



Critiquing Adult Participation in Education, Report 3: Technology Use

Margaret Becker Patterson
Research Allies for Lifelong Learning



July 2018
VALUEUSA, Media, PA
www.valueusa.org/projects

The CAPE project was funded with generous support from Dollar General Literacy Foundation

Photo credits: Margaret Patterson and Wei Song

The author thanks Marty Finsterbusch, Wei Song, Jen Vanek, and an anonymous reviewer for their helpful insights when reviewing earlier versions of the report.

Critiquing Adult Participation in Education, Report 3: Technology Use

Executive Summary

In an era when 36 million U.S. adults need basic skills, 90% of eligible adults do not participate in adult education (Patterson, 2018). VALUEUSA believed nonparticipating adults themselves could best answer questions on why they do not participate and sponsored the Critiquing Adult Participation in Education (CAPE) research project in 2017-18. A first CAPE report identified deterrents and presented nonparticipant-recommended solutions, and the second dealt with motivation around education.

CAPE researchers surveyed 125 nonparticipating adults in five U.S. states. All adults left school early or indicated education outside USA; three-fourths (75%) had never participated in adult education previously. Median age was 35 years, with a range from 18 to 75 years; 57% were female. Annual personal income was at poverty levels, with 84% earning \$0 to \$18,000 annually. Adults included parents, seniors, homeless adults, formerly incarcerated adults, recovering addicts, adults with disabilities, and elder caregivers¹.

An additional purpose of CAPE was to further understand how nonparticipating adults use technology currently and how they would prefer to employ technology in learning. Technology use in the CAPE survey refers specifically to getting online, pursuing online activities, and, if applicable, experiencing challenges that make online access more difficult. Using technology for learning refers to employing learning software on standalone computers, online learning, or using apps on a smartphone.

Beginning with an overall analysis, findings include how many nonparticipants use technology, how they connect to the internet and access websites, challenges they face, and the extent to which their preferred way of learning incorporates technology. According to survey responses, 62% of adult nonparticipants are currently online, 24% have been online previously and 14% were never online. For those who are online, the top way of connecting is through a smartphone; 9 in 10 get online through their smartphones. Once online, 4 in 5 adult nonparticipants found it easy to locate a website and 3 in 4 found it easy to identify the information they need within a website. The high rate of access to technology is encouraging and shows promise for engaging nonparticipants.

Adults were also asked how they would most like to learn something new. Most would choose to learn by themselves, either using technology, through print, or with some help from a tutor. More than half of adult nonparticipants would prefer to use technology as a tool to learn on their own and to employ what they already know to learn something new. Two in five would use technology to learn along with other people or to solve problems with other people. Nonparticipant technology use did not differ significantly by gender. These insights on preferred modes of learning are important for adult educators to recognize and respond to as they recruit and serve nonparticipants.

In a more in-depth set of analyses, CAPE respondent data were organized into profiles of approximately 10-year increments of age. Four age groups were labeled with generational names for these analyses: young Millennial, older Millennial, Generation X, and Baby Boomer. Three-fourths of Millennials were currently online, yet online access rates decreased to 56% for Generation X and to 38% for Baby Boomers. Nearly all adults in the three youngest groups had been online at some point, even if they were not currently. However, one-third of Baby Boomers reported never having been online. Adult education programming and outreach initiatives that seek to involve nonparticipants through technology need to acknowledge that substantial portions of the target population will not be online and must be reached initially through other modes. Policymakers seeking to encourage access to technology for adult learners need to ensure that policies do not inadvertently discriminate against middle-aged and older adults. This assurance is particularly critical to adults in rural areas and those experiencing unemployment.

¹ For more information on CAPE methods, see Appendix 1 below and Patterson and Song (2018).

Nearly all Millennials and two-thirds of Generation X used smartphones for online access at least sometimes, but 20% of Generation X and 29% of Baby Boomers reported never going online on a smartphone. These findings indicate that smartphone apps have potential to increase access to technology for nonparticipant adults, which bodes well for national mobile technology initiatives. Still, smartphone apps are not a panacea, especially for aging adults. Although nonparticipants generally perceived high technology efficacy, efficacy rates were higher for Millennials and decreased significantly as age increased. Ease in finding a website and finding information within a website also decreased with rising age, and 10% of Generation X and 40% of Baby Boomers found it difficult to find websites. Even with Baby Boomer doubts about learning technology, they perceived they could learn to use technology *with support* at nearly the rate of younger groups.

Although nonparticipants perceived high technology efficacy, for many of them, getting online was not without challenges. The most frequently reported challenges overall were difficulty concentrating and eyes that tired easily. Adults in all age groups reported comparable rates of challenges to using technology, such as difficulty concentrating or sitting for long periods of time or eyes that tired easily. These top three challenges were experienced at high rates by adults reporting “fair” health. Adult educators need to be aware of and prepared to deal with challenges nonparticipating adults of all ages face, as well as their intersections with fair or poor health. Being on the lookout for new adult learners who have difficulty concentrating or sitting at a monitor for a long time or who appear to have eye strain, for instance, will inform adult educators on steps they and learners can take to make using technology more comfortable. Those who plan policy need to ensure policies do not inadvertently deter adults with technology challenges from participating in programming.

Additionally, adults were asked how familiar they were with using technology for learning and how often they used it. A moderate gap in familiarity and use occurred between Millennials and the two oldest groups in using technology as a tool to learn on their own, with Millennials’ use and familiarity higher than those of Generation X or Baby Boomers. The gap with Millennials persisted when nonparticipants used what they already knew to learn something new. Older Millennials reported the highest rate of learning with others and young Millennials the highest rate of solving problems with others. Under 3 in 10 Generation X and Baby Boomers reported learning with or solving problems with others through technology. These findings indicate important generational differences that adult educators need to reflect on as they plan use of technology in group settings and develop ways to familiarize adults of all ages with learning and solving problems via technology.

The findings on former adult education participants were also promising. Regardless of age group, more former adult education participants used technology to get feedback on what they learn (45%) than those who never participated (32%). Former adult education participants also used technology to learn with other people (58%) at a higher rate than those who never participated (38%). This difference may be partly explained by the fact that the highest rate of former adult education participation was among older Millennials. While former participants may not have an advantage over nonparticipants in accessing technology, being able to use technology for these purposes will serve them well if they can be recruited into adult education. Offering learning opportunities with others and providing feedback through technology may encourage these former adult learners to return to adult education.

A final question was modal preference in learning. Although at least some of all age groups indicated interest in blended learning or learning on their own via technology, very few nonparticipants preferred learning with others via technology, and stronger preferences were apparent by age. With the exception of Generation X, most nonparticipants indicated a preference to learn on their own rather than with others. At the same time, 1 in 5 Millennials and 2 in 5 Baby Boomers go online to learn basic skills such as writing or math. This finding indicates both a desire on the part of some nonparticipants to learn basic skills and an opportunity for adult education programs to tap into that desire through outreach. Taken together, findings imply that, as potential adult learners, many middle-aged and older adults have a desire for more basic skills, yet most will require extensive orientation and support to participate successfully in blended learning or problem-solving opportunities with other adult learners.

Introduction

Millions of U.S. adults need basic skills, yet 90% of eligible adults do not participate in adult education (Patterson, 2018). VALUEUSA believed adults themselves could best answer questions on why they do not participate and sponsored the Critiquing Adult Participation in Education (CAPE) research project in 2017-18. A purpose of CAPE was to further understand how nonparticipating adults use technology currently and how they would prefer to employ technology in learning. Technology use in the CAPE survey refers specifically to getting online, pursuing online activities, and, if applicable, experiencing challenges that make online access more difficult. Using technology for learning refers to employing learning software on standalone computers, online learning, or using apps on a smartphone.

Ability to proficiently use technology for learning purposes is considered a form of literacy (Gregg, 2013; Smith, 2009). Gregg (2013) observes that technologies offering adults tools for learning, and especially mobile technologies, are on the rise. A recent edition of the classic *The Adult Learner* (Knowles, Holton, & Swanson, 2015) observed that future learning might rely on technology as a “lone facilitator of learning” (p. 216). Nonetheless, Vanek, responding to the Organisation for Economic Co-operation and Development’s (OECD) important work characterizing the skills of adults in the USA (OECD, 2013), observed, “we know that current ABE programming falls short of reaching many potential learners” (2017a, p. 62), and, according to Quigley (2017), technology offers an “unprecedented opportunity to reach and retain” potential learners (p. 52). Indeed, eligible yet nonparticipating adults – i.e., nonparticipants – already employ technology on their own. Nonparticipants frequently report turning to search engines or smartphones for information and, to a lesser extent, learning (Patterson & Song, 2018). Still, sparse research exists on which nonparticipants use technology, the extent to which they use it, and how they use it to learn (Smith, 2009).

Use of technology differs generationally, with younger adults tending to use it more than older adults. “Ensuring that adults can develop and maintain their skills and positively adapt to changes in the economy and society is especially relevant in ageing societies” (OECD, 2013, p. 52). According to PIAAC data, most nonparticipants, and nearly all of those under 25 years, use technology (Patterson, 2018). Although technology use tended to be inversely related to age in the Longitudinal Study of Adult Learning (LSAL; Strawn, 2008), among PIAAC respondents, 3 in 4 nonparticipating adults used a computer, including two thirds of adults over 55 years (Patterson, 2018). These high rates of usage are consistent with overall PIAAC rates (OECD, 2013), U.S. Census Bureau figures (Smith, 2009), and a recent national health-related study of older adults (Choi & DiNitto, 2013). Also, computer use among adults outside adult education occurred at similar rates as for adult education participants in LSAL (Strawn, 2008) and current participant access rates to smartphones are estimated at approximately 55% to 75% (Tyton Partners, 2015), suggesting that participants may not have an advantage over nonparticipants in accessing technology.

How nonparticipants use technology varies widely, however. In PIAAC, 9 in 10 nonparticipants went online at least sometimes to e-mail others outside of work or to better understand health or financial issues (Patterson, 2018). Approximately 3 in 4 got online to conduct financial transactions. Only 3 in 10 nonparticipants got online to meet virtually (Patterson, 2018). Access to and use of technology for health information varies by such factors as age and income (Prins, Monnat, Clymer, & Toso, 2015).

Health-related challenges are also a consideration in how nonparticipants employ technology. Of nonparticipating adults in PIAAC (Patterson, 2018) 30% reported health challenges (i.e., “fair” or “poor” health). An estimated 37% of unemployed adults report long- or short-term illness as a reason for not working (Patterson, 2018). Attention challenges and visual hypersensitivity often go unnoted among adults who are eligible for adult education (Patterson, in press) and can potentially cause challenges to technology use.

Additionally, the intersection of geography and technology use for nonparticipants is unclear. In general, one-third of nonparticipants live in urban settings and another third in rural areas. However, for nonparticipants the

geographic balance shifts somewhat in two regions of the USA; half of nonparticipants in the Midwest and 40% of nonparticipants in the South live in rural areas (Patterson, 2018). Not all areas of the USA have consistent access to broadband internet connections, and mobile technology access continues to grow, sometimes unevenly (Carter, 2017). Patterson & Song (2018) cited adult nonparticipants in rural areas without internet access at all, for whom technology solutions to participating in adult education would not work. What is not yet known is whether nonparticipating adults in rural areas use technology to the same extent as those in urban areas.

Lastly, use of technology is growing in the workplace and influences skills that workers need (OECD, 2013). Nonparticipants in PIAAC report lower rates of employment, 53%, and high rates of unemployment, 12% (Patterson, 2018), so gaining technology skills is critical. “Both basic literacy proficiency and fluency with computer technology are important to employability” (Strawn, 2008, p. 16). Employed adults using technology in LSAL had consistently higher rates of literacy proficiency than those not using it, who had proficiency rates comparable with unemployed adults (Strawn, 2008). In PIAAC, Vanek (2017b) noted low performance of unemployed adults in technology, with more unemployed adults performing at Level 1 or below on digital literacy assessments than average.

Technology Use Findings

Findings in this report focus on which nonparticipants use technology, the extent to which they use it, and how they use it². Technology use in the CAPE survey refers specifically to getting online, pursuing online activities, and, if applicable, experiencing challenges that make online access more difficult. Using technology for learning refers to employing learning software on standalone computers, online learning, or using apps on a smartphone. Beginning with an overall analysis of nonparticipant technology use, findings include how many adults use technology, how they connect to the internet and access websites, challenges they face, and the extent to which a preferred way of learning incorporates technology. Following overall analyses, nonparticipant technology use is profiled for adults in four age groups of roughly 10-year increments.

Overall Nonparticipant Technology Use

According to CAPE survey responses, three-fifths of adult nonparticipants are currently online, and another fourth have been online previously (see Figure 1). Only 14% reported never having been online. When adult nonparticipants are online, more than half report the following activities:

- watching videos (71%),
- using social networking (61%),
- reading periodicals and books (60%),
- researching information about topics of interest (59%),
- e-mailing (52%, and
- playing games (52%)

Small percentages of nonparticipating adults reported learning basic skills like writing or math (17%) or learning English (5%).

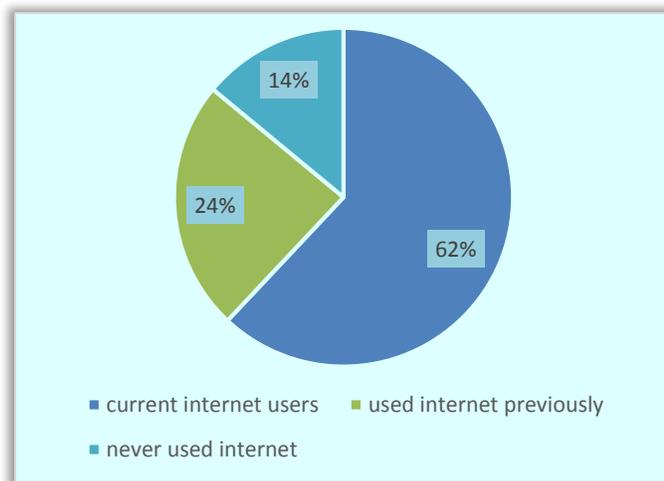


Figure 1. Technology use of CAPE respondents (N = 125)

² Survey items on technology connections, patterns of use, efficacy, challenges, activities, and ease of use came from Choi & DiNitto (2013). Items on use of technology for learning were developed from International Society for Technology in Education (ISTE) *Standards for Students* (2016).

How adults connect to the internet is also intriguing. The top way of connecting is through a smartphone (see Figure 2). Of those who are online, 9 in 10 get online through their smartphones; 73% connect “a lot” through smartphones and 16% do so “sometimes”. Three-fifths use a public computer (62%) or home computer (61%) sometimes or a lot, and half borrow a computer from a friend or family member (55%).

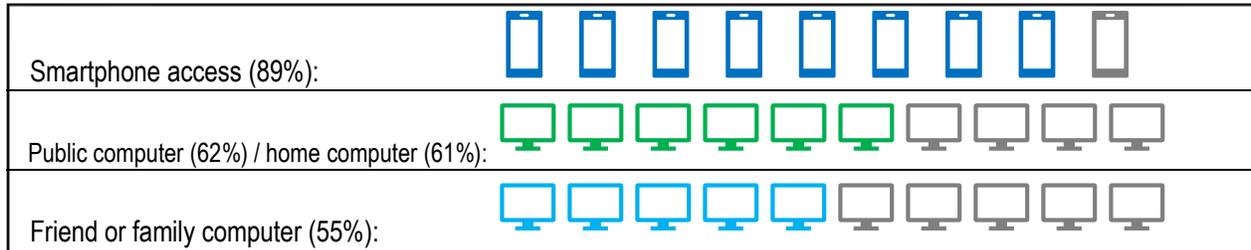


Figure 2. Ways CAPE respondents go online (n = 94)

Once online, 4 in 5 adult nonparticipants found it easy to locate a website and 3 in 4 to identify the information they need within a website. Nonparticipants perceived high technology efficacy, with a median score of 20 (ranging from 5 to 25 possible) on an efficacy composite of five statements³. More than three-fourths agreed or strongly agreed with 4 of 5 statements on technology efficacy, and 63% agreed or strongly agreed that “technology is not too complicated for me to understand.”

Getting online was not without challenges for numerous adult nonparticipants. The most frequently reported challenges were difficulty concentrating and eyes that tire easily, as displayed in Figure 3. A smaller percentage of nonparticipants reported difficulty sitting, pain in their limbs, and unsteady hands. Other challenges to getting online (7%) are physical – such as hand cramping, headaches, or lower back pain – or motion-related, including scrolling or spelling. One survey respondent wrote that being online “gets on my nerves.”

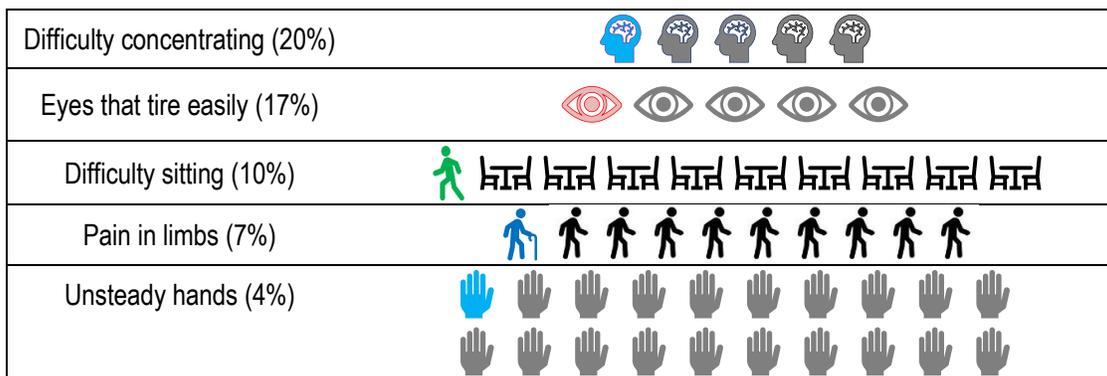


Figure 3. Challenges to technology use among CAPE respondents (n = 115)

Adults were also asked how they would most like to learn something new. As displayed in Figure 4, most of them would choose to learn by themselves, they reported, either using technology, through a book or other printed material, or with some help from a tutor. Smaller percentages of adult nonparticipants preferred working with others: face to face and via technology, only in a face-to-face group setting, or with others using only technology.

³ Items are presented in Appendix 2 (Choi & DiNitto, 2013).

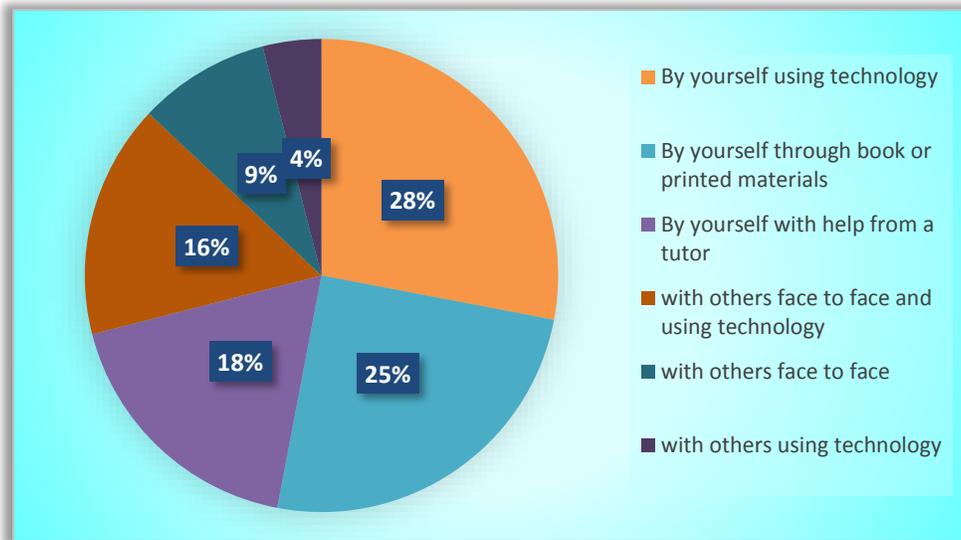


Figure 4. CAPE respondents' modal preferences for learning (n = 124)

Using technology for learning was a last CAPE survey topic. More than half of nonparticipants use technology as a tool to learn on their own (52%) and to employ what they already know to learn something new (58%). Two in five use technology to learn with other people (43%) and to solve problems with other people (40%)⁴.

Profiles by Age Group

For further analyses, CAPE respondent data were organized into age groups of approximately 10-year increments, representing more than 30 nonparticipants ages 18-27, 28-37, and 38-47, respectively. A fourth group included 24 adults from ages 48-76. Loosely following recent Pew Research Center guidelines (Dimock, 2018), age groups received generational names: young Millennials, older Millennials, Generation X, and Baby Boomers. For each group, descriptions of current factors of geography, employment, income, and health are shown in Figure 5 as context. In the first two age groups, gender was evenly balanced (53% women in each), but the Generation X group had 65% women, and the Baby Boomer group had 58% women. Nonparticipant technology use did not differ significantly by gender. More Baby Boomers lived in rural areas; younger groups were predominantly urban. Unemployment was high in all age groups, and older groups were out of the workforce more than younger groups. Income tended to increase with age. Rates of fair health increased from 13% of older Millennials to 21% of Generation X. One third of Baby Boomers reported fair health and another 8% poor health.

⁴ Six statements on use of technology for learning are in Appendix 2.

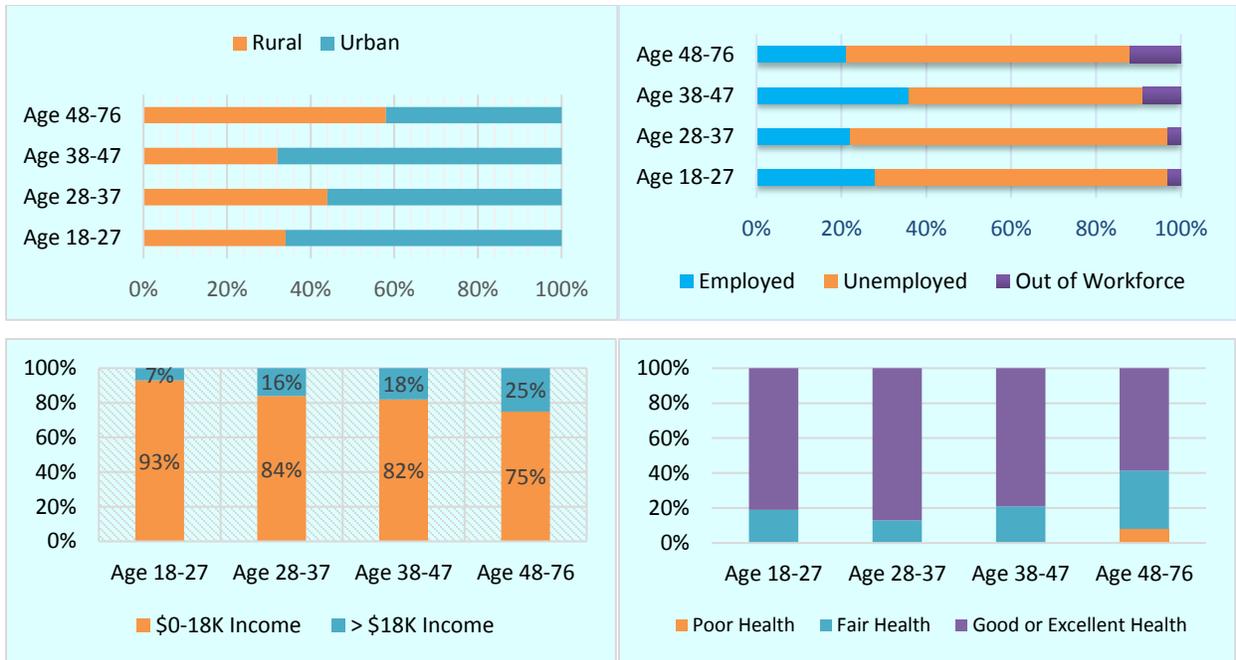


Figure 5. Demographics of CAPE respondents by age group (n = 32, 32, 34, and 24)

Online Connections, Activities, and Patterns of Use

CAPE surveys included items on online connections, activities, patterns of use, efficacy, challenges, ease of use (Choi & DiNitto, 2013), and use of technology for learning (ISTE, 2016). As reported earlier, most nonparticipants in CAPE were online and nearly all had been at some point. Connecting online had a slight negative correlation with age group, Spearman's $r = -.28, p < .01$. As shown in Figure 6, three-fourths of Millennials were currently online; Millennials had the highest rates of connecting online. Current connection rates decreased to 56% for Generation X and to 38% for Baby Boomers. Nearly all adults in the three youngest groups had been online at some point, even if they were not currently. However, one-third of Baby Boomers reported never having been online.

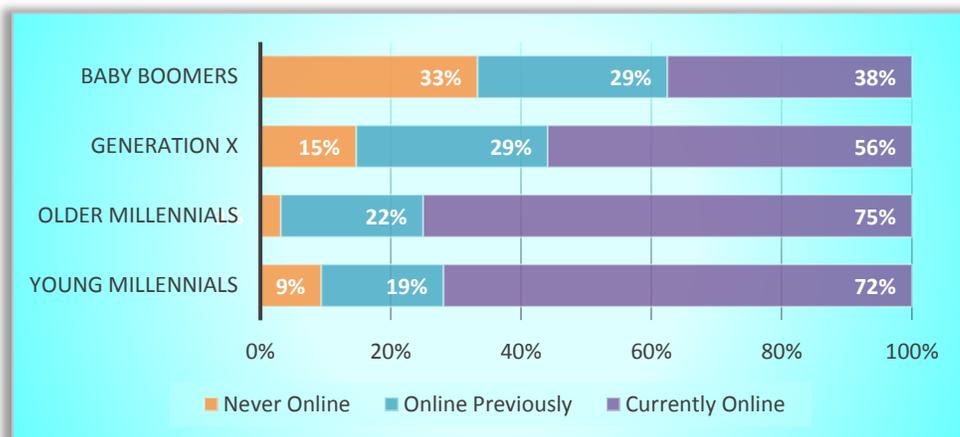


Figure 6. CAPE respondent online connections by age group (n = 32, 32, 34, and 24)

Without respect to age group, urban adults had slightly higher rates of online access (69%) than rural adults (50%), $\phi = .24, p < .05$. Also, unemployed adults were slightly less frequently online (55%) than employed adults (77%) or

those out of the workforce (75%), $\phi = .26$, $p < .05$. These differences in access may reflect, at least partly, the high proportions of Baby Boomers in rural areas or Baby Boomers' high rates of unemployment, respectively.

When adult nonparticipants were online, rates for pursuing the following activities did not vary significantly by age group and more than half of each age group generally reported doing them:

- reading periodicals and books,
- researching information about topics of interest,
- e-mailing, and
- playing games

Use of social media and videos occurred at significantly lower rates for older nonparticipants. Using social networking or dating sites, such as Facebook or Match.com, correlated negatively with age, Spearman's $r = -.40$, $p < .001$. Only 23% of Baby Boomers use social networking, compared with 88% of older Millennials. Watching videos online, such as You-tube, also correlated negatively with age, Spearman's $r = -.27$, $p = .001$. Only 39% of Baby Boomers watched videos, compared with 96% of older Millennials.

Small percentages of nonparticipating adults reported learning basic skills like writing or math, but the proportion varied significantly by age group, Spearman's $r = -.03$, $p < .01$. Approximately 1 in 5 Millennials and 2 in 5 Baby Boomers reported going online to learn basic skills, yet none from Generation X reported doing so (see Figure 7).

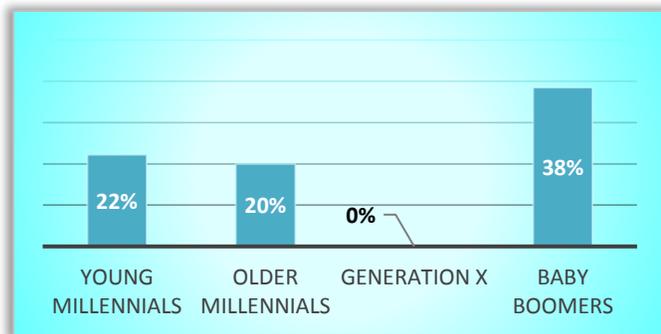


Figure 7. CAPE respondents learning basic skills online, by age group ($n = 27, 25, 26, 13$)

How adults connect to the internet on computers – whether their own, a public computer, or one lent by a friend or family member – is similar by age group. However, smartphone use decreased moderately with age, Spearman's $r = -.42$, $p < .01$. Nearly all Millennials and two-thirds of Generation X used smartphones for online access at least sometimes, but 20% of Generation X and 29% of Baby Boomers reported never going online on a smartphone (see Figure 8).

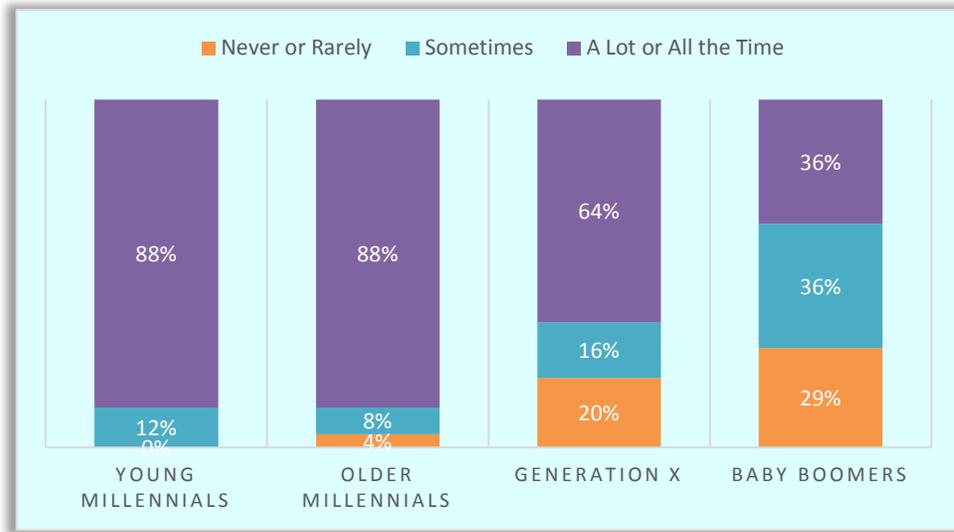


Figure 8. CAPE respondent online access via smartphone by age group (n = 26, 26, 25, 14)

Technology Efficacy, Challenges, and Ease of Use

Once nonparticipants accessed the internet, what technology efficacy, challenges, and ease of use did the four age groups experience? Although nonparticipants generally perceived high technology efficacy, as noted earlier, composite scores were higher for young Millennials (median = 21) and older Millennials (median = 24). Composite scores decreased significantly as age increased, $p < .01$, to a median of 20 for Generation X and to 19 for Baby Boomers.

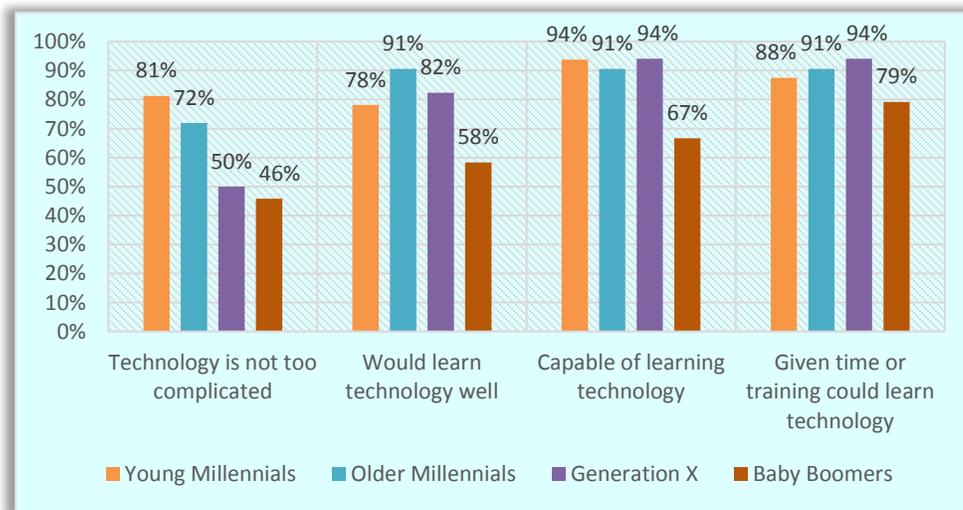


Figure 9. CAPE respondent technology efficacy by age group (n = 32, 32, 34, 24)

Responses to individual statements of technology efficacy also differed by age group, with the exception of the statement “I know that if I worked hard to learn about technology, I could do well.” Rates of agreeing or strongly agreeing that “technology is *not* too complicated for me to understand” decreased with increasing age, Spearman’s $r = -.32$, $p < .05$. Agreement rates also decreased with increasing age, as shown in Figure 9, for “I think I am the kind of person who would learn to use technology well” (Spearman’s $r = -.26$, $p < .05$), “I think I am capable of learning to

use technology” (Spearman’s $r = -.29, p < .01$), and “Given a little time or training, I know I could learn to use technology” (Spearman’s $r = -.16, p < .05$). Proportionately fewer nonparticipants from Generation X and Baby Boomers agreed that technology is not too complicated, when compared with Millennials. In the remaining three statements, Generation X adults had comparable rates of agreement as did Millennials. Although Baby Boomers tended to have doubts about learning technology, their rate of agreement with the final efficacy statement on “given a little more time or training I know I could learn to use technology” approached that of the other groups, indicating they perceived they could learn to use technology with support.

Somewhat unexpectedly, physical challenges adults faced to using technology did not vary significantly by age. Adults in all age groups reported comparable rates of challenges such as difficulty concentrating or sitting for long periods of time or eyes that tire easily. These top three challenges were experienced at high rates by adults with fair health, 31% of those with fair health reported difficulty concentrating, 27% difficulty sitting, and 31% eyes that tire easily.

Ease in finding a website also decreased with rising age, Spearman’s $r = -.31, p < .001$. Although Millennial adults tended to have little difficulty locating a website, 10% of Generation X found it “kind of hard”, and 40% of Baby Boomers found it “kind of hard” or “very hard” to do so. Locating information within a website was also harder with increasing age, Spearman’s $r = -.31, p < .01$. As shown in Figure 10, some Baby Boomers struggled to locate the information they need within a website.

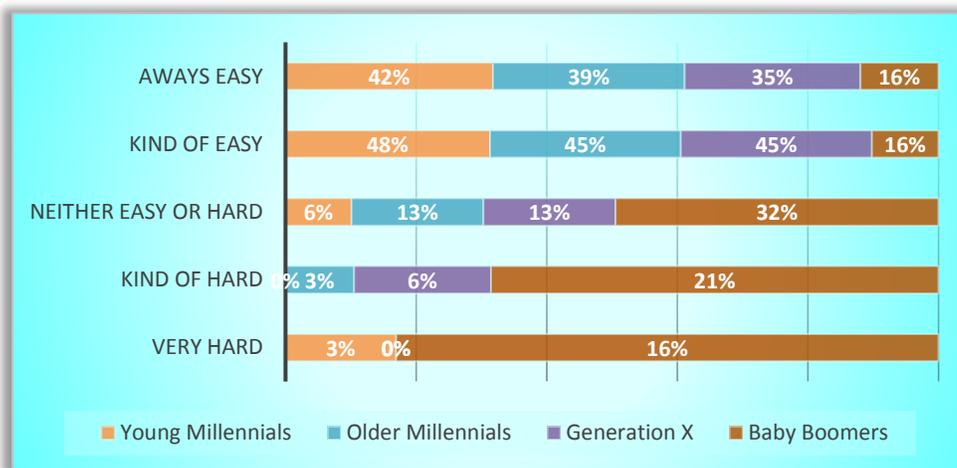


Figure 10. CAPE respondent ease locating information within websites by age group (n = 31, 31, 31, 19)

Use of Technology for Learning

How nonparticipating adults use technology to learn across the lifespan is important to developing responsive adult education programming and outreach. Adults were asked how familiar they were with using technology for learning and how often they used it in six statements⁵. As shown in Figure 11, significant generational gaps occurred in nonparticipant responses. A moderate gap in familiarity and use occurred between Millennials and the two oldest groups in using technology as a tool to learn on their own, with Millennials use and familiarity higher than those of Generation X or Baby Boomers, Spearman’s $r = -.45, p < .001$.

⁵ Six statements on use of technology for learning are in Appendix 2.

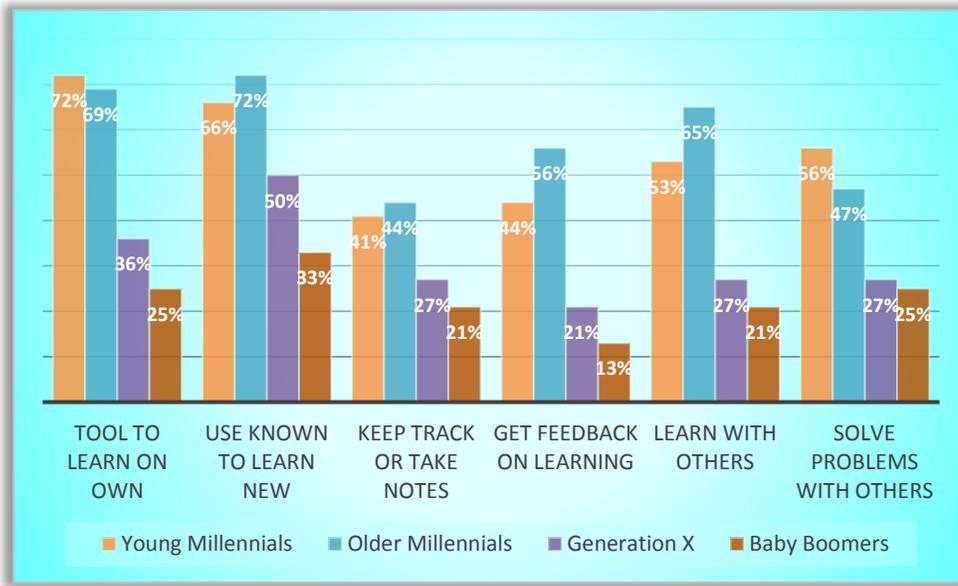


Figure 11. CAPE respondents' familiarity with and use of technology for learning by age group (n = 32, 32, 34, 24)

The gap with Millennials persisted in using what nonparticipants already knew to learn something new but was less pronounced in Generation X adults and slightly less in Baby Boomers, Spearman's $r = -.29, p < .05$. Using technology to keep track of or take notes on learning, or to get feedback on learning, occurred less often for all age groups but particularly for Baby Boomers, Spearman's $r = -.33, p < .001$ for notes and Spearman's $r = -.32, p < .01$ for feedback. Although neither group exceeded 60%, older Millennials reported the highest rate of learning with others, Spearman's $r = -.32, p < .01$, and young Millennials the highest rate of solving problems with others, Spearman's $r = -.31, p < .01$. Under 3 in 10 Generation X and Baby Boomers reported learning with or solving problems with others through technology.

Two socially related benefits of technology use and familiarity occurred for former adult education participants, specifically in learning with others through technology and getting feedback on learning via technology. Regardless of age group, more former adult education participants used technology to get feedback on what they learn (45%) than those who never participated (32%), $\phi = .24, p < .05$. Proportionately more former adult education participants also used technology to learn with other people (58%) than those who never participated (38%), $\phi = .21, p < .05$. This difference may be partly explained by the fact that the highest rate of former adult education participation was among older Millennials.

A final question by age group related to use of technology for learning is modal preference in learning. Although at least some of all age groups indicated interest in blended learning or learning on their own via technology (see Figure 12), very few nonparticipants preferred learning with others via technology, and stronger preferences were apparent by age. With the exception of Generation X, most nonparticipants indicated a preference to learn on their own rather than with others. Approximately 2 in 5 Millennials indicated preferring to learn on their own through technology, the highest rate of modal preference for both young and older Millennials. Very few Millennials preferred to learn in small groups without technology or with others *with* technology.

Generation X adults most often expressed wanting to either learn by themselves with help from a tutor or learn in a small group, both modes *without* technology. Half of Baby Boomers reported preferring to learn by themselves with a book or other printed materials. It is important to note that the survey item on modal preference for learning asked nonparticipants to select one way of learning they would *most* like and did not rank modes; numerous

adults initially checked multiple modes and when asked to select one, replied, “But I want them all [that are checked]!”

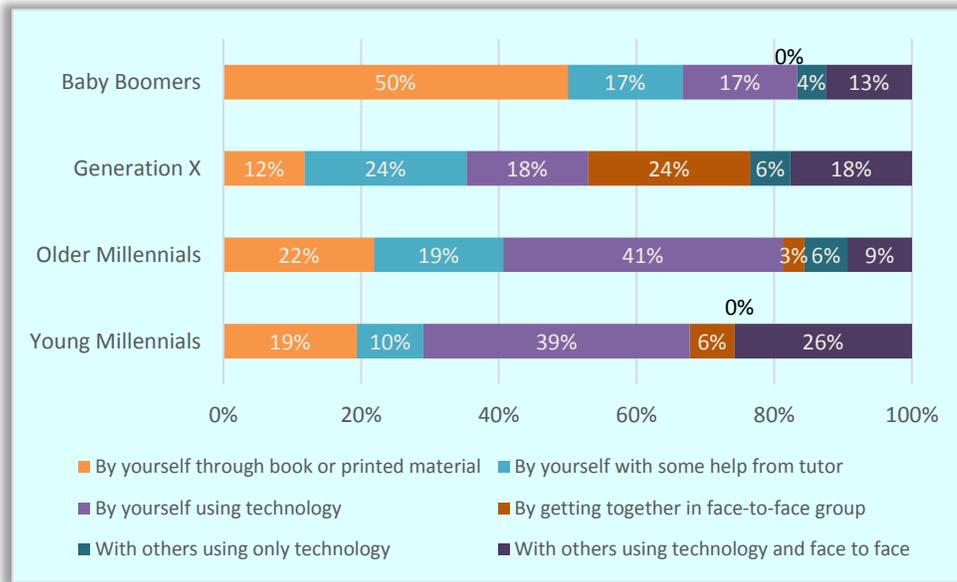


Figure 12. CAPE respondents' modal preference for learning by age group (n = 32, 32, 34, 24)

Conclusions and Recommendations

Most adult nonparticipants are currently online; the high rate of technology use is encouraging. Access is not even across generations, however. Current connection rates decreased for Generation X and Baby Boomers and one-third of Baby Boomers reported never being online. These differences in access may reflect, at least partly, the high proportions of Baby Boomers in rural areas or Baby Boomers' high rates of unemployment. Given that the national nonparticipant median age is 45 to 49 years (Patterson, 2018), these findings indicate the presence of a significant digital divide for many middle-aged and older adults. Policymakers seeking to encourage access to technology for potential or current adult learners need to ensure that policies do not inadvertently discriminate against middle-aged and older adults.

Furthermore, adults in rural areas and unemployed adults were online at lower rates than adults in urban settings, employed adults, or those out of the workforce, respectively. Adult education programming and outreach initiatives that seek to involve nonparticipants through technology need to be aware that substantial portions of the target population will not be online (Carter, 2017) and must be reached through other modes. Also, nonparticipants with limited means who cannot afford broadband internet or who have basic mobile technology data plans are restricted in access to technology and thus learning through technology. Using mobile data extensively uses up a data plan's capacity, especially when doing so without a wireless router that mobile-only users likely lack. Policymakers need to ensure that policies do not inadvertently discriminate against those without means to access broadband internet or unlimited mobile data plans. This assurance is particularly critical to adults in rural areas and those experiencing unemployment.

Of those who are online, regardless of purpose, 9 in 10 get online through their smartphones, especially Millennials and Generation X. Despite Carter's (2017) concern about uneven smartphone access, these findings indicate that smartphone apps have potential to increase access to technology for nonparticipant adults, which bodes well for national mobile technology initiatives such as the 2018 adult literacy XPrize competition (Vanek, 2017a). Still, smartphone apps are not a panacea, especially for middle-aged and older adults. Many Baby Boomers would need

further support to locate websites and information in them. While their technology efficacy is high, and they believe that they could learn to use technology, nonparticipants were clear that it needs to happen with sufficient support. Nonparticipant recommendations on solutions through technology are offered in Patterson and Song (2018).

How nonparticipating adults use technology to learn across the lifespan is informative to adult educators in developing responsive adult education programming and outreach. A moderate gap in familiarity and use occurred between Millennials and the two oldest groups in using technology as a tool to learn on their own and to apply what nonparticipants already knew to learn something new. Older Millennials reported the highest rate of learning with others and young Millennials the highest rate of solving problems with others. Under 3 in 10 Generation X and Baby Boomers reported learning with or solving problems with others through technology. Additionally, at least some of all age groups indicated interest in blended learning or learning on their own via technology, very few nonparticipants preferred learning with others via technology, and most nonparticipants indicated a preference to learn on their own rather than with others. At the same time, 1 in 5 Millennials and 2 in 5 Baby Boomers go online to learn basic skills such as writing or math. This finding indicates both a desire on the part of some nonparticipants to learn basic skills and an opportunity for adult education programs to tap into that desire through outreach. Taken together, findings imply that, as potential adult learners, many middle-aged and older adults have a desire for more basic skills, but most would require extensive orientation and support to participate successfully in blended learning or problem-solving opportunities with other adult learners. Being able to adapt to change is especially relevant for these adults (OECD, 2013).

Adult educators also need to be aware of and prepared to deal with physical challenges nonparticipating adults of all ages face to using technology, as well as their intersections with fair or poor health. Being on the lookout for new adult learners who have difficulty concentrating or sitting at a monitor for a long time or who appear to have eye strain, for instance, will inform adult educators on steps they and learners can take to make using technology more comfortable. Prospective learners may need referrals to specialists for diagnosis of attention, learning, or vision challenges (Patterson, in press). Those who plan policy need to ensure policies do not inadvertently deter adults with technology challenges from participating in programming.

The findings on former adult education participants were also promising. More former adult education participants, many of whom were older Millennials, used technology to get feedback on what they learn and to learn with other people, than those who never participated. While former participants may not have an advantage over nonparticipants in accessing technology (Strawn, 2008), being able to use technology for these purposes will serve them well if they can be recruited into adult education again. Offering learning opportunities with others and providing feedback through technology may encourage these former adult learners to return to adult education.

References

- Carter, J. (2017). Expanding access to learning with mobile digital devices. *Journal of Research and Practice for Adult Literacy, Secondary and Basic Education*, 6(2), 49-54.
- Choi, N. G., & DiNitto, D. M. (2013). The digital divide among low-income homebound older adults: Internet use patterns, ehealth literacy, and attitudes toward computer/internet use. *Journal of Medical Internet Research*, 15(5), e93. <http://doi.org/10.2196/jmir.2645>
- Dimock, M. (2018). *Defining generations: Where Millennials end and post-Millennials begin*. Retrieved from <http://www.pewresearch.org/fact-tank/2018/03/01/defining-generations-where-millennials-end-and-post-millennials-begin/>
- Gregg, N. (2013). Adults with learning disabilities: Factors contributing to persistence. In H. L. Swanson, K. R. Harris, & S. Graham (Eds.). *Handbook of Learning Disabilities*. New York, NY: Guilford Press.
- International Society for Technology in Education. (2016). *ISTE Standards for Students*. Arlington, VA: ISTE.
- Knowles, M. S., Holton, E. F., & Swanson, R. A. (2015). *The adult learner: The definitive classic in adult education and human resource development*. 8th Ed. London, England: Routledge.
- OECD (2013). *OECD skills outlook 2013: First results from the Survey of Adult Skills*. OECD Publishing. Retrieved from: <http://dx.doi.org/10.1787/9789264204256-en>
- Patterson, M (2018). The forgotten 90%: Adult nonparticipation in education. *Adult Education Quarterly*, 68(1), 41-62.
- Patterson, M. B., & Song, W. (2018). *Critiquing Adult Participation in Education, report 1: Deterrents and Solutions*. Media, PA: VALUEUSA. Retrieved from <http://valueusa.org/projects>
- Patterson, M. B. (in press). Adults with low skills and learning disabilities. *Handbook of Adult Literacy*.
- Prins, E., Monnat, S., Clymer, C., & Toso, B. W. (2015). How is health related to literacy, numeracy, and technological problem-solving skills among U.S. adults? Evidence from PIAAC. *Journal of Research and Practice for Adult Literacy, Secondary, and Basic Education*, 4 (3), 22-43.
- Quigley, B. A. (2017). Will anything be different in the 21st century? How 107 million adults and the field of adult literacy became so marginalized. *PAACE Journal of Lifelong Learning*, 26, 39-54.
- Smith, M. C. (2009). Literacy in adulthood. In M. C. Smith & N. DeFrates-Densch (Eds.), *Handbook of research on adult learning and development* (pp. 601-635). New York, NY: Routledge.
- Strawn, C. (2008). *The relationship between literacy proficiency and the digital divide among adults with low education attainment: A technical report from the Longitudinal Study of Adult Learning*. Portland, OR: Portland State University.
- Tyton Partners. (2015). *Learning for life: The opportunity for technology to transform adult education*. Retrieved from http://tytonpartners.com/tyton-wp/wp-content/uploads/2015/03/Learning-for-Life_The-Oppty-for-Tech-to-Transform-Adult-Education_March-20151.pdf
- Vanek, J. (2017a). Response to "Expanding Access to Learning with Mobile Digital Devices." *Journal of Research and Practice for Adult Literacy, Secondary and Basic Education*, 6(2), 59-62.
- Vanek, J. (2017b). *Using the PIAAC framework for problem solving in technology-rich environments to guide instruction: An introduction for adult educators*. Retrieved from https://edtech.worlded.org/wp-content/uploads/2017/09/PSTRE_Guide_Vanek_2017.pdf

Appendix 1: Methods

Interview Sites

In keeping with recommendations from *The Forgotten 90%* (Patterson, 2018), 17 interview sites were selected in Southern states (Florida, Louisiana, and Virginia) and Midwestern states (Kansas and Ohio). The author expresses deep gratitude to the many adult educators, employment officials, and non-profit administrators who recognized the importance of CAPE and recruited and hosted adults for the research⁶. In all they recruited 135 adults. In addition to administering individual surveys, researchers⁷ conducted 25 group interviews and 4 individual interviews. Six interview sites, with 75 adults, were in urban areas. Eleven sites, with 50 adults, were in rural areas.

CAPE Participants

In all, 135 adults were recruited for CAPE research⁸; final sample size was 125 adults. All adults left school early or indicated education outside USA; median education level was between grade 10 and 11 and ranged from “finished grade 6” to “went beyond high school”. Although 1 in 4 had some prior experience with adult education programming, three-fourths (75%) had never participated in adult education. Of those in adult education previously, most (63%) participated less than a year, with 1 in 4 (27%) participating one to two years and 10% two to five years.

The median age was 35 years, with a range from 18 to 75 years. By gender, 43% were male and 57% female. Ethnically, 75% were African-American, 22% European-American, and 3% Latino-American. Nearly all (97%) grew up speaking English in the USA. Geographically, the majority lived in urban areas (60%) in Florida, Kansas, Louisiana, or Ohio, with 40% living in rural areas in Louisiana or Virginia. Adults experienced median “good” health, yet 23% reported fair or poor health. Interviewees included parents, seniors, homeless adults, formerly incarcerated adults, recovering addicts, adults with disabilities, and elder caregivers.

Annual personal income was at poverty levels, with 84% earning \$0 to \$18,000 annually and another 10% earning \$18,001 to \$36,000 annually. Three percent earned more than \$36,000 and 3% did not know their income. A small proportion of adults was employed (27%), with two-thirds (66%) unemployed and 7% out of the workforce. Those who were employed most often worked part time, up to 30 hours weekly (44%), or fulltime (31 to 40 hours; 42%), with only 14% working more than 40 hours weekly.

Interview Research

Interview site visits lasted approximately 90 minutes. During site visits, researchers welcomed adults and introduced the CAPE project. They passed out, explained, and collected informed consent forms. The consent form explained the purpose and process of this study and allowed participants to opt out of being audio recorded to photographed during the group discussion. Each adult was offered a \$25 gift card as incentive. Researchers then

⁶ In chronological order, sincere thanks go to Marty Finsterbusch, VALUEUSA, for recruitment design and referrals; to Donnie Spangler in Salem, Virginia, for hosting pilot research; to Liz Lanphear and Nelson Gabriel in the Kansas City metro area for recruitment and hosting; to Patricia Tyler, NAEPDC, Kaye Sharbono, COABE, and Greg Smith, Florida Literacy Coalition, for their referrals to states and programs; to Terri Mitchell, Katie McCarty, Doretha Bennett, and Whitley Parker in Winnsboro and Monroe, Louisiana, for recruitment, numerous arrangements, and hosting; to Bonnie Entler and Bob McFeeley in Cleveland, Ohio, for partner recruitment and hosting; and to Carla Cox in Orlando, Florida, for recruitment and hosting.

⁷ The CAPE project research team included: Margaret Patterson, Wei Song, Cynthia Campbell, Usha Paulson, Laura Weisel, Wyatt Patterson, and Mary Ann Kleintop.

⁸ Under CAPE’s design, 10 adults were ineligible because of current adult education participation.

administered a 22-item survey that took adults 10-15 minutes to complete. The survey collected information on adult education background, motivation, technology use, and demographics.

Data Analyses

Quantitative survey data were double entered into Excel from paper surveys and reconciled. Data were transferred to SPSS 24 for descriptive analyses. Cross-tabulations were conducted, with Spearman's *r* indicating the effect size for significant differences between age group rankings and *phi* the effect size for significant differences in nominal comparisons, such as employment status or geography. All analyses were descriptive and causality should not be inferred.

The Cronbach's alpha coefficient for internal reliability of using technology for learning items was very high (0.91, *N* = 123). Composite scores were created for technology efficacy by summing the five efficacy items in Appendix 2. Composite scores ranged from 5 to 25. The Cronbach's alpha coefficient for internal reliability of technology efficacy subscale was high (0.81, *N* = 125)⁹. Score medians were calculated because of negative skew, and significant differences between disaggregated groups were determined through Kruskal-Wallis significance testing.

⁹ For comparison purposes, Choi and DiNitto (2013) reported internal reliability coefficients for the efficacy subscale as Cronbach alpha=.85 for those under age 60 and .92 for those age 60 and up.

Appendix 2: CAPE Survey Items on Use of Technology for Learning and Technology Efficacy

For this section, questions ask you how familiar you are with using technology for learning. The technology can be learning software on a stand-alone computer, online learning, or apps on your smart phone. **(Please mark one answer for each row):**

	I've never done it 	I know how to do it but rarely use it 	I use it a lot and am very familiar with it 
I use technology as a tool to learn on my own	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use technology to use what I already know to learn something new	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use technology to keep track of or take notes on what I learn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use technology to get feedback on what I learn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use technology to learn along with other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use technology with other people to solve problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Item source: ISTE Standards for Students (2016).

For this section, we ask you how much you agree with the following statements on using technology. **(Please mark one answer for each row):**

	Strongly disagree 	Disagree 	Neither disagree nor agree 	Agree 	Strongly agree 
I know that if I worked hard to learn about technology, I could do well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technology is not too complicated for me to understand.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think I am the kind of person who would learn to use technology well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think I am capable of learning to use technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Given a little time or training, I know I could learn to use technology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Item source: Efficacy subscale of *Attitudes Toward Computers Questionnaire* (Bear, Richards, & Lancaster, 1995) in Choi & DiNitto (2013), as revised.