy development. Researchers have found that routine reading habits are positively associated with adults' literacy skills (Juncos-Rabadan et al., 2012; Kaup et al., 2014; Pawlowski et al., 2012), and "adults in an information-rich, technology-based society like ours need to read in order to participate fully in everyday life" (Trawick, 2017, p. 1). Reading requires focus and effort, and it has been demonstrated that individuals' motivation to read can predict their reading performance (McGeown et al., 2015). According to Perfetti's (1985) verbal efficiency theory, readers who must focus on decoding words cannot fully attend to comprehension. Conversely, readers who can rapidly and easily recognize the words in a text are more able to devote their attention to comprehension. Because of this, good readers are often more motivated to read given that they gain more meaning from the text.

Reading is considered essential to a successful academic career, and it also supports professional success—an effect that many overlook. Proficiency in reading skills has been found to be correlated to job success and gainful employment (Fernández-Blanco et al., 2017). In fact, Perry and Gauly (2019) found that low-literate individuals' status as employed or unemployed can be predicted based on their vocabulary and sentence processing skills. In order to become a better reader and improve chances of professional success, a person must practice reading (Applegate et al., 2014; McGeown et al., 2015; Nadelson et al., 2013).

Part of the rationale for conducting this study comes from my (the first author's) own experience with adult literacy. My grandfather was born in 1928, and as a child he attended school when possible and helped on the farm when needed. In my childhood memories, my grandfather would study the Bible, sing in church, and look at the newspaper. It was not until I was older that I learned that my grandfather understood only the basics of reading and had been using different skills to compensate for the words that he did not know.

Previous research on adult literacy also provides a rationale for this study. Studies have shown that not all Americans read frequently, and some do not have proficient literacy abilities (Applegate et al., 2014; Holt & Smith, 2005; Smith, 1996). When looking at specific skills such as financial literacy, Smith (1996) discovered that adults who read news, editorials, and financial pages scored higher than low-activity readers, which he found consistent with Kirsch et al. (1988, as cited by Smith, 1996). Over the past couple of decades, adults' literacy achievement may have been on a decline. Goodman et al. (2013) compared the more recent 2012 Program for the International Assessment of Adult Competencies (PIACC) scores with the 1994-1998 International Adult Literacy Survey scores and found that adult literacy scores had significantly declined during the time between these two assessments.

Not only have literacy scores been on the decline, but researchers have also discovered that more than 10 million Americans entered 12th grade possessing only a basic reading level (ProLiteracy, 2016). This affects many adults in their daily lives, even influencing their children's educational achievement and health. Children who have low-literacy caregivers are 72% more likely to score at low reading levels (National Council for Adult Learning, 2015), and these parents do not read to their children as often as high-literacy parents (ProLiteracy, 2016). Low literacy skills also affect these children's health

because their parents are less likely to understand written medical information (Miller et al., 2010).

Because literacy habits and skills develop throughout childhood and into adulthood, it is essential to understand what types of texts individuals choose to read so that these text preferences and related literacy skills can be targeted in adult education programs. Using the PIAAC data set, we identified 39 literacy-related variables, which were then reduced into interpretable factors related to adult readers and the environments they interact with (e.g., adult education classes, workplaces, public libraries). We chose to use principal component analysis (PCA), followed by confirmatory factor analysis (CFA), to encompass broad categories of skills in smaller, relatable groups that would make them easier to understand and use. In turn, educators and adult literacy learners could then choose the most appropriate and accessible text types for literacy skill improvement. These categories could also provide adults with an assortment of texts that they may use in their everyday lives and help them explore other texts they have not used before.

Review of Literature on Adult Literacy

Unfortunately, research on adult literacy skills is limited, and most has been conducted outside of the United States. Literacy research in the United States typically investigates the practices of elementary-grade children or college undergraduates, and practices and skills in other ages and settings are often left unexamined. When research focuses on adult literacy in the United States, it often explores the specific types of texts that adults are using.

Adult Literacy Practices

It is vital to examine adult literacy practices. By looking at how and why adults read, as well as the types of reading materials they select, researchers can develop an understanding of how to positively impact this large and often neglected group of readers. In an online survey of 1,022 respondents over the age of 19, Merga (2017) found that adults often read to improve their knowledge, to escape reality, and as a source of personal development. This information may be crucial in planning adult literacy programs that reflect learners' needs and interests.

Not all adults choose to read, however, and demographics play a role in reading practices. Fernández-Blanco et al. (2017) found through a zero-inflated binomial negative model, with nonreaders being the always zero group, the youngest and oldest adults were usually nonreaders ($\beta = -0.0384$, $t = -2.074$, $p < .05$), with the probability following a U-shape, but women typically read regardless of their age ($\beta = -0.7645$, $t = -6.511$, $p < .01$). Men and women who had time to read due to unemployment ($\beta = -0.5709$, $t = -2.935$, $p < .01$) or retirement ($\beta = -0.5136$, $t = -3.035$, $p < .01$) were more likely to be readers than those who were currently working. The authors also found that education played a role in the probability of an individual's status as a reader: Participants with university degrees were less likely to be nonreaders (male 4.1%, female 1.9%) than those with less than a primary education (male 73.6%, female 61.1%). Fernández-Blanco et al. also discovered that a connection to cultural activities (e.g., going to museums, archaeological sites, theater/classical music concerts) often prompted an individual to be more likely to be a reader.

Although Fernández-Blanco et al. (2017) found that individuals with limited education read less than those with a university degree, K. H. Perry and Homan (2015) investigated the types of literacy practices that these individuals engage in. Perry and Homan conducted a cross-case study analysis of data from the Cultural Practices of Literacy

Study (CPLS) database to explore the literacy practices of subjects who had 7 years or less of formal education. Their 92 participants from 13 case studies in the CPLS represented marginalized people from six countries and four continents. The researchers analyzed CPLS data to focus on the participants' purposes for participating in literacy activities and found that the participants engaged in literacy practices that targeted the self as a means of entertainment, for personal development, and to cope with life. Findings also indicated that oral language (i.e., speaking with others to learn information) was an important literacy practice among many participants, and lack of time was a common barrier to engaging in reading and writing practices. Furthermore, although many of the participants engaged in various text-oriented literacy activities, they did not perceive themselves as readers and writers. Perry and Homan concluded that adult educators should consider not only their students' personal goals for learning when planning instructional programs, but also the learners' goals for their inner selves. Consequently, educators could incorporate personal literacy practices in adult literacy programs, such as the use of book clubs and journaling.

Interestingly, researchers discovered that developing a habit of reading did not have to begin in childhood. When promoting extensive reading to adult students learning how to read, Rodrigo et al. (2014) revealed that adults can develop the habit of reading simply by being exposed to books during reading interventions. The researchers established that all of the 181 adult participants in their study developed a positive outlook toward reading, with the participants who were involved in self-selected reading being more likely to purchase books or go to the library after the intervention was completed. Greenberg et al. (2006) conducted a similar study to determine whether extensive reading could help adults' literacy scores. Even though they did not find a significant difference between receptive vocabulary, word identification, word attack, or passage comprehension, the researchers found growth in reading fluency and expressive vocabulary after implementing an extensive reading program. Posttest survey results (following instruction) were even more remarkable: Students read more books (77% of participants on the posttest compared to 46% on the pretest), felt that they understood most of what they read (78% compared to 53%), and changed their belief that they read slowly (8% compared to 38%). The authors thought the intervention had developed a positive effect on the extensive readers' literacy behaviors and shaped them into becoming more confident readers as adults.

Information literacy involves the ability to understand how information is attained, to effectively evaluate the information, to use these literacy skills, and to continue learning based on the information found (Lloyd, 2011). Different people and professions encompass diverse ideas about what information literacy means (Julien, 2016). When looking at information literacy from an educational viewpoint, Lloyd (2011) explained that teachers and researchers often focus on skills that are "generic and transferable" (p. 277) that could be used in many different settings and across a variety of contexts. With this type of outlook, information literacy often focuses on what the individual is learning that can be found in a text. Some workforces use this type of information literacy, such as in an academic or research field (Lloyd, 2011; Monge & Frisicaro-Pawlowski, 2014), but Lloyd expressed that in many workplaces, information is distributed in a way that "is often described as messy, complex, and distributed through a range of practices" (p. 281). These practices are "shaped through noncanonical sources" (Lloyd, 2011, p. 281) such as collaborating with others or completing informal job training that depends on the skills needed for the specific job. Julien (2016) echoed this point, stating that information practices are "socially and culturally situated" and can take on "very different forms,

depending on context” (p. 127).

Because of this, educational practices that target information literacy sometimes do not match the skills that workers use during employment, and students find it difficult to transfer these skills to the workplace (Monge & Frisicaro-Pawlowski, 2014). Monge and Frisicaro-Pawlowski (2014) stated that traditional information literacy skills tended to be generic and encompass several different situations, rather than “acknowledging that information literacy varies by context and is influenced by the people and technology involved” (p. 66). Thus, they proposed that educators should use inquiry-based learning when teaching informational literacy skills. Inquiry-based learning presents real-world problems to students, who then use information literacy skills to evaluate the available information and determine the most appropriate solution. Monge and Frisicaro-Pawlowski emphasized that the importance of inquiry-based learning lies in both its formal and informal problem solving. This is more representative of information literacy skills needed to succeed in the workplace. Julien (2016) also saw the significance of individuals’ informal methods of seeking information to be successful in the workplace and to be a participating citizen. She noted that “information seeking is a dynamic process” (Julien, 2016, p. 127) affected by the context, and individuals who lack information literacy skills risk marginalization in their private lives and in the workforce.

When thinking of literacy skills inside the workplace, one often thinks of using manuals or memos that are provided by supervisors, but literacy skills could also include collaborating with others or learning through informal ways. Based on this reviewed literature, there is a disconnect between information literacy in the workplace and the traditional and formulaic approach that is being taught in schools.

Benefits of Reading

Students’ later success in life depends, to a large extent, on how well literacy skills are taught and nurtured in school. Prior research has shown that practicing reading can improve cognitive skills (Pawlowski et al., 2012; Suzuki et al., 2014), help develop reading skills (McGeown et al., 2015), and improve the overall understanding of reading (Rodrigo et al., 2014). When looking at literacy skills from a survey of 312 secondary students from the United Kingdom, McGeown et al. (2015) found, through a hierarchical regression, that children who had better fiction reading habits often had more advanced word reading, comprehension, and summarization skills as well as text reading speed. The researchers also learned that children with higher literacy levels spent more time reading fiction books.

In Japan, Suzuki et al. (2014) found that teaching adults how to conduct read-alouds was associated with improved memory retention demonstrated by a significant interaction between group and time. They also discovered, through several executive functioning assessments, that even participants with mild cognitive impairments were able to improve cognitive skills. Pawlowski et al. (2012) discovered that education can play a role in assessment scores because adults with higher educational attainment scored higher in the areas of attention, language, oral word span, and verbal memory than those without, but they found that even adults with lower educational attainment scored better if they had high reading/writing habits compared to those who did not. Reder et al. (2020) used the PIAAC-L (longitudinal data from the 2012 and 2015 PIAAC from Germany) and found that reading engagement was a strong predictor of literacy growth even when controlling for age, gender, education, employment, and educational gain.

Grotlüschen et al. (2016) used data pooled from adults from the 2012 Survey of Adult Skills from PIAAC to develop an item response theory. They grouped the skills from the Survey of Adult Skills into the following six sets: reading at work, reading outside of work, writing at work, writing outside of work, numeracy at work, and numeracy outside of work. They found that for general populations and low-proficiency populations (scored at or below level 1 on the PIAAC literacy or numeracy scale), there was a positive correlation between reading at home and reading at work ($r = 0.44$ and $r = 0.47$, respectively). They also found a positive, but smaller, correlation between writing at home and writing at work. The general population had a correlation of $r = 0.34$, and the correlation from the low-proficiency population was $r = 0.36$. Grotlüschen et al. found that low-proficiency adults engaged in literacy practices less than their higher scoring counterparts. In addition, the researchers theorized that adults with low proficiency may not have occupations that allow them to practice a variety of skills at work or may select jobs based on their ability to perform literacy and numeracy skills. Because of the lack of use of skills, the researchers suggested that this could hinder low-proficiency adults from practicing existing skills and developing new skills.

More research needs to be done in the area of adult literacy practices, both qualitatively and quantitatively, to determine the types of texts adults read and how these texts can benefit adult reading skills. Research also needs to be conducted on what types of informational literacy skills are being used in the workplace or if there needs to be a focus in education on content related to information literacy job skills. Based on our examination of the literature, we found that adult literacy practices and competencies are assessed differently from one study to another. Thus, we sought to use data from the PIAAC to examine variables of adult literacy practices and hence establish the factors underlying these variables. A confirmed structure might serve as a basis for future researchers to use these factors in order to help tailor instruction for adult learners.

Methods

Data Sources

Data for this study were obtained from the PIAAC, which is a large-scale study that was developed by the Organisation for Economic Co-operation and Development (National Center for Education Statistics [NCES], n.d.c). In 2012, adults from 24 countries, including the United States, were surveyed. Participants were between the ages of 16 and 65 to represent the skills of the current adult workforce (American Institutes for Research, n.d.). PIAAC examined adult competencies of cognitive and workplace skills that adults need to be successful in the economy (NCES, n.d.c). To do this, PIAAC studied individuals' education, experiences, and occupations as well as cognitive skills in literacy, numeracy, and problem solving. In the United States, the survey was conducted in English only, but the background survey about participants' demographics, education, and occupation was conducted in English and Spanish. Participants were randomly selected from different communities, and a representative from the U.S. Department of Education visited participants' homes to conduct the survey in a one-on-one setting (NCES, n.d.a). The survey generally took about two hours and included background questions as well as questions regarding activities that adults did in their daily lives. For this study, we used the original PIAAC 2012 U.S. Public Use File in SPSS format, which was released May 5, 2014 (NCES, 2015). The current study included only participants from the United States. The rationale for using data from the PIAAC is that it is perhaps the most comprehensive data source available that addresses a vast array of adult literacy practices and

competencies. Also, the large representative sample size enhances the external validity of the findings.

Sample

The sample for this study consisted of 5,010 participants in the United States who took part in the PIAAC study. The gender distribution was 45.1% male and 52.6% female, with 2.3% not indicating their gender. Participants ranged between 16 and 65 years old, with the largest group of participants between the ages of 50 and 54 (11.2%) and the smallest group between the ages of 16 and 19 (7.0%). The age distribution is shown in Table 1. Racial distribution was as follows: White (66.2%), Black (12.8%), Hispanic (11.1%), Asian/Pacific Islander (4.7%), other races (2.6%), and not stated (2.5%). Finally, 45.5% of participants had an education level above high school, approximately 40.0% had a high school education, 12.6% had less than a high school education, and the remaining 1.9% did not respond or had missing data.

Table 1

Distribution of Participants by Age

Age	Frequency	%
16–19	351	7.0
20–24	486	9.7
25–29	523	10.4
30–34	522	10.4
35–39	479	9.6
40–44	499	10.0
45–49	522	10.4
50–54	562	11.2
55–59	505	10.1
60–65	561	11.2
Total	5,010	100.0

Variable Selection

The original PIACC data set contained 1,326 variables. For our study, we selected variables that contained any mention of reading (e.g., books, journals, newspapers, manuals, memos) in everyday life or in the workplace. We also included variables about writing skills that were used (e.g., forms, letters, articles). Informed by the literature review, we also included variables related to any form of workplace literacy (e.g., filling in forms, cooperating with coworkers, planning time) because several studies mentioned that nontraditional workplace skills often take place instead of traditional literacy skills (Lloyd, 2011; Monge & Frisicaro-Pawlowski, 2014). After looking at the variables

selected, we decided to include all of the variables that were grouped in the background questionnaire as skills used at work, literacy skills used in everyday life, and literacy skills used at work (NCES, n.d.b). This would allow us to determine whether skills that may not have been mentioned in the previous literature (e.g., selling, negotiating, advising, influencing people at work) may be related to literacy variables.

All variables were measured on a five-point Likert scale that captured the frequency of literacy practice use (5 = *every day*, 4 = *at least once a week but not every day*, 3 = *less than once a week but at least once a month*, 2 = *less than once a month*, and 1 = *never*). Table 2 provides a list of all variables used. Several of the variables have similar names because participants were asked how often they performed some activities in their everyday lives and how often they did the same activities in the workplace.

Table 2
Factors and Loadings

	Loading
Factor 1: Literacy Reading Skills	
Skill use everyday life–Literacy–Read letters, memos, or mails	.744
Skill use everyday life–Literacy–Write letters, memos, or mails	.669
Skill use everyday life–Literacy–Read newspapers or magazines	.641
Skill use everyday life–Literacy–Read directions or instructions	.575
Skill use everyday life–Literacy–Read books	.543
Skill use everyday life–Literacy–Read professional journals or publications	.471
Skill use everyday life–Literacy–Read financial statements	.442
Skill use everyday life–Literacy–Fill in forms	.424
Factor 2: Literacy Work Skills	
Skill use work–Literacy–Fill in forms	.769
Skill use work–Literacy–Write reports	.651
Skill use work–Literacy–Read letters, memos, or mails	.551
Skill use work–Literacy–Write letters, memos, or mails	.538
Skill use work–Literacy–Read directions or instructions	.509
Skill use work–Literacy–Read manuals or reference materials	.473
Factor 3: Work-Related Reading	
Skill use work–Literacy–Read professional journals or publications	.716
Skill use work–Literacy–Read newspapers or magazines	.704
Skill use work–Literacy–Read books	.507
Factor 4: Planning/Organizing Own Time	
Skill use work–How often–Organizing own time	.818
Skill use work–How often–Planning own activities	.811

Factor 5: Educating Others

Skill use work–How often–Presentations	.658
Skill use work–How often–Teaching people	.610
Skill use work–How often–Planning others’ activities	.574

Factor 6: Financial Literacy/People Skills

Skill use work–How often–Selling	.784
Skill use work–How often–Negotiating with people	.675
Skill use work–How often–Influencing people	.653
Skill use work–How often–Advising people	.474
Skill use work–Literacy–Read financial statements	.460

Factor 7: Application of Skills for Solving Challenges

Skill use everyday life–Literacy–Read diagrams, maps, or schematics	.613
Skill use work–Literacy–Read diagrams, maps, or schematics	.590
Skill use everyday life–Literacy–Read manuals or reference materials	.559
Skill use work–Problem solving–Simple problems	.407
Skill use work–Problem solving–Complex problems	.392

Factor 8: Sharing and Cooperating

Skill use work–How often–Sharing work-related info	.792
Skill use work–Time cooperating with coworkers	.718

Factor 9: Writing

Skill use everyday life–Literacy–Write articles	.730
Skill use everyday life–Literacy–Write reports	.601
Skill use work–Literacy–Write articles	.496

Data Analysis

Prior to analysis, the data were screened for missing cases in the variables. There was no systematic pattern to missing cases on any of the variables. PCA was then conducted on the 39 variables using varimax orthogonal rotation. The criteria used to determine the number of factors to retain were eigenvalues, screeplot, and total variance explained. We also conducted CFA to test the accuracy of the underlying structure we had established using PCA. The latter analysis would give credence to the results of the PCA.

Results

Principal Component Analysis

From the 39 variables, 10 factors were extracted, which accounted for 59.2% of the total variance in literacy habits. The last factor was later excluded because it was not meaningful, so the final study included nine factors and 37 variables. These factors and their loadings are shown in Table 2, and Table 3 includes the variance after rotation.

The communalities of the variables included are moderately high, with most values being related by at least 50%. Four variables, *read directions or instructions* (at work and in everyday life), *read books* (everyday life), and *read financial statements* (everyday life) were related only between 30% and 50%. These variables were included because, based on both the Kaiser-Meyer-Olkin Measure of .908 and Bartlett's Test of Sphericity [$X^2(741) = 47,346.7, p < .001$], the variables are related enough to allow a factor analysis to be performed.

Table 3
Percent of Variance Explained by Each Factor

Factor	Rotation sums of squared loadings		
	Total	% of variance	Cumulative %
1	3.31	8.49	8.49
2	3.02	7.74	16.22
3	2.61	6.69	22.91
4	2.41	6.17	29.08
5	2.29	5.87	34.95
6	2.25	5.76	40.71
7	2.14	5.76	46.19
8	1.73	4.44	50.63
9	1.70	4.35	54.98

The following variables related to literacy use in everyday life loaded heavily on Factor 1: *read letters, memos, or mails; write letters, memos, or mails; read newspapers or magazines; read directions or instructions; read books; read professional journals or publications; read financial statements; and fill in forms*. Subsequently, Factor 1 was labeled *Literacy Reading Skills* because each variable reflected the participants' reading activities in their daily lives. This first factor explained 8.5% of the variance and had an eigenvalue of 3.31.

Factor 2 had an eigenvalue of 3.02 and accounted for 7.7% of the variance in literacy habits. This factor was labeled *Literacy Work Skills* and comprised the following six variables, all of which had to do with literacy skills use at work: *fill in forms; write reports; read letters, memos, or mails; write letters, memos, or mails; read directions or instructions; and read manuals or reference materials*. Factor 3, *Work-Related Reading*, also had to do with the types of literacy skills used at work, and it comprised three variables: *read professional journals or publications, read newspapers or magazines, and read books*. This factor explained 6.7% of the total variance and had an eigenvalue of 2.61.

The next three factors focused on the frequency with which participants used literacy skills at work. The first among these is use of *Planning/Organizing Own Time* (Factor 4), followed by use of literacy skills in *Educating Others* (Factor 5), and lastly the application of *Financial Literacy/People Skills* (Factor 6). These three factors accounted for 6.17%, 5.87%, and 5.76% of total variance, and had eigenvalues of 2.41, 2.29, and 2.25, respectively.

Factor 7 captured the use of literacy skills for solving problems and was labeled *Application of Skills for Solving Challenges*. The variables loading onto this factor included both everyday skills (*read diagrams, maps, or schematics* and *read manuals or reference materials*) and workplace skills (*read diagrams, maps, or schematics; problem solving simple problems, and problem solving complex problems*). The variance explained by this factor was 5.48% with an eigenvalue of 2.14.

Factor 8 encompassed variables related to sharing resources with coworkers and was labeled *Sharing and Cooperating*. Two variables loaded heavily on this factor: *sharing work-related info* and *time cooperating with coworkers*. The variance explained by this factor was 4.44% with an eigenvalue of 1.73. The last factor (Factor 9) was labeled *Writing Skills* because it included writing skills from everyday life and at work. The variables loading on this factor were *write articles* (everyday life and at work) and *write reports* (at work). The factor had an eigenvalue of 1.65 and explained 4.35% of the total variance.

Through PCA, we were able to extract nine factors from 37 variables. Based on the results of the analysis, we found that variables about everyday life skills were more closely related than workplace variables because several of them grouped into Factor 1, which had the largest eigenvalue and accounted for the largest share of variance (8.1%). From Factors 2 and 3, we were able to see variables that were related to Factor 1, but these variables were more workplace oriented. Several of the other workplace literacy variables grouped together into smaller factors that showed relationships among these skills. This factor analysis provided us with important information about which skills are more closely related to one another and hence can be combined into latent factors that could then be used in other forms of statistical analyses such as regression.

Confirmatory Factor Analysis

The main purpose of the study was to explore and establish the underlying structure of adult literacy practices. Using PCA, we established a nine-factor model, which is summarized in Table 3. As a follow-up to the PCA, we conducted CFA using the lavaan package in R as well as JASP software (version 0.14.1) to ensure that the model we established was a good fit. Because of the Likert-scale nature of the indicators, we used the diagonally weighted least squares method to estimate the model parameters (Mîndrilă, 2010). The model converged with eight factors, excluding Factor 8 (Sharing and Cooperating) because variables loading on that factor had negative variances.

As recommended by Schreiber et al. (2006), we used the Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), root-mean-square error of approximation (RMSEA), and standardized root-mean-square residual (SRMR) to assess goodness of fit. The CFI was .936 and the TLI was .928. These two values are within the “acceptable” range, where values greater than .90 are generally indicative of acceptable fit and those above .95 are indicative of very good fit (Hooper et al., 2008). According to Hu and Bentler (1999), acceptable thresholds are values less than .07 for the RMSEA and less than .08 for the SRMS. For our model, the SRMR was .065 and the RMSEA was .066; both suggested an acceptable fit. This is consistent with the CFI and TLI indices, which both suggested

acceptable fit. Thus, the results of the CFA largely support and confirm the structure of the PCA model, albeit excluding the factor of sharing and cooperating. We can be generally confident that an eight-factor model is fairly acceptable and potentially replicable.

Discussion

A total of 39 variables were entered into the analysis, and 10 factors were extracted. The last factor, which included the variables *working physically for long* and *using hands and fingers*, was excluded because it was not interpretable and did not include literacy skills. A total of 55% of the cumulative variance of the final 37 variables may be attributed to the nine remaining factors (the variance of each factor is located in Table 3). The factor with the largest share of variance was Factor 1: Literacy Reading Skills, which included reading newspapers, magazines, professional journals, and other publications. In previous research about the reading habits of adults, these types of literature were often mentioned by participants or were focused on by the researchers (Applegate et al., 2014; Nadelson et al., 2013). These types of texts are often read to discover information, and many adults may see these as socially acceptable forms of texts (Gee, 2008; Reder, 1994). This could be why these factors contained the largest variance and formed this particular factor. The two variables with the highest loadings from this factor were reading ($r = 0.77$) and writing ($r = 0.67$) letters, memos, or mail. Letters are often a direct form of communication that allows the reader and writer to interact about information in their daily lives. Reder (1994) connected letters to his practice engagement theory and found that many multinational people used these in their daily lives and thought that these practices could be “natural contexts for stimulating the further development of reading” (p. 64). Workplaces, educators, and researchers could consider the many forms of literacy that adults regularly use that could help their literacy skills in their everyday lives and workplaces.

Literacy Work Skills encompassed several skills used at work including filling in forms; writing reports; reading and writing letters, memos, or mail; reading directions or instructions; and reading manuals or reference materials. These skills were mentioned in the literature as a way that the educational world sees workplace literacy, but other informal strategies, such as guidance of experienced workers or collaboration in communities of practice, are more often used on the job (Monge & Frisicaro-Pawlowski, 2014). If we look deeply at what these variables include, they do not necessarily match nonfiction skills that are being taught in the classroom through Common Core or state standards. Just as with the information from Factor 1, educators need to place more focus on the literacy skills that will prepare children for their future lives and careers. Although there has been a focus on integrating more nonfiction reading and writing skills, policy makers need to consider whether these skills are actually being used in students’ future lives or just meet the requirements of being “real” texts. More work needs to be conducted on integrating these skills throughout the education curriculum and adult literacy classes. Also, due to the specialties of certain occupations, workplaces may need look at the specific types of documents they use to determine whether employees may need training on how to complete these documents. Such training could be performed by managers or coworkers in a mentoring situation.

Factor 3: Work-Related Reading included variables of reading professional journals or publications, newspapers or magazines, and books at work. Although previous research found that these forms of literacy were not valuable in some workplaces (Lloyd, 2011; Monge & Frisicaro-Pawlowski, 2014), it is possible that the types of employment of the participants in this study’s sample affected the forms of literacy that they engaged in. Monge and Frisicaro-Pawlowski (2014) mentioned that educational programs often do not

concentrate on the informal learning that is completed in the workplace and instead focus only on context-based learning. This often leads to employees experiencing difficulties transferring knowledge from academic to workplace learning. Hamilton and Barton (2000) expressed that, depending on the meaning of the text, it may not transfer between different environments. Research needs to focus on pairing literacy skills with future careers so that educators and policy makers can more appropriately prepare children for the literacy demands of their future jobs and make the connection between academic learning and the workplace. Workplaces could provide employees with texts such as journals, magazines, and newsletters that are relevant to the job that could be read during breaks or checked out to be read at home. They could also offer weekly memos or in-office correspondence so that workers could summarize interesting information that they had read along with the source to keep other employees up to date with professional news.

Over the past few years, educators have prepared students to become workplace ready through the use of Common Core or similar state standards. Even though the literacy skills from the PIAAC data set may not fit “traditional” forms of literacy, there should be a focus on the literacy skills that children will use in the future so that they are prepared for life outside of school. However, when we look at previous research, only a limited number of studies focused on connecting literacy to personal and professional communication. Other literacy genres that researchers may wish to include in future studies are financial documents, instructional manuals, and forms that are used in people’s everyday lives. These types of texts are often in specific types of workplaces and are not necessarily generalizable (Lloyd, 2011). This would give researchers information about a variety of skills that may be used in certain workplaces that may not have been researched before. These variables could also be due to the type of occupations studied or may not be important to the ever-changing and current workforce.

Factors 7 and 9 (Application of Skills for Solving Challenges and Writing Skills) encompassed a combination of skills used in everyday life and at work. Factor 7 involved several nonfiction skills that are a focus of literacy and content classrooms, including reading diagrams, maps, or schematics and reading manuals or reference materials. Teachers use these to provide children with life and career skills. Solving simple and complex problems was also included in this factor. These two variables are the closest related variables to the informational literacy provided by previous research. In previous research (Lloyd, 2011; Monge & Friscaro-Pawlowski, 2014), solving problems tended to be achieved through communication and collaboration with others. Through the use of a variety of texts, adult educators need to understand that it can be beneficial to attend to various genres of texts and explicitly teach features related to them (K. H. Perry, 2009). However, just because they are teaching one type of text, it may not be generalizable to several types of workplaces (Hamilton & Barton, 2000). Hamilton and Barton (2000) discussed the value of types of informational skills that should be studied because these skills may be more valued in one form of workplace than another. Factor 9: Writing Skills included the use of writing articles and reports in everyday life and at work. Adult writing skills is an area in which research was limited (K. H. Perry et al., 2017), so more research should be conducted into the forms of writing that are included in adults’ everyday lives and workplace. This would allow the workplace and the educational fields to develop a connection between what adult readers already know how to write and what they may face in the workplace so that the transition from school to workplace would be easier for some struggling readers.

When planning this study, variables from Factor 4: Planning/Organizing Own

Time, Factor 5: Educating Others, Factor 6: Financial Literacy/People Skills, and Factor 8: Sharing and Cooperating were included in the original analysis because they were forms of learning, but they did not include traditional literacy skills. After we completed further research on the topic, these skills seemed just as important as the traditional ideas of literacy. However, results of a follow-up CFA excluded Factor 8 from the initial nine-factor model. Factor 4 included organizing one's own time and planning one's own activities at work. When compared to previous research, this factor relates to literacy skills through functions that require completing formal tasks, such as creating a schedule and writing plans and goals. Lloyd (2011) felt that workplaces often revolve around these types of literacies based on the specific setting and needed training. Because of this, information literacy that is being taught only as a "text-based information skill" (p. 294) may not match the workplace environment. This is why it is important to look at several different forms of information literacy, both text and collaboration based, to help students and adults understand future workplace environments.

Factor 5: Educating Others is about working with others (as is Factor 8, which was subsequently dropped). Research has shown that researchers often saw more cooperative and communication skills taking place on the job instead of traditional literacy skills that are seen in the classroom (Lloyd, 2011; Monge & Frisicaro-Pawlowski, 2014). Like with previous factors, workplaces may need to focus on these areas with onsite trainings or cooperative learning workshops to help their employees develop these skills. Factor 6: Financial Literacy/People Skills could also be related to information literacy depending on the place of employment. This area focused on selling, negotiating, influencing, and advising as well as reading financial statements. Variables from this factor were included in the study because they were grouped with other variables in the section of the background questionnaire focused on skills used at work (NCES, n.d.b). Other skills, such as negotiating and influencing, were included because they were also included in the section on skills used at work, and they could be related to the nontraditional skills seen in previous studies (Lloyd, 2011; Monge & Frisicaro-Pawlowski, 2014). It was interesting how these variables were grouped together because they are not what someone thinks of as literacy skills, but they include speaking and listening skills that are sometimes included in new literacy standards for students. This is another factor that merits further research to establish what type of workers seem to score high on this latent factor to determine whether these variables are important to specific types of occupations that may not have been present in the data set. According to these findings, different forms of communication should be studied to reveal the typical ways individuals in various occupations communicate, such as teaching, negotiating, and advising. This information could be used to tailor career training so that future employees gain the communication skills needed to prosper in their chosen careers.

Implications

Several findings from the current study are consistent with previous research. Earlier research showed that adults read a variety of materials (Mugambi, 2015; Nadelson et al., 2013; Rasiyah et al., 2011) and that, depending on the reason for reading, they choose different forms of texts, from printed books and journals to websites and magazines. Previous research also presented various ways that adults use information literacy skills in the workplace, from collaboration with others to paper-based literacy skills that are often seen in the field of education (Lloyd, 2011; Monge & Frisicaro-Pawlowski, 2014). Based on these previous findings, along with the findings of this research, we discuss what this means for adult educators, policy makers, and the workplace.

Adult Educators

Because we can see that adults use a wide variety of literacy skills, educational settings such as school systems, colleges, and adult education services could focus on providing instruction in the career-based literacy skills that are needed in the workplace. One of the ways that adult educators could do this is by relating everyday literacy skills to skills that individuals may need in the workplace.

Adults often use newspapers to discover important information about their community and may use letters, memos, and mail to communicate with family members or friends. Through these types of texts, adult educators could offer low-literacy adults familiar texts that they are comfortable using as a bridge. For example, adult educators could use the format of the friendly letter to help their students understand how to read memos or business letters. They could also help low-literacy adults understand information that often appears on important forms, such as employment applications and government documents. This would allow these adults to develop familiarity with the information that the documents are asking for and to understand why certain information is needed. These types of everyday related information from specific skills or jobs prepare adults for particular jobs (Lloyd, 2011; Monge & Friscaro-Pawlowski, 2014). Hamilton and Barton (2000) explained that when looking at the types of skills, the underlying values of the skills should be studied to determine whether they are appropriate for the workplace.

These educators could then continue to bridge the gap between the reading skills used in everyday life and the skills needed for work. They could incorporate hobby magazines or local newspapers that their students read at home, and classes could incorporate occupation-related magazines, journals, or newsletters to let adults see how these genres of texts are very similar but also have a few differences. As Perry (2009) indicated, genre knowledge, the understanding of functions, features, and purposes of various genres of texts, is an essential element of adults' literacy skills. Consequently, educators should explicitly develop genre knowledge when using the various reading materials with their students.

With the advent of new technology for many of these reading skills, such as online magazines and newspapers, adult educators could use both apps and physical texts to understand the information that could be used in daily life. Adults could use a mapping app to discover how to reach a destination and then use a physical map to understand how maps work. They could also use video apps to comprehend how to complete a project in a manual. These forms of texts would provide adult learners with ways to understand information even if they are not able to read the given text. Through the use of familiar texts and technology, adult educators could provide their students with recognizable items that would make them feel more comfortable using unfamiliar texts and skills.

Finally, adult educators need to think about the amount of time it takes for a low-proficiency adult to complete work. Grotlüschen et al. (2016) found that there was a strong, consistent association between an increase in accuracy and a decrease in processing speed when adults completed the reading components section of the PIAAC. The researchers concluded that low-proficiency adults may need more time and more practice to understand or complete tasks with accuracy. Giving these adults the time and practice allows them to develop fluency in completing tasks with which they are comfortable.

Workplace Education

When considering the results of this study in combination with other research

(Lloyd, 2011; Monge & Friscaro-Pawlowski, 2014), there is a slight disconnect between the forms of information literacy that are being taught in school and those that are being used in the workplace. More research should be conducted to identify the skills that are needed for workers in various professions. The findings would help employers target those skills when providing on-the-job training for their employees.

Similar to how adult education needs to bridge the gap between what adults use in everyday life and what they need to use in the workplace, employers need to determine how to help their workers use the tools that they have around them. This may include bringing in texts that adults are familiar with and constructing their knowledge of workplace texts, but it could also include introducing workers to new forms of texts that may not relate to their everyday jobs but are found in their everyday lives. Workplaces could look at the types of texts and documents that are most often used in the occupation and provide new hires with training regarding how to use these documents. Similar support can be provided for all workers when new forms/documents are introduced in the workplace.

Employers could also begin incorporating forms of technology into the workplace to provide employees with a variety of ways to understand work-related information. This could include videos about how to perform specific tasks or diagrams of machinery. These types of activities would be similar to the inquiry-based learning that Monge and Friscaro-Pawlowski (2014) suggested, and these tasks could help adults determine different ways to solve problems in their everyday and work lives.

Workplaces could also help adults with their communication skills by having them interact with others in the community, similar to the collaborative activities that Lloyd (2011) mentioned regarding literacy skills that he saw in the workplace. Employers could also incorporate these skills by providing cooperative learning workshops and team-building exercises, expanding workers' collaborative capabilities. Businesses could also work with community resources to provide opportunities for employees to learn new skills or forms of assistance outside of their work life.

Policy Makers

One final area that needs to be looked at is policy makers and the decisions they make based on all types of learners, both in school and out, and how this impacts what types of texts they will use in their future jobs. Future research needs to be conducted to determine what types of literacy skills are being used by adults with various occupations and in different demographic or geographic areas. Policy makers, on a local level, could tailor the content and materials for students to correspond with career paths with similar backgrounds. This would not only better prepare students for their chosen careers, but also provide them with more information about the types of literacy that would be involved in their future professions.

On national and state levels, policy makers should make sure that career paths are available to adults with many different literacy and numeracy skill levels with the opportunity to advance their skills and improve their job performance. According to the Office of Career, Technical, and Adult Education (2015), providing low-skilled adults with training prepares them to advance to different levels in their career. These type of career pathways could allow adults to use the skills that they have to begin a job and then receive training, either outside of the job or on the job, to help them develop the skills needed to move up the career ladder. These trainings could be specialized to help them develop the literacy skills that they need to be successful at future levels of their career and prepare them for what they may see in future job opportunities.

Grotlüschen et al. (2016) determined, according to 2012 PIAAC data from participating countries, that about one-third of adults with low proficiency participate in some type of adult education. Policy makers need to understand that adults with low proficiency come from all walks of life. This may mean that, depending on the area and the clientele, education may need to be focused on what is needed in that time and place. Policy makers may need to look at transportation issues, class times, and other issues that may restrict adults from attending education classes. Grotlüschen et al. found that 28.1% of low-proficiency adults from the United States wanted to participate in some form of training but had not started. This was found to be due to a number of reasons, such as work, family, finances, and required prerequisites. Based on this information, policy makers need to understand that learning is a process that continues throughout a person's life and can be both formal and informal depending on the needs of the learner.

Conclusion

As stated in the Results section, the structure of literacy activities that we propose for future analyses is an eight-factor model, excluding Factor 8. According to the several criteria for model fit that were assessed, it is an acceptable model explaining adult literacy practices.

From a teaching perspective, there is more to learn from this data set to determine what benefits these factors could have on the participants who use these different skills or the adults that need to develop them. Previous research studied the broad form of reading and writing to uncover how these habits can affect comprehension and cognition (Pawlowski et al., 2012; Rodrigo et al., 2014; Suzuki et al., 2014), but further analysis could be conducted to establish how specific skills could improve comprehension, vocabulary, problem solving, and numeracy (areas included in the PIAAC survey). By looking at these areas combined, colleges, trade schools, and on-the-job training programs may be able to provide instruction that helps students transition to becoming skilled employees needed in the workforce.

As we educators—in both traditional and nontraditional settings—look at the literacy practices of adults, we can begin to understand what types of texts adults read at home and work, which may help us better respond to their literacy needs. Using PIAAC data to examine variable relationships, connections between the literacy skills used at home and the types of literacy skills employed at work become clearer. Adult educators can better support adult learners' literacy needs when additional information such as literacy skills used in home life and daily work are known. Employers can use these factors to establish workplace trainings that meet the needs of their workers based on these types of literacy skills that are used in the occupation. If they can uncover the skills that are most often used in their field, companies, trainers, and other adult educators can work with schools and colleges to construct programs to develop these skills. This may lead to a better understanding of how future workers need to be trained and what forms of literacy need to be taught in school. Using these findings, educators can determine the different types of literacy skills that are not being emphasized in the classroom but are important in the workplace, and they can modify their curricula accordingly. Although the factors in this study are a viable starting point, further research needs to be done using these factors to determine areas that these literacy skills influence and how they might be developed to increase professional success.

Author Biographies

Melissa R. Killian is a Ph.D. Literacy graduate of Tennessee Technological

University where she previously received a Bachelor's degree in Education (K–8) and Master's degrees in Reading (PreK–12) and in Curriculum and Instruction. She has taught second and third grade and is currently a reading/math interventionist in a K–8 elementary school in Tennessee. She also works as an adjunct for Tennessee Technological University. Her current interests include adult literacy, family involvement in reading, and differentiated instruction. She is an active member of the Tennessee Literacy Association (TLA) and International Literacy Association (ILA).

George Chitiyo, Ph.D. is a professor of educational research at Tennessee Technological University. His academic background is in economics and quantitative research methods in education. His research interests include the psychosocial aspects of HIV/AIDS in southern Africa as well as economics of health and higher education.

Nancy Kolodziej is a professor at Tennessee Technological University and holds a doctoral degree from Lehigh University, Bethlehem, Pennsylvania. Nancy is the author of *Learning Station Models for the Middle Grades*, a book published by the Association of Middle Level Education and has co-authored the twelfth edition of *Teaching Reading in Today's Elementary Schools* and the eleventh edition of *Secondary School Literacy Instruction: The Content Areas*. Nancy is an active member of the International Literacy Association; she is on the Review Board of *The Reading Teacher* and *The Reading Professor* and was a member of ReadWriteThink's national eight-member advisory panel.

Ashley B. Akenson is the Director of Graduate Programs at Tennessee Technological University. She graduated from Tennessee Tech University with her M.A. in Curriculum and Instruction in May 2017 and her Ph.D. in Education with a concentration in Program Planning and Evaluation in May 2018. Her research interests include quantitative and qualitative research methods, mindfulness, program planning and evaluation, and at-risk and marginalized populations. She is an active member of the International Society for the Scholarship for Teaching and Learning (ISSoTL), American Educational Research Association (AERA), American Evaluation Association (AEA), and American Mindfulness Research Association.

References

- American Institutes for Research. (n.d.). *PIAAC: A strategy to assess and compare adult foundational skills and their social and economic impact*. https://static1.squarespace.com/static/51bb74b8e4b0139570ddf020/t/5706d72a59827e9e33ac9e4a/1460066090272/Introduction+to+PIAAC_Updated+-+March+2016_040116.pdf
- Applegate, A. J., Applegate, M. D., Mercantini, M. A., McGeehan, C. M., Cobb, J. B., Deboy, J. R., Modla, V. B., & Lewinski, K. E. (2014). The Peter Effect revisited: Reading habits and attitudes of college students. *Literacy Research and Instruction, 53*(3), 188–204. <https://doi.org/10.1080/19388071.2014.898719>
- Dechant, E. V., & Smith, H. P. (1977). *Psychology in teaching reading* (2nd ed.). Prentice-Hall. <https://doi.org/10.1017/edp.2020.18>
- Fernández-Blanco, V., Prieto-Rodríguez, J., & Suárez-Pandiello, J. (2017). A quantitative analysis of reading habits in Spain. *International Journal of Arts Management, 19*(3), 19–32.
- Gee, G. P. (2008). *Social linguistics and literacy: Ideology in discourses* (3rd ed.). Routledge. <https://doi.org/10.4324/9780203944806>

- Goodman, M., Finnegan, R., Mohadjer, L., Krenzke, T., & Hogan, J. (2013). *Literacy, numeracy, and problem solving in technology-rich environments among U.S. adults: Results from the Program for the International Assessment of Adult Competencies 2012: First look* (NCES 2014-008). U.S. Department of Education, National Center for Education Statistics. <https://nces.ed.gov/pubs2014/2014008.pdf>
- Greenberg, D., Rodrigo, V., Berry, A., Brinck, T., & Joseph, H. (2006). Implementation of an extensive reading program with adult learners. *Adult Basic Education, 16*(2), 81–97.
- Grotlüschen, A., Mallows, D., Reder, S., & Sabatini, J. (2016). *Adults with low proficiency in literacy or numeracy* (Education Working Paper No. 131). Organisation for Economic Co-operation and Development. <https://doi.org/10.1787/19939019>
- Hamilton, M., & Barton, D. (2000). The International Adult Literacy Survey: What does it really measure? *International Review of Education, 46*(5), 377–389. <https://doi.org/10.1023/A:1004125413660>
- Holt, J. K., & Smith, M. C. (2005). Literacy practices among different ethnic groups: The role of socioeconomic and cultural factors. *Reading Research and Instruction, 44*(3), 1–21. <https://doi.org/10.1080/19388070509558429>
- Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods, 6*(1), 53–60.
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling, 6* (1), 1–55. <https://doi.org/10.1080/10705519909540118>
- JASP Team. (2020). JASP (Version 0.14.1) [Computer software]. <https://jasp-stats.org/>
- Julien, H. (2016). Beyond the hyperbole: Information literacy reconsidered. *Communications in Information Literacy, 10*(2), 124–131. <https://doi.org/10.15760/comminfolit.2016.10.2.28>
- Juncos-Rabadan, O., Pereiro, A. X., Facal, D., Rodriquez, N., Lojo, C., Caamaño, J. A., Sueiro, J., Boveda, J., & Eiroa, P. (2012). Prevalence and correlates of cognitive impairment in adults with subjective memory complaints in primary care centers. *Dementia and Geriatric Cognitive Disorders, 33*(4), 226–232. <https://doi.org/10.1111/ggi.12157>
- Kaup, A. R., Simonsick, E. M., Harris, T. B., Satterfield, S., Metti, A. L., Ayonayon, H. N., Rubin, S. M., & Yaffe, K. (2014). Older adults with limited literacy are at increased risk for likely dementia. *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences, 69*(7), 900–906. <https://doi.org/10.1093/gerona/glt176>
- Lloyd, A. (2011). Trapped between a rock and a hard place: What counts as information literacy in the workplace and how is it conceptualized? *Library Trends, 60*(2), 277–296. <https://doi.org/10.1353/lib.2011.0046>
- McGeown, S. P., Duncan, L. G., Griffiths, Y. M., & Stothard, S. E. (2015). Exploring the relationship between adolescent reading skills, reading motivation and reading habits. *Reading and Writing, 28*(4), 545–569. <https://doi.org/10.1007/s11145-014-9537-9>

- Merga, M. K. (2017). What motivates avid readers to maintain a regular reading habit in adulthood? *Australian Journal of Language and Literacy*, 40(2), 146–156.
- Miller, B., McCardle, P., & Hernandez, R. (2010). Advances and remaining challenges in adult literacy research. *Journal of Learning Disabilities*, 43(2), 101–107. <https://doi.org/10.1177/0022219409359341>
- Mîndrilă, D. (2010). Maximum likelihood (ML) and diagonally weighted least squares (DWLS) estimation procedures: A comparison of estimation bias with ordinal and multivariate non-normal data. *International Journal of Digital Society*, 1(1), 60–66. <https://doi.org/10.20533/ijds.2040.2570.2010.0010>
- Monge, R., & Friscaro-Pawłowski, E. (2014). Redefining information literacy to prepare students for the 21st century workforce. *Innovative Higher Education*, 39(1), 59–73. <https://doi.org/10.1007/s10755-013-9260-5>
- Mugambi, F. N. (2015). Exploring reading habits and academic success in rural Kenya. *International Federation of Library Associations and Institutions*, 41(4), 353–363. <https://doi.org/10.1177/0340035215610303>
- Nadelson, L. S., Villagómez, A., Konkol, D., Haskell, C., McCulley, M., & Campbell, D. (2013). Messages are everywhere: Reading perceptions, habits, and preferences of undergraduates. *Journal of College Reading and Learning*, 43(2), 70–90. <https://doi.org/10.1080/10790195.2013.10850367>
- National Center for Education Statistics. (2015). *Program for the International Assessment of Adult Competencies (PIAAC) 2012 U.S. public use file (PUF)*. <https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2014045REV>
- National Center for Education Statistics. (n.d.a). *Frequently asked questions*. <https://nces.ed.gov/surveys/isas/faqs.asp>
- National Center for Education Statistics. (n.d.b). *U.S.—household 2012 background questionnaire: English*. https://nces.ed.gov/surveys/piaac/final_en_bq.htm
- National Center for Education Statistics. (n.d.c). *What is PIAAC?* <https://nces.ed.gov/surveys/piaac/index.asp>
- National Council for Adult Learning. (2015). *Adult education facts that demand priority attention*. <http://www.ncalamerica.org/AdultEDFacts&Figures1215.pdf>
- Office of Career, Technical, and Adult Education. (2015). *Making skills everyone's business: A call to transform adult learning in the United States*. U.S. Department of Education, Office of Career, Technical, and Adult Education. <https://www2.ed.gov/about/offices/list/ovae/pi/AdultEd/making-skills.pdf>
- Pawłowski, J., Remor, E., de Mattos Pimenta Parente, M. A., de Salles, J. F., Fonseca, R. P., & Bandeira, D. R. (2012). The influence of reading and writing habits associated with education on the neuropsychological performance of Brazilian adults. *Reading and Writing*, 25(9), 2275–2289. <https://doi.org/10.1007/s11145-012-9357-8>
- Perfetti, C. A. (1985). *Reading ability*. Oxford University Press.
- Perry, A., & Gauly, B. (2019). Analysing poor reading skills: A comparison between PIAAC literacy levels and reading components. *Survey Methods: Insights From the Field*. <https://surveyinsights.org/?p=12603>

- Perry, K. H. (2009). Genres, contexts, and literacy practices: Literacy brokering among Sudanese refugee families. *Reading Research Quarterly*, 44(3), 256–276. <https://doi.org/10.1598/RRQ.44.3.2>
- Perry, K. H., & Homan, A. (2015). “What I feel in my heart”: Literacy practices of and for the self among adults with limited or no schooling. *Journal of Literacy Research*, 46(4), 422–454. <https://doi.org/10.1177/1086296X14568839>
- Perry, K. H., Shaw, D. M., Ivanyuk, L., & Tham, Y. S. S. (2017). Adult functional literacy: Prominent themes, glaring omissions, and future directions. *Journal of Language & Literacy Education*, 13(2), 1–37. <https://doi.org/10.1177/1086296X14568839>
- ProLiteracy. (2016). *Adult literacy and basic education: The facts*. https://www.proliteracy.org/Portals/0/pdf/ProLiteracy_member-central-media-resources_adult-literacy-facts-letter.pdf?ver=2016-03-08-155040-310
- Rasiah, R., Kaur, H., & Nagaratnam, S. (2011). Reading habits and interests of Generation Y students: Challenges of reflective learning. *Journal of Interdisciplinary Research in Education*, 1(1), 39–53.
- Reder, S. (1994). Practice engagement theory: A sociocultural approach to literacy across languages and cultures. In B. Ferdman, R. M. Weber, & A. Ramirez (Eds.), *Literacy across languages and cultures* (pp. 33–74). State University of New York Press.
- Reder, S., Gauly, B., & Lechner, G. (2020). Practice makes perfect: Practice engagement theory and the development of adult literacy and numeracy. *International Review of Education*. <https://doi.org/10.1007/s11159-020-09830-5>
- Rodrigo, V., Greenberg, D., & Segal, D. (2014). Changes in reading habits by low literate adults through extensive reading. *Reading in a Foreign Language*, 26(1), 73–91. <http://doi.org/10125/66688>
- Schreiber, J. B., Nora, A., Sage, F. K., Barlow, E. A., & King, J. (2010). Reporting structural equation modeling and confirmatory factor analysis: A review. *Journal of Educational Research*, 99(6), 323–338. <https://doi.org/10.3200/JOER.99.6.323-338>
- Smith, M. C. (1996). Differences in adults’ reading practices and literacy proficiencies. *Reading Research Quarterly*, 31(2), 196–219. <https://doi.org/10.1598/RRQ.31.2.5>
- Suzuki, H., Kuraoka, M., Yasunaga, M., Nonaka, K., Sakurai, R., Takeuchi, R., Murayama, Y., Ohba, H., & Fujiwara, Y. (2014). Cognitive intervention through a training program for picture book reading in community-dwelling older adults: A randomized controlled trial. *BMC Geriatrics*, 14(1), 1–9. <https://doi.org/10.1186/1471-2318-14-122>
- Trawick, A. R. (2017). *Using the PIACC Literacy Framework to guide instruction: An introduction for adult educators*. Program for the International Assessment of Adult Competencies. <http://piaacgateway.com/research-to-practice-guides>