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A Look at External Political Efficacy and the Role of Digital Skills in the Adults U.S. Population

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A Look at External Political Efficacy and the Role of Digital Problem-Solving Skills in the U.S. Adults Population

Abstract

The ability to effectively use digital technology and problem-solve are critical skills for maintaining democratic health, particularly as civil society and the modern digital landscape continuously evolve. However, information on whether individuals have the critical problem-solving skills to use digital technology and confidently affect change is yet to be further explored. Using data from the 2017 Program for International Assessment of Adult Competencies (n = 2,749), we examined the associations between digital problem-solving skills and the three levels (low, neutral, high) of external political efficacy in the U.S. adult population. We used multinomial logistic regression and found a positive association between digital problem-solving skills and external political efficacy, while explanations for the three levels of efficacy are nuanced. Continuous development of digital problem-solving skills through adult education has implications for political efficacy, and ultimately for the promotion of a variety of civic engage8ment in the adult life stages.

Keywords: PIAAC; politics; digital divide; adult population; civic engagement

Introduction

The interrelationships between political efficacy—perception of one's ability to influence the government and to affect political change (Campbell et al., 1954)—and digital skills have been receiving increasing attention in the U.S. According to the National Conference on Citizenship's Civic Health Index 2021 report, the health of American civil society has been steadily declining since the mid-1960s. The rise of digital technology has mixed influences on democratic attitudes and behaviors (Atwell et al., 2021). However, in part due to the lack of digital skills, more online information users are exposed to and believe in conspiracy theories, which demote political participation and democracy (Xiao et al., 2021). Therefore, to better understand, promote, and maintain civic health, this study examines the association between political efficacy and digital skills among the U.S. adult population.

Literature Review

Political efficacy: What is it, and why is it important?

Political efficacy is referred to as an individual's confidence in their ability to influence the political process and affect change (Campbell et al., 1954). There are two dimensions of political efficacy: (1) *internal efficacy*, which is referred to as an individual's belief that they are competent and capable of understanding and participating in politics, and (2) *external efficacy*, which is referred to as an individual's belief that political institutions are competent and capable of positively changing in response to

citizens' needs (Craig & Maggiotto, 1982). Individuals who believe that the political system is responsive to their needs (external efficacy) are also likely to believe that they are politically competent and have the skills to affect change (internal efficacy) (Linde & Peters, 2020). Therefore, political efficacy is one of the major contributors to maintaining democracy, participating in civil society, and nurturing individual well-being (Campbell et al., 1954; Chan et al., 2020; Prats & Meunier, 2021). As previous research shows, a range of education programs (e.g., civic education, service learning) and how these are taught have significant impacts on political efficacy and participation in general and among historically underrepresented populations, in particular (Willeck & Mendelberg, 2022).

Political efficacy and digital problem-solving skills

Digital technology is continuously evolving and embedded in almost all facets of daily living, including how individuals choose to communicate, learn, work, and even engage with politics (OECD, 2020). Yet, the digital landscape is not inclusive of all people, and certain sub-populations with limited digital skills, as well as other foundational skills (e.g., literacy), may struggle with political efficacy and involvement (Grotlüschen, 2018; Prats & Meunier, 2021; Saal et al., 2020). Therefore, given the changes in the digital and political landscapes, it is important to monitor determinants of political efficacy like information-communication-technology (ICT) and digital problem-solving skills.

At the same time, measures of ICT skills in household-level social surveys are often based on self-reported access to the Internet and electronic devices, along with the usage of ICT utilization patterns (United Nations ICT Task Force, 2005). Individuals are also known to overestimate their ICT skills, and as such, limited empirical evidence is available on political efficacy and objective measures of digital skills among U.S. adults (Palczyńska & Rynko, 2021). Thus, addressing the measurement challenge of digital skills in relation to political efficacy at the population level is needed. In this respect, one of the national data—the Program of International Assessment of Adult Competencies (PIAAC)—provides a unique opportunity to analyze the systematically assessed digital problem-solving skills.

The PIAAC digital problem-solving skill is defined as the ability to "[use] digital technology, communication tools, and networks to acquire and evaluate information, communicate with others, and perform practical tasks" (OECD, 2009). Unlike ICT skill, which often focuses on self-reported usage, digital problem-solving skill focuses on the cognitive ability to construct goals and strategies to solve problems using diverse digital tools and resources. For example, the ability to make meaning of symbolic digital information like text, graphics, icons, commands, and Web pages and to utilize tools like email, chat/messaging features, and software applications to express new information to others are the components of PIAAC digital problem-solving skills. In short, the digital landscape and political issues can no longer be separated in contemporary societies, and digital skills, which can be seen as the specific ICT skills built on fundamental literacy

skills, play a significant role (a.k.a., critical online media literacy) to find, understand and use political information online and engage in political activities (Radovanović et al., 2015).

Political efficacy, education, skills, and other related factors

Formal education is a known determinant of political efficacy (Prats & Meunier, 2021; Schulz, 2005). While formal education is generally segmented throughout the early stages of life, skills can be acquired beyond formal education and throughout the life course, promoting continuous civic and political outcomes (Grotlüschen, 2018; Vera-Toscano et al., 2017). According to the "Skills Matter" report that uses the PIAAC data (OECD, 2016), digital skills are positively associated with political efficacy. Other sociodemographic and economic characteristics, including age, gender, race and ethnicity, income, and health are also known to contribute to political efficacy (Goerres, 2007; Gothreau, 2020; Igielnik, 2020). Language barriers and cultural backgrounds may also explain differences in political efficacy between immigrant versus native-born individuals in the U.S. (Rose et al. 2019).

The use of PIAAC in other studies on political efficacy

The study of political efficacy is not necessarily a new phenomenon, yet the use of population-level data like PIAAC is still scarce (Grotlüschen, 2018; Prats & Meunier, 2021; Rhodes et al., 2019; Rose et al., 2019; Saal et al., 2020). The PIAAC data are presumably the only recent data that include the systematically assessed digital problem-solving skills and political efficacy at the population level in the U.S. Indeed, most

previous studies analyzed case study data (Barnett, 2018; Chan et al., 2020). Even though several studies that used the PIAAC data have made significant contributions to the literature, other important areas of inquiry are yet to be explored, using different methodological approaches to expand underlying interpretations.

To start, political efficacy is generally measured using a Likert-type scale (Rose et al., 2019), or as a dichotomous measure (e.g., high versus low political efficacy) (Grotlüschen 2018; Authors, 2020). Dichotomizing political efficacy as either high versus low limits the interpretation of the neutral category by placing the neutral category in one of the two categories or dropping the neutral category entirely from the analysis. For example, Authors (2020) dichotomized high and extremely high political efficacy as having political efficacy (yes), and low, extremely low, and neutral as no political efficacy. However, Grotlüschen (2018) noted that there is a difference between those who have low political efficacy versus those who are politically indifferent. In this respect, explicit inclusion of the neutral category may address the measurement and interpretation gap in the literature, and therefore, our study adopted the unexplored measurement approach of three-level (i.e., low, neutral, and high) political efficacy measure.

Theoretical Framework

We applied the three capital theoretical framework of learning as developed by Schuller et al. (2004) for the present study. The three capital framework proposes that individuals cultivate their assets (human, social, and identity capitals) through learning and, in return, benefit from these assets in the form of positive health, family life, and

civic life. *Human capital* is defined as the knowledge and skills possessed by an individual to participate in social life and foster economic well-being (Becker, 1993). *Social capital* signifies the social networks, norms, and expectations that an individual has as a means of achieving goals and contributing to civil society. *Identity capital* refers to an individual's sense of self and their understanding of their reality across the life course (Schuller et al. 2004). Our operationalized model (Figure 1) depicts the three capitals in the form of a triangle (as cited in Schuller et al. 2004:13). Although Figure 1 only includes our variables of interest, the items within the triangle are linked to the determinants of civic participation (Conely & Cordie, 2023; Grotlüschen, 2018).

We argue that the process of digital skill acquisition (a form of human capital), and one's confidence to affect the political process (forms of identity and social capital) fit within the scope of Schuller et al.'s framework. Existing frameworks like rational choice theory, social capital theory, and civic voluntarism (Pattie et al., 2003) often explore these three capitals in silos. Therefore, this integrated three-capital framework, which extends the existing literature in view of the more nuanced interpretation, is suitable for this study because the series of individual characteristics jointly shape individuals' behavioral outcomes like learning, skills acquisition, and political efficacy (Saal et al., 2020).

Research Hypothesis

To address the limited number of population-level studies, unexplored measurement approaches and interpretation gaps, we examined the association between

the three levels of external political efficacy (i.e., low, neutral, high) and systematically assessed digital problem-solving skills. Specifically, our research question (RQ1) is: *Are digital problem-solving skills associated with the three levels (low, neutral, and high) of external political efficacy in the U.S. adult population?* We hypothesize that higher digital problem-solving skills are associated with greater political efficacy because of their abilities to acquire and evaluate relevant information within the dynamic political and digital landscapes in the U.S. The conceptual model of this study is shown in Figure 2.

Method

Data

We used data from the 2017 PIAAC U.S. household public use files (NCES, 2019a). PIAAC is a large-scale assessment of the adult basic skills (e.g., literacy, numeracy, and digital problem-solving) across OECD countries. For the PIAAC U.S. household data include the samples from noninstitutionalized adults aged 16 to 74. To measure individuals' digital problem-solving skill proficiency, PIAAC administered an interactive computer-based assessment that simulates the use of computer applications, commands, and functions commonly found in technology-related settings (e.g., emails, web pages, word processors, spreadsheets). However, only individuals who had prior experience with computers and minimum required performance in the ICT-Core module were eligible for the digital problem-solving assessment in PIAAC. Thus, out of the 3,660 respondents in the 2017 PIAAC data, 2,872 respondents (cases missing [n = 788 or

21.5%]) completed the digital problem-solving skill assessment. It should be noted that the missing digital problem-solving skill assessment is by the study design in the PIAAC (OECD, 2013). Of the 2,872 respondents, 5 respondents or 0.02% of respondents did not respond to the political efficacy question on the assessment. After excluding the number of respondents who did not have the political efficacy measure, and/or any of the covariates, our final analytic sample size was 2,749 (cases missing [n = 123 or 4.3%]). Except for the cases with missing digital problem-solving assessment by the screening process, no systematic patterns of missingness were observed.

Variables

Outcome variable. Political efficacy is our outcome of interest. In PIAAC, the respondents were asked to what extent they agreed or disagreed with the following statement: “People like me don’t have any say about what the government does.” The Likert-type response categories included strongly agree to strongly disagree (1-5), which indicated low to high political efficacy. We re-organized the response categories into three levels, including low (strongly agree and agree), neutral (neither agree nor disagree), and high (disagree and strongly disagree) political efficacy, based on the conceptually meaningful classifications and frequency distributions. Specifically, the neutral category is often arbitrarily classified as either lower or higher political efficacy. In addition, the neutral category is not in alignment with the natural continuation or transition between agreeing and disagreeing. For example, “neither agree nor disagree” can be interpreted as being unable to assess one’s political efficacy or being uninterested

in political engagement. This study adopted the self-reported external political efficacy (Saal et al., 2020).

Predictor variable. Digital problem-solving skill is our predictor of interest. PIAAC provides measures of digital problem-solving skill in the set of 10 plausible values with scores ranging from 0 to 500. Digital problem-solving score plausible values are estimated using the item response theory (IRT), based on the respondents' performance on the computer-based assessment in PIAAC (see the OCED's 2013 technical report). Examples of the assessment items include adjusting computer system settings to creating text files or graphics based on instructions found in emails and attachments. For further details regarding the methodology and the sample items of the digital problem-solving skills component of the PIAAC assessment, see the OECD's 2013, or the NCES's 2019 technical reports (NCES, 2019b; OECD, 2013). It should be noted that PIAAC digital skill proficiency is often reported in four levels (below level 1, & levels 1-3). Detailed descriptions of each digital skill level have been published elsewhere (National Center for Education Statistics, 2013). Our review of the PIAAC digital skill level description suggests that proficiency level 2 (Score 291-340) is required for complex digital skill use for political information-seeking and participation.

Covariates. Age was recorded in 10-year intervals as 16-25, 26-35, 36-45, 46-55, 56-65, and 66-74. Gender was dichotomized as women versus men (reference group). Race/ethnicity was classified into four variables: Black, Hispanic, or other race and ethnicity, and White (reference group). Nativity was measured as U.S. born versus

foreign born (reference group). Employment was measured as employed versus “not employed” (not in the labor force and unemployed: reference group). Income is the decile indicating income level 1 to 10. PIAAC does not provide the income information of individuals who are not employed, and as such, non-employed adults were categorized into the lowest income decile in the present study. We dichotomized individuals’ educational attainment as having completed a college degree (a minimum of an associate degree) or higher versus less than a college degree (reference group). Parent/guardian’s educational attainment was dichotomized similarly to individuals’ educational attainment where at least one parent (mother/female guardian or father/male guardian) had a completed college degree (a minimum of an associate degree) or higher versus less than a college degree (reference group). The number of household members was kept as a continuous variable. Finally, individuals’ self-reported health was measured on a scale of 1 to 5: poor to excellent health.

Analytic Plan

We used IDB Analyzer version 4.0.14 (IEA 2017) and SAS version 9.4 for all data analyses (Copyright © 2013, SAS Institute, Inc.). The IDB Analyzer generates the SAS macro program that incorporates the sampling weights, replicate weights, and plausible values into the estimations in the nationally representative descriptive summary and statistical models. We estimated the weighted descriptive statistics and conducted bivariate significance tests by low, neutral, and high political efficacy. To address the research question, we used multinomial logistic regression (DeMaris, 2004). Multinomial

logistic regression is a form of generalized linear models for outcome variables with more than two unordered response categories. Although we considered alternative models, such as in a linear regression and binary logistic regression, we adopted the multinomial regression as the most suitable model due to the distributional assumption and type 1 error rates (DeMaris, 2004).

Upon the examination of unconditional model without the covariates, we constructed a fully conditional model (see Figure 2). We evaluated the predictive accuracy of the model by using the area under the receiver operating characteristic (AU-ROC) and the Hosmer and Lemeshow (2013) criteria (> 0.70 = acceptable; > 0.80 = excellent; > 0.90 = outstanding predictive accuracy). Given that the model evaluation strategies of multinomial logistic regression are limited, we conducted three binary logistic regression models for all variables of interest in which the outcome variables were operationalized as low versus high, neutral versus low, and high versus neutral political efficacy, and then applied the AU-ROC and Hosmer and Lemeshow criteria. Although our final models showed slightly lower AU-ROC (0.60 – 0.65) than the conventional criteria, we presented the findings as the baseline findings. Finally, we examined the variation inflation factor (VIF < 10) for each of the models to assess multicollinearity. None of the final models had evidence of multicollinearity (DeMaris, 2004).

Results

Table 1 shows the descriptive summary of the three levels of political efficacy. Of the 2,749 cases, 31% of respondents reported having low political efficacy, 24% reported having neutral political efficacy, and 45% reported having high political efficacy. Respondents who reported having low political efficacy had a digital problem-solving skill mean score of 263 (SE = 1.73), respondents with neutral political efficacy had a mean score of 274 (SE = 2.17), and respondents with high political efficacy had a mean score of 277 (SE = 1.58). Even with adults with high political efficacy, the average digital problem-solving skill score was lower than the desired level (Level 2) (National Center for Education Statistics, 2013).

Table 2 presents the estimated odds ratios from the multinomial logistic regression models of political efficacy. While there is an association between digital problem-solving skill scores and political efficacy, the significance of this association varied by the level of political efficacy. For example, respondents with higher digital problem-solving skill scores had significantly higher odds of reporting high political efficacy than low political efficacy (OR = 1.01, SE < 0.01, $p < 0.05$). Respondents with higher digital problem-solving skill scores had significantly higher odds of reporting neutral political efficacy than low political efficacy (OR = 1.01, SE < 0.01, $p < 0.05$). However, digital problem-solving skills were not associated with reporting high political efficacy versus neutral political efficacy. Overall, our hypothesis was partially supported.

Discussion

We examined the association between digital problem-solving skills and external political efficacy among the U.S. adult population. In line with Schuller et al.'s (2004) theoretical framework, we found that greater digital problem-solving skills (human capital) are linked to greater political efficacy. Previous studies showed that digital problem-solving skills as well as digital media use were associated with political efficacy (Grotlüschen, 2018; Martin et al., 2018). These individuals with insufficient problem-solving skills may not have comprehended political information online hence, disengage from the political process (Reichert, 2016). It is also likely that individuals with lower human capital (e.g., skills) lack the ability and resources necessary to invest in additional forms of capital, including identity and social capitals, resulting in poorer political engagement (Schuller et al. 2004).

At the same time, the association between lower digital skills and lower political efficacy was also correlated to other factors, including lower educational attainment, poorer health, and younger age. Grotlüschen (2018) noted that individuals may disengage from the political process not merely because of their low human capital but because they believe government institutions disregard their social and political concerns. For example, individuals with poorer health are likely to display low political efficacy, presumably, if they believe political institutions are non-responsive to their existing health concerns. Finally, there is likely a cohort effect. That is, younger adults are generally less trusting of the government, subsequently resulting in low political efficacy and political participation (Rainie et al., 2019). Also, they may not have the long-term life

experience to evaluate political knowledge (Goerres, 2007). Interestingly, the cross-national study also showed that multiple factors, including current socioeconomic status, earlier life family environment, and cognitive skills, are jointly related to political efficacy (Borgonovi & Pokropek, 2017). In addition, while sufficient digital skills can generally be assets, and insufficient digital skills can be harmful to political efficacy, certain digital media (e.g., social media) may only enhance the feeling of being informed about politics and overlook actual political knowledge or depth of understanding, depending on local sociopolitical contexts (e.g., rural vs. urban) (Boulianne et al., 2023; García del Horno et al., 2023). Altogether, while digital skills and political efficacy are associated, other factors, including greater knowledge, health, and life experiences, are most likely contributing factors to political efficacy.

Finally, we identified that digital problem-solving skills are likely to be one of the factors to advance political efficacy from low to neural or low to high, but not necessarily neutral to high. Thus, preventing and addressing the high prevalence of low digital problem-solving skills are crucial for future civic health among the adult population. Whereas skills generally can be acquired beyond formal education (Grotlüschen, 2018; Vera-Toscano et al., 2017), digital problem-solving skills improvement may be particularly beneficial to certain sub-groups (i.e., low political efficacious groups).

Policy Implications

The findings from our study support the promotion of digital problem-solving skills as a means for increasing political efficacy and, in turn, for maintaining civic and

political health overall. Adults with lower educational attainment, which is generally more challenging to improve at the population-level, can increase their sense of political efficacy through skills acquisition like digital skills. Thus, digital equity and adult education policies, as well as intervention programs, should implement a series of digital access improvements, digital skill development, and consistent digital tool usage regardless of life stages to ensure adults can maintain their political efficiency (Van Dijk, 2009). For example, system-wide efforts to set a standard for digital skill levels (e.g., PIAAC level 2) in relation to political efficacy and reaching out to adults with lower digital skills through adult education programs can be effective strategies to address the gap in digital skills and political efficacy (National Research Council, 2012).

Digital skill training can provide individuals with the necessary abilities to adequately decipher political information, update their political knowledge, and mitigate feelings of political disengagement (Rasmussen and Nørgaard 2018; Sasaki 2017). Also, Individuals with adequate to high basic skills are necessary for legitimizing political institutions, including acting on personal political beliefs and effecting change (e.g., voting) (Brady et al. 1995), yet their skills are only valuable to democracy if they themselves are confident enough in their ability to influence change. As our empirical findings show, the role of digital problem-solving skills for the low-to-neutral and neutral-to-high differences are not the same, and such nuanced differences need to be reflected in adult education programs. As such, the baseline assessment of digital

problem-solving skills, which could assign individuals to appropriate intervention courses per their skill level is critical.

Limitations and Contributions

Our study is not without its limitations. First, while the PIAAC dataset is distinct in that it measures digital problem-solving proficiency, digital problem-solving scores are only available for participants with basic computer skills. Thus, the generalizability of the findings may be limited to the adult population with basic digital skills. Second, the PIAAC data measured political efficacy in a single survey item. Future studies need to expand the theoretical and empirical aspects for both internal and external political efficacy measurements. Third, the possibility of omitted variable bias cannot be ruled out. For example, the conventional marital status measures (i.e., married, single, divorced, widowed) were not available in the PIAAC data and individuals who reported themselves as unemployed were measured as not having an income in the PIAAC dataset, along with other unavailable information such as specific digital media use and local sociopolitical contexts (Boulianne et al., 2023). Finally, given that the AU-ROC was not optimal, model improvement is warranted in future studies.

Despite the limitations, our study made several significant contributions, particularly by expanding the methodology and theoretical framework generally used for understanding political efficacy. First, our study provided additional empirical evidence of the associations between political efficacy and digital problem-solving skills and supported the previous findings with a different measurement approach (see, for example,

Grotlüschen 2018; Prats and Meunier 2021; Rhodes et al. 2019; Rose et al. 2019; Authors, 2020). Second, our findings suggested the nuanced interpretations of digital skills and the external political efficacy levels. Third, the use of the PIAAC dataset allowed us to use the large-scale assessment of digital problem-solving skill, which have not been available in ICT-related data. Fourth, we presented the additional factors (e.g., education, health, and age) that were linked with different levels of political efficacy. Multiple determinants of political efficacy are supported by the three capital underpinnings. Overall, the findings from our study made a case for interventions through digital skills promotions, by the differing political efficacy levels.

Conclusion

As civil society evolves within the digital space, digital problem-solving skills are necessary to assess political information, limit disinformation, and maintain civic health. Therefore, the examination of the political efficacy, which includes conceptually distinctive levels --- low, neutral and high, clarify the roles of digital skills among the U.S. adult population. The findings of the low and high, and low and neutral political efficacy remained consistent with previous scholarly work. However, the findings for the neutral versus high political efficacy remains nuanced. Adults with higher digital problem-solving skills are likely to be politically efficacious, yet digital skills alone may not be a sufficient promoter of high political efficacy. Nonetheless, continuous development of digital problem-solving skills has implications for political efficacy, and ultimately for the promotion of a variety of civic engagement in the adult life stages.

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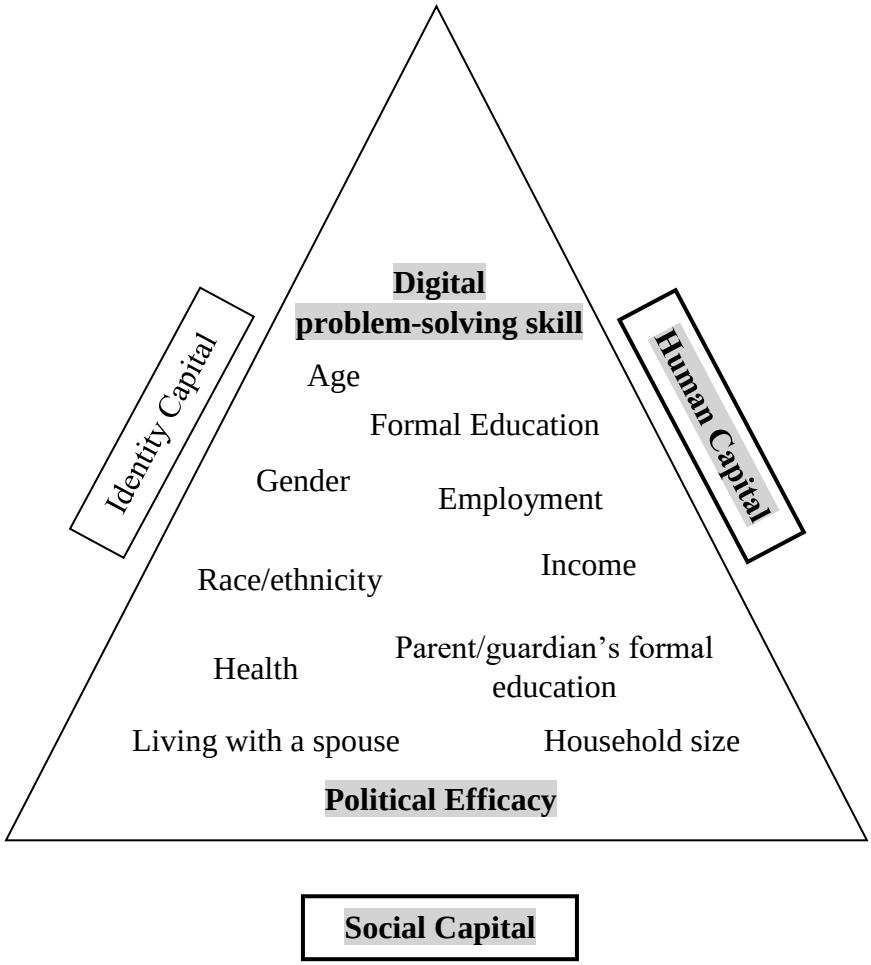
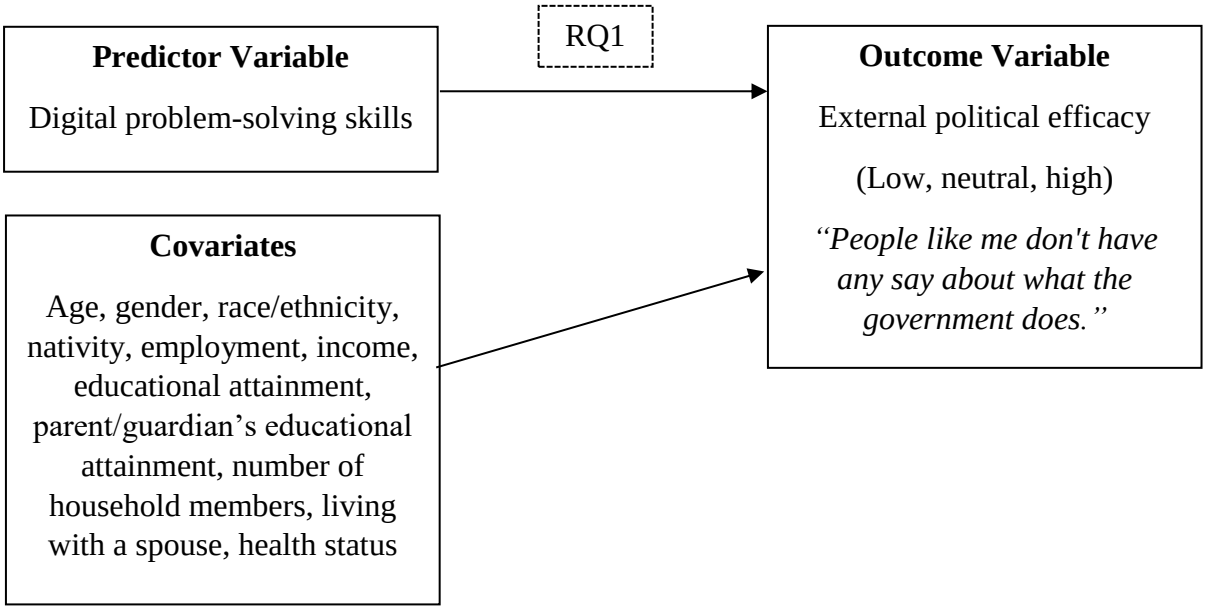
Figure 1. The Three Capital Theoretical Framework*



*Notes: *This model is based on the three capitals of learning model as cited in Schuller et al. (2004) and has been reformatted to include our variables of interest.*

The items in the bold letters are the main focus of the study.

Figure 2. Conceptual Operationalized Model



Research Question 1 (RQ1): *Is digital problem-solving skills associated with the three levels (low, neutral, and high) of external political efficacy among adults in the U.S. population?*

Table 1. Weighted Descriptive Summary of the Three Levels of Political Efficacy

Variables	Low Political Efficacy n = 851 30.96% Mean (SE) or percentage	Neutral Political Efficacy n = 660 24.01% Mean (SE) or percentage	High Political Efficacy n = 1,238 45.03% Mean (SE) or percentage
Digital problem-solving score (0-500)	*[a, b]	*[b]	*[a]
	262.51 (1.73)	274.17 (2.17)	276.93 (1.58)
Age group (10-year band)		*[b, c]	*[c]
24 years old or less	15.54%	22.84%	16.40%
25-34 years old	15.74%	21.29%	18.49%
35-44 years old	17.52%	16.22%	16.20%
45-54 years old	19.51%	16.41%	17.06%
55-65 years old	21.88%	14.44%	20.00%
66 years old or older	9.81%	8.70%	11.85%
Gender	NS	NS	NS
Women	48.38%	52.71%	52.46%
Men	51.62%	47.29%	47.54%
Race/ethnicity	NS	*[c]	*[c]
White	63.51%	61.66%	67.1%
Black	14.23%	11.05%	11.98%
Hispanic	13.94%	17.29%	13.07%
Other	8.32%	10.0%	7.85%
Citizenship status	NS	NS	NS
U.S. born	85.72%	87.91%	86.44%
Foreign born	14.28%	12.09%	13.56%
Employment status	*[a, b]	*[b]	*[a]
Employed	69.31%	74.92%	72.77%
Unemployed	30.69%	25.08%	27.23%
Income (1-10: None to highest decile)	*[a, b]	*[b]	*[a]
	3.05 (0.10)	3.52 (0.15)	3.68 (0.09)
Educational attainment	*[a]	*[c]	*[c]
College degree or higher	32.06%	36.06%	51.20%
Less than a college degree	67.94%	63.94%	48.80%
Parent/guardian's educational attainment	*[a, b]	*[b]	*[a]
College degree or higher	38.94%	47.78%	50.24%
Less than a college degree	61.06%	52.22%	49.76%
Number of household members	NS	NS	NS
	3.11 (0.05)	3.18 (0.07)	3.06 (0.04)
Living with a spouse	*[a]	*[c]	*[c]
Yes	52.14%	52.45%	58.17%
No	47.86%	47.55%	41.83%
Health status (1-5: Poor to excellent)	*	*	*
	3.29 (0.04)	3.49 (0.04)	3.69 (0.03)

*$p < 0.05$; NS = not significant

[a] compares the association between the variable of interest and high political efficacy versus low political efficacy (where reference = low political efficacy).

[b] compares the association between the variable of interest and neutral political efficacy versus low political efficacy (where reference = low political efficacy).

[c] compares the association between the variable of interest and neutral political efficacy versus high political efficacy (where reference = high political efficacy).

The sampling weights, replicate weights, and digital problem-solving skills plausible values were applied.

Table 2. Estimated Odds Ratios from the Multinomial Logistic Regression Models of Political Efficacy

	High Political Efficacy (Ref = Low Political Efficacy)		Neutral Political Efficacy (Ref = Low Political Efficacy)		Neutral Political Efficacy (Ref = High Political Efficacy)	
Variables	Unconditional Model OR (SE)	Conditional Model OR (SE)	Unconditional Model OR (SE)	Conditional Model OR (SE)	Unconditional Model OR (SE)	Conditional Model OR (SE)
Digital problem-solving score (0-500)	1.01 (0.01)*	1.01 (0.01)*	1.01 (0.01)*	1.01 (0.01)*	0.99 (0.01)	0.99 (0.01)
Age group (10-year band)	-	1.14 (0.05)*	-	0.95 (0.05)	-	0.83 (0.04)*
Women (vs. men)	-	1.13 (0.12)	-	1.15 (0.13)	-	1.02 (0.11)
Black (vs. White)	-	1.05 (0.19)	-	0.96 (0.22)	-	0.91 (0.19)
Hispanic (vs. White)	-	1.07 (0.28)	-	1.45 (0.36)	-	1.35 (0.27)
Other races/ethnicities (vs. White)	-	0.83 (0.15)	-	1.34 (0.23)	-	1.61 (0.32)*
U.S. born (vs. foreign born)	-	1.10 (0.25)	-	1.39 (0.29)	-	1.27(0.25)
Employed (vs. unemployed)	-	0.80 (0.13)	-	1.04 (0.17)	-	1.31 (0.24)
Income group (1-10: None to highest decile)	-	1.01 (0.02)	-	1.00 (0.02)	-	0.99 (0.02)
College degree or higher (vs. less than a college degree)	-	1.48 (0.21)*	-	0.93 (0.16)	-	0.63 (0.09)*
Parent/guardian's college degree or higher (vs. less than a college degree)	-	1.19 (0.13)	-	1.09 (0.17)	-	0.92 (0.12)
Number of household members	-	1.00 (0.04)	-	0.95 (0.04)	-	0.95 (0.04)
Living with a spouse (vs. not living with a spouse)	-	1.07 (0.13)	-	1.22 (0.16)	-	1.14 (0.15)
Subjective health status (1-5: Poor to excellent)	-	1.37 (0.08)*	-	1.15 (0.06)*	-	0.84 (0.05)*
AU-ROC Score		0.65		0.60		0.63

Ref = Reference group

Note: The models predicted the odds of reporting high political efficacy versus low political efficacy (reference), neutral political efficacy versus low political efficacy (reference), and neutral political efficacy versus high political efficacy (reference).

OR = Odds ratio (obtained by exp [the estimated regression coefficient])

SE = Standard error (associated with the estimated regression coefficient), SE was rounded up when less than 0.01

AU-ROC = Area Under the Receiving Operating Characteristics

* indicates statistically significant association between political efficacy levels and variable of interest ($p < 0.05$)

The sampling weights, replicate weights, and digital problem-solving skills plausible values were applied.