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Exploring the relationship between African American adult learners' computer, Internet, and academic self-efficacy, and attitude variables in technology-supported environments

Yu-Chun Kuo[1] · **Brian R. Belland**[2]

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Abstract
This study was conducted to investigate the relationship between African American adult students' computer, Internet, and academic self-efficacy, and their attitudes toward computers, in technology-supported environments. The study examined whether computer and Internet self-efficacy differed between students with high and low levels of user attitude and computer anxiety. Correlations between academic self-efficacy and computer and Internet self-efficacy were also explored. Participants included adult students who were enrolled in face-to-face and online courses at a university in the southern United States. Quantitative approaches (i.e., MANOVA, correlation, and regression) were used to analyze the collected data. Results indicated that adult students showed a higher level of confidence in performing basic computer or software skills and Internet browsing actions in comparison to advanced computer skills or Internet tasks (e.g., tasks related to encrypting/decrypting and system manipulation). Computer and Internet self-efficacy significantly differed between learners with high and low levels of attitudes toward computers. Positive correlations were found between computer self-efficacy, Internet self-efficacy, and academic self-efficacy. Both computer self-efficacy and Internet self-efficacy were significant predictors of academic self-efficacy.

Keywords Computer self-efficacy · Internet self-efficacy · Academic self-efficacy · African American students · Digital technology

✉ Yu-Chun Kuo
yuchun100@gmail.com; kuo@rowan.edu

Brian R. Belland
brb288@psu.edu

[1] Department of Science, Technology, Engineering, Art, and Math Education, Rowan University, 201 Mullica Hill Rd, Glassboro, NJ 08028, USA

[2] Educational Psychology, Counseling, and Special Education, Pennsylvania State University, 106 CEDAR Building, University Park, PA 16802, USA

Introduction

Digital technologies have played an increasing role in American education, both in online learning and traditional, face-to-face teaching and learning. Accordingly, there has been much research into the impact that digital technologies have on education, and the ways in which students use such. However, little research has investigated the impact of digital technology integration among African Americans (Graham and Choi 2016; Huang et al. 2017; Smith 2014). A large-scale report from Pew Research Center indicates that African Americans are less likely to go online and have access to broadband services at home when compared to white Americans (Smith 2014). On the contrary, no significant differences were found for cell phone or smartphone ownership (Smith 2014).

Members of underrepresented minorities such as African Americans or Latin Americans are disadvantaged in terms of access, acquisition and use of digital technologies (Graham and Choi 2016). While more affordable technologies have emerged in recent years, disparities of technology skills between minorities and whites have not decreased significantly (Graham and Choi 2016). Most studies on African Americans' use of digital technologies focus on the context of health (Austin and Royster 2017), with several about technology use among African American youths (Clark 2017; Shank and Cotten 2014). Limited research focuses on the use of digital technologies by African American adult students.

Defined as the extent to which individuals think they will be successful at a given task, self-efficacy is an important predictor of whether the same individuals will engage in the task (Bandura 1977). Computer self-efficacy, Internet self-efficacy, and academic self-efficacy are important predictors of the extent to which learners will engage in technology-supported environments (Kuo et al. 2014; Hodges 2008). These two types of technological self-efficacy are related to user attitudes, such as computer attitude and computer anxiety. No prior research has investigated African American adult students' computer or Internet self-efficacy or computer attitude or anxiety (Kuo et al. 2014; Warren et al. 2010).

Individuals' Internet and computer self-efficacy may be related to their academic self-efficacy in technology-enhanced learning environments (Baker 2015; Shank and Cotten 2014). Limited research has indicated that time spent and frequency of using technologies and availability of computers or digital devices are related to academic success or students' confidence level in learning content from a specific subject area. However, much of this research focused on traditional, elementary and secondary school students (Baker 2015; Clark 2003; Ozerbas and Erdogan 2016; Shank and Cotten 2014). The potential impact of technology use or access on academic self-efficacy is not fully explored among minority adult students.

In addition to the lack of research investigating the relationships among computer, Internet, and academic self-efficacy in technology-supported environments, few studies have focused on the relationships among African-American adult students' technology usage, self-efficacy and attitudes toward computers. Consequently, more research is needed to explore minority students' self-efficacy and their attitudes toward technology.

Theoretical framework

Social cognitive theory posits bidirectional influence among three factors: the person (e.g., personality, demographic characteristics, cognitive perceptions), the environment (e.g., social or situational circumstances), and the behavior (Bandura 1986). There are several dimensions and constructs developed as part of the social cognitive learning theory, such as behavioral capability, reinforcements, observational learning, and expectations (Bandura 1982). There are two types of expectations: efficacy expectations and outcome expectations. This study focuses on efficacy expectations (self-efficacy), which refers to an individuals' belief in their capability to execute a particular action in order to produce desired outcomes (Bandura 1977).

Self-efficacy has been used to understand individuals' reactions to computing technology, as well as adoption and use of computers (Compeau and Higgins 1995; Compeau et al. 1999). One's self-assessment of his/her capability to use technology successfully influences his/her decisions to adopt new technology products and the frequency of using them after adoption (Compeau et al. 1999). Self-efficacy in using technology was found to be related to computer behaviors, performance, and training (Torkzadeh et al. 2006). Although a positive relationship has been found between attitudes and self-efficacy with regard to technology use, the impact of self-efficacy on affective factors is not fully explored (Compeau et al. 1999).

Computer self-efficacy

Computer self-efficacy is the judgment of one's ability to complete a task with the use of a computer (Compeau and Higgins 1995). The construct of computer self-efficacy helps one to understand computer user behavior including user perceptions, acceptance, and use of computer systems (Compeau et al. 1999; Torkzadeh et al. 2006). Previous research indicated that computer self-efficacy is associated with several factors, including user attitudes toward computers, computer anxiety, user characteristics, frequency of computer use, learning processes, learning outcomes, and information searching skills (Osborn 2001; Torkzadeh et al. 2006). Antecedent variables, including prior computer experiences, instructor support and encouragement, and training, may affect an individual's computer self-efficacy. In turn, this could influence one's decision about technology acceptance and use (Lim 2001; Torkzadeh and Koufteros 1994). Training improves the development of computer self-efficacy, especially for those who have favorable attitudes toward computers (Torkzadeh et al. 2006).

Internet self-efficacy

Internet self-efficacy refers to the belief in one's capability to organize and execute Internet related actions to accomplish required tasks (Eastin and LaRose 2000). Due to the rise of the World Wide Web, it is necessary for technology adopters to not only possess the ability to use a computer, but also to have an adequate level of

capability in using the Internet to perform various activities (Nahm and Resnick 2008; Puzziferro 2008; Torkzadeh et al. 2006). Internet self-efficacy was found to be related to a number of variables, including Internet experiences (Eastin and LaRose 2000), user attitudes (Torkzadeh and Van Dyke 2002), computer anxiety (Torkzadeh et al. 2006), user characteristics (Torkzadeh and Van Dyke 2002; Wu and Tsai 2006), motivation (Liang and Wu 2010), learning process (Tsai 2012) and learning outcomes (Kuo et al. 2014; Kuo and Belland 2016; Joo et al. 2000).

Academic self-efficacy

Academic self-efficacy refers to one's confidence in success in academic learning. Self-efficacy has a positive influence on learning outcomes, such as task persistence, task choice, skill acquisition, and academic achievement or performance (Hodges 2008). Generally, students with higher self-efficacy for completing a task have higher motivation, make greater effort, and persist longer than those with lower self-efficacy. High self-efficacy brings students to a deeper level of engagement with learning tasks and leads to better performance, which in turn raises self-efficacy. In contrast, low self-efficacy brings about inferior performance, and decreases self-efficacy for a series of relevant tasks (Bandura 1977, 1982; Bandura and Schunk 1981).

Computer attitude

Computer attitude is an individual's perceptions toward the use of a computer, such as likes/dislikes or pleasant/unpleasant feelings toward it (Loyd and Gressard 1984). Computer attitudes are associated with several factors such as demographic variables (e.g., gender, age) (Chang et al. 2012), computer adoption (Sanders and Morrison-Shetlar 2001), computer anxiety (Korobili et al. 2010; Sam et al. 2005), and experience with computers (Garland and Noyes 2004; Paraskeva et al. 2008). For example, Mueller and Wood (2012) found that attitudes toward computers affect teachers' adoption of technology, and influence whether they integrate technology into the classroom. Computer training and Internet access experiences can improve adults' computer attitudes (Chang et al. 2012).

Computer anxiety

Computer anxiety refers to negative emotions or cognitive status experienced by an individual when he or she considers using, or actually uses, computer-based technology such as a computer or other computer equipment (Bozionelos 2001; Glass and Knight 1988). Fear and apprehension are two of the most frequently mentioned components of computer anxiety (Chua et al. 1999). Behavioral indications of computer anxiety include an avoidance of computers, excessive concerns with computers, and minimal use of computers (Bozionelos 2001). Several factors are related to computer anxiety, including user characteristics (Chua et al. 1999), social-economic background (Bozionelos 2004), computer experiences (Bozionelos 2001;

Maricutoiu 2014), computer self-efficacy (Hause et al. 2012; Simsek 2011), and performance (Barbeite and Weiss 2004; Buche et al. 2007).

Relationships among variables

Learners with high efficacy expectations may have a greater chance of success in computer and Internet-related tasks (Torkzadeh et al. 2006). Higher computer self-efficacy is linked to more positive attitudes toward computers and lower computer anxiety (Durndell and Haag 2002). The relationships among Internet self-efficacy, computer attitude, and computer anxiety were not fully explored in prior research. When students are required to use technology in learning, the self-appraisal of their ability to perform computer or Internet-related actions may have an impact on their perceptions of academic success in a class (Baker 2015; Ozerbas and Erdogan 2016; Shank and Cotten 2014). For example, Clark (2003) examined 3rd through 12th grade African American students and found that their academic self-efficacy appeared to increase through the use of laptop computers based on descriptive analysis. Shank and Cotten (2014) investigated fourth and fifth graders in urban schools and found the frequency of using multimedia for communication and the number of using technologies for social networking activities are predictors of academic self-efficacy. Baker (2015) indicated the amount of time spent on using educational technology for learning mathematics is related to perceived academic self-efficacy for urban middle school students. Ozerbas and Erdogan (2016) found the use of digital classroom technologies significantly predicted middle school students' academic success in learning mathematics.

Given that class activities or assignments may not be completed without the use of designated technologies, students with inferior technology skills may experience frustration and feel less confident in performing well in a class involving the use of technology. In addition, it is suggested to include specific activities or actions for computer or Internet use to predict self-efficacy in learning (Shank and Cotten 2014). Both computer and Internet self-efficacy scales utilized in this study correspond to such a suggestion as they address users' confidence level in performing specific actions or behaviors through the use of computer and the Internet. Hence, this study assumes that computer self-efficacy and Internet self-efficacy are positively related to, and may be predictive of, academic self-efficacy in technology-supported environments.

Purpose of the study

The objectives of this study were twofold: (1) examine adult learners' computer and Internet self-efficacy as well as their academic self-efficacy, and (2) investigate the impact of computer attitude and computer anxiety on computer and Internet self-efficacy, as well as the correlations between academic self-efficacy and computer and Internet self-efficacy.

1. What are adult learners' computer self-efficacy and Internet self-efficacy?
2. Do computer self-efficacy and Internet self-efficacy differ in terms of levels of user attitude?
3. Do computer self-efficacy and Internet self-efficacy differ in terms of levels of computer anxiety?
4. Is academic self-efficacy related to computer self-efficacy and Internet self-efficacy?
5. Do computer self-efficacy and Internet self-efficacy predict academic self-efficacy?

Methods

Sample

Participants were undergraduate students who were enrolled in sixteen courses in an Interdisciplinary Studies program in a southern university in the United States. The majority of these students had a full- or part-time job and family to take care of. Many of them previously dropped out of an undergraduate program due to health, family, or other issues. They came back to school to earn a bachelor's degree by attending evening and online courses. Out of 460 students, 414 responded to the survey. Among them, 21.3% were male and 78.7% were female, and most were single (Married: 28.9%; Single: 71.7%). There were a range of ages represented, with 25.6% aged 18–25, 24.4% aged 36–45, and 23.9% 46–55 (see Table 1). About 95% of the students were African Americans (see Table 1). The majority of the students reported being online for the class for no more than 10 h per week. About 11% of the students reported spending more than 15 h online for the class, and 82% had prior experience taking online courses.

Procedure

The study included sixteen online and face-to-face courses collected from two academic years. All courses were one semester long and involved the use of Blackboard and/or web 2.0 tools (i.e., wikis, blogs). Students who took online courses were required to access online materials and participate in required activities or assignments in Blackboard. Some of these online courses also used the features of wikis and blogs provided in Blackboard. Students who took face-to-face courses used Blackboard or web 2.0 tools (i.e., wikis, blogs) to access class materials and participate in several class activities in the classroom.

Instruments

The survey included six sections: learner background information and five instruments that measure learners' computer self-efficacy, Internet self-efficacy, academic

Table 1 Background information of adult learners

	N	Percentage
Gender		
Male	88	21.3
Female	326	78.7
Marital status		
Married	119	28.9
Single	293	71.1
Age		
18–25	106	25.6
26–35	80	19.3
36–45	101	24.4
46–55	99	23.9
Above 56	28	6.8
Ethnicity		
African–American	394	95.2
Caucasian	10	2.4
Asian	3	0.7
Others	7	1.7
Hours spent online for the class		
Less than 5 h	171	41.3
6–10 h	149	36.0
11–15 h	47	11.4
16–20 h	32	7.7
Above 20 h	15	3.6
Number of online courses taken		
None	73	18
1–5	187	46.1
6–10	96	23.6
11–15	33	8.2
16–20	11	2.7
21 or above	6	1.3

Table 2 Instruments

Scales	Scale type	Number of items	Original reliability	Reliability in this study
Computer self-efficacy	5-point Likert scale	25	0.95	0.98
Internet self-efficacy	5-point Likert scale	15	0.92	0.95
Academic self-efficacy	7-point Likert scale	6	0.93	0.95
User attitude	5-point Likert scale	5	0.81	0.72
Computer anxiety	5-point Likert scale	4	0.81	0.89

self-efficacy, user attitudes, and computer anxiety (see Table 2). These five scales displayed good reliability and validity in previous research.

Originally developed by Murphy et al. (1989), the computer self-efficacy scale contained 25 items to measure perceptions of computer-related knowledge and skills (Torkzadeh et al. 2006). The items were validated through experts who taught computer courses, and the reported internal consistency reliability of the scale was above 0.90. The Internet self-efficacy scale included 15 items to measure learners' self-efficacy regarding interacting with the Internet (Torkzadeh et al. 2006). The scale was reviewed by practitioners and academics with a reliability of 0.95. The self-efficacy scale for learning and performance, with an internal consistency reliability of 0.90, measured performance expectations (Pintrich et al. 1993). It included eight items. These items were developed based on a theoretical framework and were validated through several rounds of revisions. Five items (reliability = 0.81) generated by the interview data measured users' attitudes toward or affective response when using computers (Compeau and Higgins 1995). Four items addressed computer anxiety (reliability = 0.81), defined as negative feelings related to interacting with a computer (Torkzadeh et al. 2006). Factorial validity was performed for the development of computer anxiety scale.

Data collection

Data were collected through online (for online students) and printed (for face-to-face students) surveys, which were distributed during the last week of the course. To increase the response rate, students who volunteered to complete the survey were given extra credit by the instructor.

Data analysis

Data were analyzed using quantitative methods. Table 3 lists analysis strategies used for each research question.

Results

RQ1: What are adult learners' computer self-efficacy and Internet self-efficacy?

Table 4 shows descriptive statistics. Students had a moderately high level of computer self-efficacy, with an average score of 4.06. They also possessed a medium-level of Internet self-efficacy ($M = 3.79$, $SD = 0.88$). Academic self-efficacy was quite high ($M = 6.31$, $SD = 0.88$). Students' attitudes toward using computers were positive ($M = 3.96$, $SD = 0.76$). Their computer anxiety was lower than the mid-point score 3.

Table 5 shows sub-dimensions of both computer and Internet self-efficacy scales. In terms of computer self-efficacy, students had higher confidence in performing beginning computer-related skills and file and software skills than advanced skills.

Table 3 Research questions and corresponding analyses

	Research questions	Analyses
1.	What are adult learners' computer self-efficacy and Internet self-efficacy?	Descriptive analysis
2.	Do computer self-efficacy and Internet self-efficacy differ in terms of levels of user attitude?	MANOVA analysis
3.	Do computer self-efficacy and Internet self-efficacy differ in terms of levels of computer anxiety?	MANOVA analysis
4.	Is academic self-efficacy related to computer self-efficacy and Internet self-efficacy?	Correlation analysis
5.	Do computer self-efficacy and Internet self-efficacy predict academic self-efficacy?	Regression analysis

Table 4 Descriptive information for each scale

Scales	Range	Midpoint	*M*	*SD*
Computer self-efficacy	1–5	3	4.06	0.88
Internet self-efficacy	1–5	3	3.79	0.88
Academic self-efficacy	1–7	4	6.31	0.88
User attitude	1–5	3	3.96	0.76
Computer anxiety	1–5	3	2.17	1.03

Table 5 Descriptive information for sub-scales of computer self-efficacy and Internet self-efficacy

Scales	Sub-scales	Range	Midpoint	*M*	*SD*
Computer self-efficacy	Beginning skills	1–5	3	4.23	.88
	Advanced skills	1–5	3	3.91	.91
	File and software skills	1–5	3	4.06	.97
Internet self-efficacy	Browsing	1–5	3	4.35	.88
	Encryption/decryption	1–5	3	3.51	1.16
	System manipulation	1–5	3	3.71	.99

The browsing category of Internet self-efficacy had the highest average score, followed by system manipulation and encryption/decryption.

RQs 2 and 3: Do computer self-efficacy and Internet self-efficacy differ in terms of levels of user attitude and computer anxiety?

MANOVA was used to examine whether computer self-efficacy and Internet self-efficacy differed in terms of different levels of user attitude and computer anxiety (see Tables 6, 7). Outliers were identified and removed, and critical assumptions (e.g., homogeneity) were checked. Significant differences of computer self-efficacy were found between students with positive and negative attitudes toward computers.

Table 6 MANOVA analysis for CSE and ISE with high and low levels of UA

	High UA		Low UA		*F*
	M	*SD*	*M*	*SD*	
Computer self-efficacy (CSE)	4.16	0.74	2.68	0.54	44.04***
Internet self-efficacy (ISE)	3.87	0.78	2.61	0.65	27.91***

UA refers to user attitude

Table 7 MANOVA analysis for CSE and ISE with high and low levels of CA

	High CA		Low CA		*F*
	M	*SD*	*M*	*SD*	
Computer self-efficacy (CSE)	3.81	.79	4.25	.73	29.52***
Internet self-efficacy (ISE)	3.69	.84	3.90	.78	5.63**

CA refers to computer anxiety

Similarly, students with higher levels of computer anxiety had lower levels of computer and Internet self-efficacy.

RQ4: Are academic self-efficacy, computer self-efficacy and Internet self-efficacy related?

Table 8 displays correlations among three self-efficacy variables. Both computer self-efficacy ($r = .500$, $p < .01$) and Internet self-efficacy ($r = .385$, $p < .01$) were positively correlated with academic self-efficacy at a significant level.

RQ5: Do computer self-efficacy and Internet self-efficacy predict academic self-efficacy?

Multiple regression was performed to examine whether computer self-efficacy and Internet self-efficacy significantly predicted academic self-efficacy (see Table 9). The analysis showed that both computer self-efficacy ($\beta = .12$, $p < .05$) and Internet self-efficacy ($\beta = .18$, $p < .05$) were significant predictors of academic self-efficacy.

Discussion

African American students showed higher confidence in performing basic-level computer and Internet skills than advanced-level ones

African American students possessed moderately high computer and Internet self-efficacy. Their computer self-efficacy was higher than their Internet self-efficacy. This result is similar to the finding of a study conducted by Torkzadeh et al.

Table 8 Correlations among variables

	Computer self-efficacy	Internet self-efficacy	Academic self-efficacy
Computer self-efficacy	–	.689**	.500**
Internet self-efficacy		–	.385**
Academic self-efficacy			–

**$p < .01$

Table 9 Multiple regression model: academic self-efficacy explained by two predictor variables

Variables	*B*	*SE B*	β	*t*	*p*
Computer self-efficacy	.23	.07	.12	3.26	.001**
Internet self-efficacy	.19	.07	.18	2.84	.005**

**$p < .01$

(2006), in which undergraduate students in business programs were found to have better computer self-efficacy ($M = 4.24$) than Internet self-efficacy ($M = 3.59$). Interestingly, African American students in the current study had a lower score in computer self-efficacy ($M = 4.06$), but a higher score in Internet self-efficacy ($M = 3.79$) than those in Torkzadeh et al. (2006).

Computer self-efficacy

Students' confidence in performing basic-level computer operations (e.g., using the computer to write, saving content into a file, moving the cursor around the screen, opening or exiting a program, or printing) was highest, followed by that of their file and software using skills (e.g., copying and deleting a file, organizing or managing files, or running software). Their confidence level in performing advanced computer-related functions (e.g., understanding terms about computer hardware and software, knowing stages of data processing, troubleshooting computer problems, or using a variety of programs) was lowest. This finding is aligned with the result of prior studies that applied the same computer self-efficacy instrument (Santoso et al. 2014; Torkzadeh et al. 2006). In these studies, participants were reported to have the highest level of confidence in computer beginning skills, followed by either advanced skills or file management skills. When compared to the research of Santoso et al. (2014), the African American students in this study appeared to have lower confidence in beginning and advanced computer skills, including file management skills. Similarly, students in our study showed a slightly lower score in entry-level computer skills ($M = 4.23$), compared with the score ($M = 4.44$) of business students from other universities in the Midwest United States (Torkzadeh et al. 1999).

Internet self-efficacy

African American students were more confident in performing actions relevant to browsing (e.g., surfing or browsing the World Wide Web, finding information on the World Wide Web) than system manipulation (e.g., sending a fax, scanning pictures, downloading, creating a homepage) and encryption/decryption (e.g., decrypting or encrypting email messages). Their confidence in engaging in encryption and decryption was the lowest among the three sub-categories of Internet self-efficacy. A similar pattern was also found in previous research that used the same Internet self-efficacy instrument (Torkzadeh and Van Dyke 2002). In their study, undergraduate students who attended an introductory course to computers from a southwest university in the United States showed the highest confidence level in browsing ($M = 4.35$), followed by system manipulation ($M = 3.71$) and encryption/decryption ($M = 3.51$). When compared to their scores, the African American students in this study had higher scores in all three sub-scales of Internet self-efficacy. Similarly, a reported mean score ($M = 3.68$) of Internet self-efficacy, conducted by Shi et al. (2011) for about 1000 adults in China, is slightly lower than that of African American students ($M = 3.79$) in the current study.

Computer self-efficacy and Internet self-efficacy significantly differ in terms of high and low levels of computer attitudes and computer anxiety

Computer attitude and computer anxiety have a significant influence on computer and Internet self-efficacy among African American undergraduate students. Students with high levels of computer attitudes showed higher computer and Internet self-efficacy than those with low levels of computer attitudes. On the contrary, students with high computer anxiety showed low computer and Internet self-efficacy when compared to their counterparts with low computer anxiety. These results are in alignment with previous research that indicates a positive relationship of computer self-efficacy with computer attitude but a negative relationship with computer anxiety (Hong et al. 2014; Lee and Huang 2014). The positive effect of computer attitude on Internet self-efficacy implies that African American students with more positive attitudes toward computers were more likely to have better Internet self-efficacy, similar to the findings of Torkzadeh and Van Dyke (2002). The negative influence of computer anxiety on Internet self-efficacy indicates that students who were more anxious when using computers tended to show lower Internet self-efficacy. Although not investigated in previous research, such a relationship appears to be reasonable because negative emotions toward computers may possibly mitigate one's confidence in performing Internet-related tasks, especially when these tasks require the use of a computer.

Computer self-efficacy and Internet self-efficacy are predictors of academic self-efficacy

Positive correlations were found among computer self-efficacy, Internet self-efficacy, and academic self-efficacy, which implies that the three types of self-efficacy in the technological and learning domains were related to each other in technology-supported environments. Both computer self-efficacy and Internet self-efficacy are significant predictors of academic self-efficacy, which implies that African American students who were more comfortable with using computers and the Internet were more confident that they would be academically successful. This finding is reasonable, given that technology-based learning environments demand the use of some types of technology tools, and in such environments, students' confidence level in using computers or the Internet is critical to their expectations of success in academic performance. Therefore, African American students with higher levels of computer or Internet self-efficacy might expect greater success in classes in which technologies are used to facilitate learning.

Conclusion and implications

This study indicated that African-American non-traditional adult students' confidence level toward computers is higher in beginning and file and software skills, but lower in advanced skills. Students appeared to have higher confidence in performing browsing actions, but lower confidence in system manipulation and actions related to encrypting and decrypting. Adult students with high levels of attitude had higher computer and Internet self-efficacy than those with low levels of attitude. Those with high levels of computer anxiety had significantly lower computer and Internet self-efficacy than those with low levels of computer anxiety. This result aligns with the finding of previous research that positive user attitude toward computers and low computer anxiety are related to higher computer or Internet self-efficacy. Confidence in utilizing computers and the Internet was positively correlated with academic self-efficacy. Computer self-efficacy and Internet self-efficacy were both significant predictors of academic self-efficacy.

This study contributes to the understanding of minority students' computer, Internet, and academic self-efficacy, and their attitudes toward computers and computer anxiety in technology-supported environments. The findings of this study not only confirm the positive effect of user attitude and negative influence of computer anxiety on computer and Internet self-efficacy, but also add to the limited literature about minority non-traditional students' perceptions of their ability to perform computer and Internet related tasks, their expectations for success in a course, and the significant impact of computer and Internet self-efficacy on academic self-efficacy in technology-supported settings. Future research is suggested to further investigate how course design and content area influence minority students' perceptions of emerging

technologies and how self-efficacy toward technology and academic success influence student learning outcomes.

Practical implications suggest that (a) training be provided to enhance minority adult students' confidence in performing advanced computer skills and Internet skills in encryption/decryption and system manipulation; (b) additional support or training is needed for those with less positive user attitudes toward computer and higher computer anxiety to enhance their confidence level in using computers and the Internet; and (c) instructors should pay more attention to students with low computer and Internet self-efficacy, as computer and Internet self-efficacy are good indicators of one's expectancy for success in a class.

Compliance with ethical standards

Conflict of interest The authors declare that they have no competing interests.

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Yu-Chun Kuo is an Assistant Professor of Instructional Technology at Rowan University. Her research interests include technology integration into teaching and learning, online interaction, and applications of self-efficacy and self-regulated learning in online settings.

Brian R. Belland is an Associate Professor of Educational Psychology at the Pennsylvania State University. His research interests focus on the use of technologies to support problem solving and argumentation during complex problem solving.