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Preservice Training Amid a Pandemic in Ghana: Predictors of Online Learning Success Among Teachers

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The coronavirus disease 2019 outbreak has brought the world to a standstill, especially the education sector. Globally, it has claimed over two million lives, with over 100 million people infected, forcing schools to close down. This has reignited the importance of online teaching and learning for preservice teachers who comprise the next frontiers in providing online education to their future students. However, studies on online learning [OL] success among preservice teachers in developing countries, such as Ghana, remain scarce. Accordingly, this study mainly aimed to assess the predictors of OL success among preservice teachers in Ghana. Bandura's social cognitive theory guided the study; in total, 526 preservice teachers were recruited from four colleges of education. Although the teachers were ambivalent regarding the success of OL, significant differences were found between the following demographics: gender, specialization, marital status, the preferred mode of learning, and the place of residence. Moreover, the study discussed the need for intensive information and communications technology education among preservice teachers, particularly women, developing their confidence in computer skills, and other recommendations.

Keywords: COVID-19, preservice teachers, online teaching, students, Ghana

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INTRODUCTION

The global outbreak of coronavirus disease 2019 (COVID-19) has affected all sectors of society. According to the World Health Organization (WHO), as of February 2020, an estimated 100 million people have been infected, and over two million lives have been claimed. Owing to human-to-human respiratory transmission, most countries have intensified public education on preventing and curbing the disease's spread (Kebede et al., 2020; Sheng, 2020; WHO, 2020). Countries have institutionalized some of these measures, including the wearing of facemasks, social distancing, and controlling overcrowding in public spaces, to protect their citizens. The pandemic has adversely impacted the social fabric of society as individuals adapt to new ways of living and different situations. For example, the education sector has been affected with the complete closure of some schools. Other schools have adopted a blended approach that entails a combination of both face-to-face and online learning [OL] (Bayham & Fenichel, 2020; Esposito & Principi, 2020). In developing countries such as Ghana, OL is new to the education system, which largely depends on face-to-face teaching and learning. Indeed, the education system lacks basic facilities such as computers, Internet

access, and accessible platforms for providing OL services to students (Amanor-mfoafo et al., 2020). This raises critical questions as to whether teachers are (being) prepared to embrace the new OL system to support the teaching and learning of all students in the classroom. Accordingly, examining the main predictors of OL success among preservice teachers in Ghana appears to be necessary.

OL is any learning experience or environment that relies upon the Internet or World Wide Web as the primary delivery mode of communication and presentation (Appana, 2008). The demand for OL coincided with a global campaign for quality education for all students, irrespective of their age and location (Gilbert, 2015). This call has intensified with the COVID-19 outbreak pandemic. It is essential to state here that the transition from the traditional face-to-face teaching to OL has been beneficial for many. For instance, learners who are limited by time and space constraints can still further their education with fewer difficulties through OL (Gilbert, 2015). You and Kang (2014) also argued that OL benefits learners who desire to control their learning and manage their time properly because OL gives them flexibility or the opportunity to learn at their convenience. Unsurprisingly, academics have long criticized traditional or face-to-face instructional environments for encouraging passive learning, ignoring the individual differences and needs of the learners, and not paying sufficient attention to problem-solving, critical thinking, or other higher-order thinking (Hannum & Briggs, 1982; Banathy, 1994). Moreover, Nagrale (2013) noted the importance of OL because it grants international students easy access to course materials. Although Brown (2017) admitted that online teaching and learning can be tedious, he argued that OL is a cost-effective medium through which learners can learn and maximize their potential. The benefits of OL could materialize in the event that teachers are trained and have resources at their disposal to extend accessible education to all.

Teacher education is central to the successful adoption of online teaching and learning. If teachers are well trained, they will likely embrace OL and teaching and support all students to maximize their potential. Because teachers receive a reasonable level of information and communications technology (ICT) training during their initial preservice training programs, they are more open to studying online (Husain, 2011). However, in most developing countries, including Ghana, the curricula of teacher institutions do not support the use of online platforms in teaching and learning. Several studies have highlighted the benefits of online teaching and learning in achieving positive student outcomes (e.g., Shahid, 2005); thus, organizing in-service training will help supplement the inadequacies in or absence of preservice teacher training with respect to online teaching and learning. Regular in-service training programs on the use of technology in teaching and learning will help teachers develop confidence, improve their self-efficacy, and open them to new ideas for effective teaching practices (Ememe et al., 2013). Darling-Hammond et al. (2017) summarized and emphasized the importance and need for in-service training programs in the quest of achieving positive student outcomes. However, in-service training is nonexistent, one-off, and irregular in Ghana and most developing countries. This phenomenon underscores the need for a greater emphasis to be placed on preservice training and the incorporation and acceptance of OL as a mode of instruction in teacher training colleges.

COVID-19 has changed the world, and it is important for schools and preservice teachers to develop positive attitudes toward OL. Namely, both teacher training institutions and preservice teachers must embrace OL as a "game changer" or "the new game in town." This will effectively prepare preservice teachers as they will be more open to adopting online teaching in the delivery of their lessons to future students. As part of efforts toward promoting accessible education to all, this quantitative study seeks to understand the predictors for success in terms of OL among preservice teachers in Ghana.

Preservice Training and Online Teaching in Ghana

Ghana is one of the most peaceful countries in sub-Saharan Africa. It has an estimated population of approximately 30 million people. The government has placed education at the forefront of national development with several provisions to promote accessible education to all since Ghana's independence in 1957. Notably, Ghana has a three-tier education structure: early childhood, primary school, and junior high school (together known as basic education; 11 years); senior secondary education (3 years); and tertiary education (2–4 years) (Ministry of Education, 2013). The training of teachers is at the heart of efforts toward achieving accessible education. Both colleges of education and universities are involved in training teachers. For example, 48 colleges of education run degrees of 2–4 years in education programs for teachers. The accredited colleges of education are affiliated to two universities (University of Cape Coast and University of Education, Winneba), which are the traditional teacher education institutions that are mandated to prepare teachers to teach at all school levels (Adu-Gyamfi & Otami, 2020; Buabeng et al., 2020).

The COVID-19 outbreak led to the closure of schools, with teacher training colleges attempting to deliver online lectures to students. However, the body of knowledge on the predictors of OL in Ghana has yet to be investigated. Nevertheless, the available evidence suggests that while educational institutions in developing countries make several attempts to adopt OL, progress has been slow (Khan et al., 2010; Saeedikiya et al., 2010). In particular, several factors, such as poor Internet connections, inadequate infrastructures, low levels of ICT knowledge (technical know-how), teacher unpreparedness, and weak content development (Aung & Khaing, 2016; Iddrisu et al., 2020), negatively impact the adoption of OL in Ghana. Only a few tutors and lecturers in Ghana are confident and prepared to teach online, while the majority of them prefer training (Akyeampong, 2017; Aboagye, 2020). Thus, investigating whether students, such as preservice teachers, are comfortable or ready to embrace OL and incorporate it in their teaching activities seems appropriate. Currently, given the realities of the COVID-19 pandemic, innovative alternatives, such as OL, will shape the future of

education in developing and developed countries. Because preservice teachers are expected to adopt online teaching in their classrooms, a large-scale study that can clarify the perceptions of these teachers toward OL in Ghana will prove useful.

Theoretical Framework

We adopted a psychosocial model known as the social cognitive theory (SCT) as a framework for this study, which aimed to understand the relationship between teachers' profiles and access to OL. Bandura developed the SCT (1988, 1991, 2002, 2005) to explain human behavior. At the heart of the SCT lies skills development to achieve a desired outcome. Moreover, within the tenets of the SCT, Bandura (1977) proposed three determinants that explain human behavior: personal factors associated with the learner, the learner's cognitive capabilities, and the context wherein the behavior takes place. Undoubtedly, learning occurs in a naturalistic setting in which an interaction between a learner, their context, and the acquisition of knowledge provides an impetus for explaining human behavior. This process, according to Bandura (2002, 2005), is called triadic reciprocal determinism, which is an unending cycle wherein the learner has control over what they learn to achieve a better outcome and is ultimately judged by what they have learned about a given phenomenon.

This study conceptualized two main components of the SCT: self-observation and self-evaluation (Bandura, 1977, 1991). First, in terms of self-observation, the individual conducts an internal assessment to determine their ability to perform a given behavior. It should be noted that learning is a product of cognitive skills and abilities. In terms of OL, preservice teachers should be able to assess the knowledge that they have acquired to engage in OL. Second, self-evaluation refers to an individual's assessment of their competencies considering personal goals and future achievements. The self-evaluation also incorporates aspects that explain one's confidence in executing a given task (1988, 1991). Here, preservice teachers' use of OL could impact their academic performance, which is the measure of their learning and experiences. The cognitive capacity of preservice teachers could provide baseline information regarding their academic performance and capacity to adopt such approaches in classrooms.

The SCT was deemed a practical framework because it provides an opportunity to study personal characteristics and environmental factors that might influence OL experiences. Moreover, the SCT offers opportunities to assess students' cognitive skills and the direct or indirect effects thereof on the learning and academic performance of preservice teachers in Ghana. In this study, we envisage the usage of OL by preservice teachers as a product of their personal characteristics, the knowledge that they have acquired, and the opportunities created within the school environment for them to acquire knowledge and excel in classrooms.

Predictors of OL

Previous studies have reported that various factors influence the successful design and implementation of online teaching and learning. These factors include, but are not limited to, the course structure, instructional design, technology, instructors, and students. For example, Swan et al. (2000) investigated factors that affect the success of OL in the United States with a sample of 3,800 students enrolled in 26 courses and demonstrated that consistency in course design, interaction with course instructors, and active discussion were key factors that influenced the success of online courses.

Similarly, Zia (2020) explored the factors responsible for influencing online classes during the COVID-19 pandemic by collecting data from 716 business school students through a questionnaire. The aforementioned study found that attitude, curriculum, motivation, technology, and training were key factors that affected online classes. Although all these factors influence the successful design and implementation of online teaching and learning, student factors are the most crucial areas and require full attention. Specific aspects that must be considered include the learner's style and engagement with learning content (Al-Azawei et al., 2016), their experience with and use of online chat rooms (Baxter & Haycock, 2014), and their demographic characteristics, such age and gender (Parnell & Carraher, 2003; Roblyer, 1996).

The association between student-related profiles and OL has received attention in the literature, especially in Europe and Northern America (Mykota & Duncan, 2007; Haverila & Barkhi, 2009; Palvia et al., 2018). For example, Mykota and Duncan (2007) investigated the extent to which individual learner characteristics predict the degree of social presence experienced for those enrolled in online, postgraduate, and special education courses. Their research revealed that demographic characteristics such as the age and gender of learners provided little predictive power in determining whether the student would choose a web-based or an in-class course on the same topic. However, the extent to which learners' demographic characteristics play key roles in online teaching and learning is evident in the work of Sanders and Shetlar (2001), which revealed that women had a more positive attitude toward a web-based course than men. In addition, other studies revealed that computing experience among learners is a strong predictor of attitudes toward computers, computer usage (Dyck & Smither, 1994; Thompson et al., 1994), and Internet usage (Atkinson & Kydd, 1997). Unfortunately, the association between students' profiles and OL in sub-Saharan Africa remains unreported. It is essential to study the predictors of success in OL among preservice teachers in Ghana to address this gap, particularly given the current COVID-19 pandemic. Thus, the following questions were formulated.

- What is the association between demographics and OL success among preservice teachers in Ghana?
- What are the predictors of OL success among preservice teachers in Ghana?
- Does computer access influence the academic performance of preservice teachers in Ghana?

METHODS

Participants

The participants herein were preservice teachers enrolled in four colleges of education in Ghana. The colleges of education were

TABLE 1 | Association between demographics and dependent variables.

Demographics (N = 526)	Sample (100%)	OLS	CS	IL	DL	NOL	AS
Gender	370 (70%)	3.53 (0.51)	3.54 (0.99)	3.86 (0.69)	3.43 (0.78)	2.67 (1.05)	3.63 (0.45)
Male	156 (30%)	3.38 (0.44)	3.14 (0.86)	3.79 (0.67)	3.58 (0.87)	2.59 (0.90)	3.46 (0.44)
Female *t*		3.21**	4.71*	1.07	−1.96*	0.82	3.90*
Partial eta squared		0.02	0.04	0.002	0.007	0.001	0.03
Age (n = 525)	247 (47%)	3.50 (0.51)	3.50 (0.96)	3.74 (0.55)	2.57 (0.80)	2.66 (1.00)	3.92 (0.48)
19–22 years	202 (38%)	3.50 (0.48)	3.41 (0.92)	3.74 (0.54)	2.46 (0.74)	2.64 (1.00)	3.92 (0.46)
23–25 years	76 (15%)	3.38 (0.47)	3.20 (1.11)	3.69 (0.53)	2.56 (1.01)	2.62 (1.05)	3.89 (0.58)
26 years and above *F*		1.90	2.78	1.49	1.23	0.06	0.85
Partial eta squared		0.007	0.01	0.006	0.005	0.001	0.003
Specialization	234 (45%)	3.56 (0.47)	3.59 (0.93)	3.89 (0.58)	3.55 (0.75)	2.70 (1.01)	3.65 (0.44)
STEM	292 (55%)	3.42 (0.50)	3.29 (0.98)	3.79 (0.58)	3.46 (0.81)	2.61 (1.00)	3.52 (0.46)
General *t*		3.28**	3.45**	2.02*	0.24	1.06	2.95**
Partial eta squared		0.02	0.022	0.008	0.001	0.002	0.02
Year of study	256 (49%)	3.43 (0.50)	3.35 (0.97)	3.69 (0.54)[a]	2.51 (0.79)	2.62 (0.94)	3.78 (0.44)[a]
Year 1	236 (45%)	3.52 (0.50)	3.46 (0.97)	3.75 (0.54)[a,b]	2.52 (0.75)	2.70 (1.06)	3.99 (0.48)[b]
Year 2	34 (6%)	3.58 (0.37)	3.75 (0.89)	3.95 (0.53)[b,c]	2.70 (0.98)	2.53 (1.08)	3.94 (0.60)[a,b]
Year 3		2.71	2.94*	2.97*	0.56###	0.55###	7.41**
F		0.01	0.011	0.011	0.003	0.002	0.03
Partial eta squared							
Marital status	22 (4%)	3.37 (0.43)	3.62 (0.72)	3.56 (0.56)	3.02 (0.71)	2.80 (0.92)	3.37 (0.52)
Married	504 (96%)	3.49 (0.50)	3.41 (0.98)	3.85 (0.58)	3.49 (0.78)	2.64 (1.01)	3.58 (0.45)
Single *t*		−1.11	1.31##	−2.22	−2.77**	0.72	−2.18*
Partial eta squared		0.002	0.002	0.009	0.01	0.001	0.009
Adequate ICT course	343 (65%)	3.59 (0.47)	3.64 (0.91)	3.94 (0.58)	3.50 (0.81)	2.72 (1.07)	3.65 (0.45)
Yes	183 (35%)	3.28 (0.47)	3.03 (0.96)	3.64 (0.57)	3.41 (0.72)	2.51 (0.86)	3.45 (0.44)
No *t*		7.13**	7.15**	5.52**	1.32	2.30*	4.84**
Partial eta squared		0.09	0.09	0.06	0.003	0.01	0.04
Preferred mode (n = 520)	43 (8%)	3.89 (0.60)[a]	3.93 (1.08)[a]	3.93 (0.54)[a]	2.40 (0.90)	4.07 (0.78)[a]	3.87 (0.46)
Online	333 (64%)	3.34 (0.43)[b]	3.21 (0.92)[b]	3.65 (0.52)[b]	2.58 (0.77)	2.27 (0.76)[b]	3.89 (0.47)
Face-to-face	144 (28%)	3.69 (0.46)[c]	3.76 (0.89)[a]	3.87 (0.52)[a]	2.42 (0.71)	3.06 (0.99)[c]	3.98 (0.47)
Both		42.87##**	25.53**	9.14**	2.90	122.95##**	1.96
F		0.16	0.09	0.03	0.01	0.31	0.07
Partial eta squared							
Place of residence	53 (10%)	3.67 (0.56)[a]	3.77 (1.04)[a]	3.91 (0.64)[a]	2.52 (0.90)[a]	3.00 (1.03)[a]	3.94 (0.53)
Regional capital	101 (19%)	3.60 (0.47)[a]	3.66 (0.98)[a]	3.84 (0.46)[a]	2.49 (0.77)[a]	2.76 (1.08)[a]	3.97 (0.47)
District capital	163 (31%)	3.57 (0.45)[a]	3.62 (0.79)[a]	3.80 (0.50)[a]	2.38 (0.73)[a,b]	2.61 (0.98)[a]	3.92 (0.46)
Town	209 (40%)	3.31 (0.48)[b]	3.07 (0.97)[b]	3.58 (0.55)[b]	2.66 (0.78)[c]	3.19 (0.94)[b]	3.87 (0.46)
Village		15.73**	16.54##**	10.04**	3.97**	3.49*	1.17
F		0.08	0.09	0.05	0.02	0.02	0.02
Partial eta squared							

*OLS = OL Success; CS = Computer Skills; IL = Independent Learning; DL = Dependent Learning; NOL = Need for OL; AS = Academic Skills; ICT = Information Communications Technology; **p < 0.01; *p < 0.05; superscripts [(a,b,c)] = significant differences; ## = Violation of homogeneity of variance and Welch statistics reported.*

selected based on convenience; we chose institutions that were willing to support the data collection process. The data were collected while the institutions were closed and were exploring ways to adopt OL as an alternative form of education. Institutions that were willing to share questionnaire on their online platforms (e.g., WhatsApp) were considered.

Only four of the 10 institutions contacted allowed their students to participate in the study. In total, 526 preservice teachers completed the online survey. **Table 1** presents a summary of the demographic characteristics of the participants. Of the participants, 70% were male (30% were female), and 47% were aged between 19 and 22 years old (15% were at least 26 years old). In terms of the teachers' area of specialization, 55% specialized in general areas (technical, social sciences, arts, and vocational education), and 45% specialized in science, technology, engineering, and mathematics (STEM). In terms of their enrolment year, 49% of the participants were in their first year of study while 6% were in their third year of study. As for their preferred mode of study,

TABLE 2 | Summary of regression for OL success.

Variable	*B*	*SE B*	*Beta*	*t*	*P*
Gender	−6.55	2.03	−0.13	−3.23	0.001**
Age	−1.67	1.32	−0.05	−1.27	0.21
Specialization	−3.45	1.87	−0.08	−1.84	0.07
Year of study	2.00	1.51	0.06	1.32	0.19
Marital status	3.75	4.78	0.03	0.78	0.43
Adequate ICT course	−10.82	1.97	−0.23	−5.49	0.001**
Preferred mode	2.40	1.60	−0.06	1.50	0.14
Place of residence	−4.61	0.93	−0.21	−4.93	0.001**

*ICT = Information Communications Technology; **p < 0.01.*

64% indicated a preference for face-to-face learning, and 8% who showed preference for OL. Finally, 40% of the participants lived in rural areas while 10% lived in regional capitals.

Data Collection

A standard questionnaire comprising two sections was used to collect data from the participants. The first section collected demographic information. The second section was chosen because of its close alignment with the theoretical framework. Specifically, we used an adapted form of the OL Success (OLS) scale (Kerr et al., 2006; Mckeever, 2019), which has 45 items, with five subscales. These subscales are computer skills (n = 11), independent learning (n = 10), dependent learning (n = 6), need for OL (n = 5), and academic skills (n = 10). The items were anchored on responses that ranged from 1 (strongly disagree) to 5 (strongly agree); a mean score of at least 4 was interpreted to mean a greater degree of success.

The items on the first subscale were positively worded. Some items were "I am capable of using chat rooms online," "I am capable of managing files on a computer," and "I can install new software when necessary." For the second subscale, nine items were positively worded; one was negatively worded ("I am a procrastinator"). This was reverse coded during the data analysis. Some items on the scale were "I am goal-oriented," "I am self-motivated," and "I am a good time manager." A mean score of at least 4 was interpreted to mean that the participants were more likely to be independent learners.

In the third subscale, all the items were negatively worded and were reversed coded during the data analysis. Some items were as follows: "I often leave tasks unfinished," "I require help in understanding written instructions," and "I have trouble comprehending what I read." A mean score of at most 3was interpreted to mean that the participants were more likely to be dependent learners.

The fourth subscale pertained to the need for OL; all the items were positively worded. Some items on the scale were "Because of my personal schedule, I need online courses," "It is difficult for me to get to the campus to attend classes," and "I need online courses because of my geographical distance from universities." A mean score of 4 was interpreted as expressing a greater need for OL.

The fifth subscale was on academic skills. Although 11 items were positively worded, two were negatively worded ("I need face-to-face interaction to learn" and "I need faculty feedback on my completed assignments"). Other positively worded items on the scale were "I am a good reader," "I read carefully," and "I am a good writer." A mean score of at least 4 was interpreted to indicate high academic skills.

The adapted scales were piloted at a different college (N = 51) outside the study population, which yielded appropriate reliability scores for the OLS (0.88) and the subscales (computer skills = 0.90; independent learning = 0.70; dependent learning = 0.71; need for OL = 0.89; and academic skills = 0.78). Because the reliability scores were appropriate, we chose not to check the structural validity of the questionnaire.

Procedure

Ethics approval was received from a college of education in Ghana. Further approvals were received from Ministry of Education, and Ghana Education Service who reviewed the study protocols before its implementation. Further, we wrote formal letters to the various institutions; their subsequent approvals were obtained to collect data. Of the 10 colleges contacted, only four responded to the request and allowed their students to participate. Since the colleges had been closed owing to COVID-19, the institutions asked the researchers to share a link to the study to the representatives of each group. These representatives were administrators of various social media platforms such as WhatsApp and Facebook. Thus, they had permission to share the Google Forms survey for the students to complete. Information concerning the research statement and implied consent preceded the questions. Consent was implied by the participants clicking on the link to begin the questionnaires. The data were collected between May 2020 and August 2020. Each participant spent at least 25 min on the questionnaire, which was in English. Participation was voluntary; the participants were informed that they were not obliged to complete the questionnaire.

Data Analysis

The data were collected using Google Forms. The data were first transferred to Microsoft Excel for cleaning and subsequently transferred to SPSS 26 for the analysis. Initially, we assumed that the data were normally distributed based on the sample size. Per Field (2013), studies with a larger population are automatically normally distributed based on the central tendency theorem. Further, we continued to test the reliability of the scale before answering the research questions. Computing Cronbach's alpha yielded appropriate score for the OLS (0.90) and the subscales (computer skills = 0.94; independent learning = 0.79; dependent learning = 0.74; need for OL = 0.81; academic skills = 0.74). Moreover, the inter-reliability correlation matrix yielded a score of 0.3 for most items.

Subsequently, to answer Research Question 1, we computed the scores for all the measures before using a *t*-test and an analysis of variance (ANOVA) to ascertain the associations between the demographic variables and OL success in Ghana. The t-tests were computed for measures with two levels (e.g., gender), while ANOVAs were computed for measures with at least three levels (e.g., age). In addition, we ensured that the assumptions of normality and homogeneity of variances were not violated. We assessed the homogeneity of variances using Levene's *t*-test. In relation to the ANOVAs, where there was a violation, we reported results of the Welch statistics. Finally, we used partial eta squared to ascertain the strength of the association between demographic variables and the measures; it was explained as follows: small (0.01–0.04), moderate (0.05–0.09), and large (at least 0.1).

Research Question 2 was answered using linear regression. Specifically, we computed six linear regressions to understand the predictors of OL success. First, we computed the linear regression for OL success before proceeding to the five subscales. Preliminary assessments were made to ensure that we did not violate the following assumptions: normality, linearity, and homoscedasticity.

Finally, to answer Research Question 3, we used a hierarchical regression to understand the influence of other subscales on

academic success. Before computing the regression, we checked the strengths of associations between the subscales using the Pearson correlation coefficient. The correlations were interpreted as follows: small (0.10–0.29), moderate (0.30–0.49), and large (0.50–1.0). Subsequently, we computed the hierarchical regressions with academic skills as the outcome variable. Once again, we checked the assumptions of normality, linearity, and homoscedasticity to ensure that they were not violated.

RESULTS

Overall, the participants were ambivalent on OL success. The mean score for the OLS was 3.48 (SD = 0.49). The subscales yielded the following scores: computer skills (M = 3.42, SD = 0.97), independent learning (M = 3.84, SD = 0.59), dependent learning (M = 3.47, SD = 0.78), need for OL (M = 2.65, SD = 1.01), and academic skills (M = 3.58, SD = 0.46).

Association Between Demographics and OL Success

Independent sample t-tests were conducted to compare two-level demographics and dependent variables (see **Table 1**). First, in terms of gender, there were significant differences between male and female preservice teachers regarding the OLS (t (524) = 3.21, p = 0.001). The effect size was considerably small (partial eta squared = 0.02). For the subscales, significant differences were observed between the participants in relation to computer skills (*t* (524) = 4.71, p = 0.01; partial eta squared = 0.04), dependent learning (t (524) = −1.96, p = 0.05; partial eta squared = 0.007), and academic skills (t (524) = 3.90, p = 0.02; partial eta squared = 0.03).

Second, we computed the association between the area of specialization and the dependent variables. With respect to the OLS, a significant difference existed between preservice teachers. Those specializing in STEM seemed more successful in OL than those who specialized in the general arts and related areas (t (524) = 3.28, p = 0.001). However, the effect size was considerably small (partial eta squared = 0.02). On all the scales, those who specialized in STEM were more positive on all the variables than those who specialized in other areas. Specifically, there was a significant difference between the participants in computer skills (t (524) = 3.45, p = 0.001), independent learning (t (524) = 2.02, p = 0.01), and academic skills (t (524) = 2.95, p = 0.001).

Third, in relation to marital status, we noted differences between the participants on two measures: dependent learning and academic skills. For example, for dependent learning, those who were married yielded more positive results than those who were unmarried. Moreover, regarding academic skills, the unmarried participants were more positive than those who were married.

Fourth, we observed differences between the participants on whether they had taken ICT courses. On the OLS, the participants who had taken adequate courses in ICT indicated more success than those who had not (t (524) = 7.13, p = 0.001). However, the effect size was moderate (partial eta squared = 0.09). Furthermore, we noted significant differences on the following subscales: computer skills, independent learning, need for OL, and academic skills. The effect sizes ranged from small to moderate. Notably, the participants who had taken ICT courses yielded more positive results on all the measures than those who had yet to take such courses.

ANOVAs were conducted to examine the association between three-level demographics and the dependent variables. First, there were significant differences between the participants in relation to their year of study on the following subscales: computer skills, independent learning, and academic skills. On all the subscales, the effect sizes were considerably small. With respect to computer skills, the participants who were in their third year yielded more positive results than those in their second and first years, F (2, 523) = 2.94, p = 0.05. Post-hoc comparisons using Tukey's test showed no difference between the participants. For independent learning, a similar trend was observed because those in their third year evinced more positive results than those in their early years of study, F (2, 523) = 2.97, p = 0.02. Post-hoc comparisons using Tukey's test showed a difference between those were in their first and third years, with the latter being more independent than the former. Regarding academic skills, the participants in their second and third years had more positive results than those in their first year, F (2, 523) = 7.41, p = 0.002. The post-hoc comparison showed that preservice teachers in their second and third years differed from those in their first year.

With respect to the preferred mode of learning, there were significant differences between the participants on the OLS, F (2, 523) = 42.87, p = 0.001, with a substantially large effect size (partial eta squared = 0.16). The post-hoc test showed that those who indicated a preference for OL were more successful than those who indicated otherwise. In terms of the subscales, there were differences between the participants on computer skills, independent learning, and need for OL. On all the subscales, those who indicated a preference for OL ranked higher in terms of their computer skills and being independent learners and also expressed a need for more OL than those who indicated otherwise.

In terms of the place of residence, on the OLS, the participants who lived in the regional, district, and town areas were more successful than those in rural areas. The post-hoc test showed that those living in regional, district, and town areas differed from those in rural areas. Similar trends were observed on the following subscales: computer skills, independent learning, dependent learning, and need for OL. Specifically, those living in rural areas differed from the rest on all the subscales and indicated a preference for more training and more dependent learning than those in regional, district, and town areas.

Predictors of Successful OL

Six linear regressions were computed to assess the ability of demographic variables to predict the dependent variables (**Table 2**). The first model was on the regressing of demographic variables on the overall OL success. The demographics contributed to 17% of the variance in overall learning success, F (8, 510) = 13.15, p = 0.001. The following

TABLE 3 | Summary of demographic variables predicting computer skills.

Variable	B	SE B	Beta	t	P
Gender	−4.94	5.87	−0.21	−5.18	0.001**
Age	−1.84	0.95	−0.12	−2.96	0.003**
Specialization	−1.51	0.62	−0.07	−1.71	0.08
Year of study	0.82	0.88	0.05	1.15	0.25
Marital status	−4.13	0.71	−0.08	−1.84	0.07
Adequate ICT course	−4.95	2.25	−0.22	−5.34	0.001**
Preferred mode	1.16	0.75	0.61	1.53	0.13
Place of residence	−2.32	0.44	−0.22	−5.29	0.001**

*ICT = Information Communication Technology; **p < 0.01.*

TABLE 4 | Summary of demographic variables predicting independent learning.

Variable	B	SE B	Beta	t	p
Gender	−0.49	0.51	−0.04	−0.97	0.33
Age	−0.004	0.33	0.001	−0.01	0.99
Specialization	−0.844	0.47	−0.08	−1.81	0.07
Year of study	0.69	0.38	0.08	1.82	0.07
Marital status	1.64	1.19	0.06	1.38	0.17
Adequate ICT course	−2.11	0.49	−0.19	−4.30	0.001**
Preferred mode	0.44	0.40	0.05	1.10	0.27
Place of residence	−0.94	0.23	−0.18	−4.04	0.001**

*ICT = Information Communication Technology; **p < 0.01.*

TABLE 5 | Summary of demographic variables predicting dependent learning.

Variable	B	SE B	Beta	t	p
Gender	−1.26	0.45	−0.12	−2.77	0.01**
Age	−0.56	0.29	−0.09	−1.89	0.06
Specialization	0.19	0.42	0.02	0.45	0.65
Year of study	0.16	0.34	0.02	0.47	0.64
Marital status	−3.63	1.07	−0.15	−3.40	0.001**
Adequate ICT course	0.63	0.44	0.07	1.42	0.155
Preferred mode	−0.38	0.36	0.06	−1.05	0.30
Place of residence	0.27	0.21	−0.05	1.27	0.21

*ICT = Information Communication Technology; **p < 0.01.*

demographic variables made significant contributions in the variance in OL success: gender, having taken an adequate ICT course, and place of residence. Of these, "adequate ICT course" made a significant contribution to the variance in OL success (b = −0.23, p = 0.001).

Five additional models were computed for the subscales. First, we regressed demographic variables on computer skills (see **Table 3**). The demographic variables explained 45% of the variance in computer skills, F (8, 510) = 16.28, p = 0.001. The following predictors yielded significant results: gender, age, ICT course, and place of residence. However, "adequate ICT course" and "place of residence" were the best predictors of computer skills.

The second model was a regression of demographics on independent learning (see **Table 4**). The model explained 34% of the variance in independent learning, F (8, 510) = 8.17, p = 0.001. Only having taken an adequate ICT course and the place of residence significantly predicted independent learning. The variable "adequate ICT course" was the best predictor of independent learning.

The third model was on the regression of demographic variables on dependent learning (see **Table 5**). According to the model, the demographics made a contribution of 21% to the variance in dependent learning, F (8.510) = 3.02, p = 0.003. The following demographics significantly predicted dependent learning: gender and marital status. The variable "marital status" emerged as the most significant predictor of dependent learning.

TABLE 6 | Summary of demographic variables predicting the need for OL.

Variable	B	SE B	Beta	t	p
Gender	−0.65	0.49	−0.06	−1.31	0.19
Age	−0.10	0.32	−0.01	−0.32	0.75
Specialization	−0.33	0.46	−0.03	−0.72	0.48
Year of study	−0.18	0.37	−0.02	−0.49	0.62
Marital status	−0.68	1.16	−0.03	−0.58	0.56
Adequate ICT course	−0.62	0.48	−0.06	−1.29	0.20
Preferred mode	−0.19	0.39	−0.02	−0.49	0.62
Place of residence	−0.65	0.23	−0.13	−2.87	0.004*

*ICT = Information Communication Technology; *p < 0.05.*

TABLE 7 | Summary of demographic variables predicting academic skills.

Variable	B	SE B	Beta	t	p
Gender	−0.90	0.59	−0.07	−1.54	0.13
Age	−0.04	0.38	−0.005	−0.11	0.91
Specialization	−1.27	0.54	−0.103	−2.33	0.02*
Year of study	0.92	0.44	0.09	2.11	0.04*
Marital status	2.71	1.39	0.09	1.95	0.05*
Adequate ICT course	−1.87	0.57	−0.15	−3.27	0.001**
Preferred mode	0.77	0.47	0.07	1.65	0.10
Place of residence	−0.18	0.27	−0.03	−0.65	0.52

*ICT = Information Communication Technology; **P < 0.01; *P < 0.05*

TABLE 8 | Hierarchical multiple regression analysis relating to academic skills.

Variable	Beta	SE B	Beta	t	p
Step 1	0.09	0.03	0.16	3.67	0.001**
Computer skills	0.47	0.05	0.41	9.09	0.001**
Independent learning	−0.12	0.05	−0.09	−2.27	0.02*
Dependent learning	−1.12	0.05	−0.10	−2.47	0.01**
Need for OL	0.09	0.03	0.15	3.17	0.002**
Step 2	0.45	0.05	0.40	8.71	0.001**
Computer skills	−0.13	0.05	−0.10	−2.38	0.02*
Independent learning	−0.11	0.05	−0.09	−2.27	0.02*
Dependent learning					
Need for OL					
Gender	−0.49	0.53	−0.04	−0.92	0.36
Age	0.04	0.34	0.004	0.11	0.91
Specialization	−0.76	0.47	−0.06	−1.62	0.11
Year of study	0.54	0.38	0.05	1.43	0.15
Marital status	1.79	1.22	0.06	1.46	0.14
Adequate ICT course	−0.47	0.51	−0.04	−0.93	0.35
Preferred mode	0.40	0.40	0.04	0.99	0.32
Place of residence	0.41	0.24	0.07	1.71	0.09

*ICT = Information Communication Technology; **p < 0.01.*

The fourth model was a regression of demographic variables on the need for OL (**Table 6**). The demographics made a significant contribution of 17% to the variance in the need for OL F (8, 510) = 1.92, p = 0.05. Only "place of residence" significantly predicted the need for OL.

The fifth model was a regression of demographic variables on academic skills (see **Table 7**). Overall, the demographic variables contributed to 27% of the variance in academic skills, F (8,510) = 5.17, p = 0.001. In total, four demographic variables significantly predicted academic skills: specialization, year of study, marital status, and ICT course. "Adequate ICT course" emerged as the most significant predictor.

What is the Influence of Other Variables on Academic Skills?

The relationships between the dependent variables were computed using the Pearson correlation coefficient. There was medium but negative correlation between dependent learning and independent learning (r = −0.31, p = 0.001); a strong, positive correlation existed between computer skills and independent learning (r = 0.51, p = 0.001). Moreover, there was a medium correlation between the need for OL and computer skills (r = 0.29, p = 0.001). A medium correlation existed between computer skills and academic skills (r = 0.37, p = 0.001).

A hierarchical multiple regression was used to assess the influence of other variables on academic skills of preservice teachers (**Table 8**). In Step 1, variables (computer skills, independent learning, dependent learning, and the need for OL) contributed to 29% of the variance in academic skills, F (4, 514) = 53.91, p = 0.001. In this phase, independent learning emerged as the most significant contributor to the variance in academic skills.

In Step 2, with the addition of demographic variables, the predictors contributed to 30% of the variance in academic skills, F (12, 506) = 19.46, p = 0.001. Four predictors made significant contributions to the variance in academic skills; all the demographic variables made some significant contribution in the variance. Once again, "independent learning" made the largest contribution to the variance in academic skills.

DISCUSSION

Here, we adopted Bandura's (1977, 1988) SCT as a theoretical framework to understand preservice teachers' OL experiences and the impact of computer skills on academic performance. In terms of self-observation (Bandura, 2002), the preservice teachers seemed unsure about their computer skills, OL needs, and academic performance. The participants were unsure about OL success and ranked low in terms of their computer skills, need for OL, and academic performance. This finding is partly consistent with previous studies that have reported low confidence of students in terms of their computer skills, need for OL, and academic performance (Maritim & Getuno, 2018; Coman et al., 2020). This probably suggests that students may not have been provided enough computer skills to enable them to engage in OL. With COVID-19 becoming a global concern, OL is a game changer because educators will likely strive to adopt or improve access to education through OL. However, the participants herein may be concerned about their chances of excelling academically owing to their low computer skills. Unsurprisingly, computer access in education is a challenge in Ghana (Ministry of Education, 2017; Iddrisu et al., 2020), which may mean that the participants have experienced few courses, thereby leading to uncertainty about their computer literacy. This is probably a wake-up call for all educators in Ghana in that they must equip schools to be able to provide appropriate computer education to students. This will prepare the students for OL at all levels of education.

The importance of ICT training for OL cannot be emphasized enough. Here, preservice teachers who indicated that they had taken adequate training in ICT were more positive about their computer skills and academic performance than those who indicated otherwise. Similarly, ICT training was a significant predictor of overall OL success and independent learning. This finding is consistent with previous studies that reported that students with ICT training had higher computer skills than those without (Husain, 2011; Nagrale, 2013). In promoting OL, one's computer training is highly relevant because it has become the means to an end—namely, access to education. It is apparent that preservice teachers will be able to evaluate learning and cognitive achievements in classrooms if they are given adequate ICT training. It is important to reiterate that the self-evaluation of participants is important because they are being prepared to teach others in the future. If they evaluate themselves positively with respect to computer skills, they would be in a good position to promote the learning of their future students who might access education through online platforms. There is no gainsaying that ICT education reforms in Ghana may be needed at a time where education is likely moving away from face-to-face teaching to OL.

There was an interesting finding about the participants' preferred mode of learning. Specifically, participants who preferred OL had greater computer skills and were independent learners. This finding partly agrees with previous studies that reported an association between OL and a high level of computer skills (Husain, 2011). This suggests that once students are given the required training in ICT, they may have a greater preference for OL. This type of learning is an appropriate mode of education in difficult times such as the current pandemic. Independent learners are highly sought after at a time where the world seems to be facing enormous challenges. There is a need for people who can contribute toward solving worldwide problems (Orgoványi-Gajdos, 2016). It appears that OL could afford students the chance to become independent learners, innovative researchers, and even candidates for future problem solvers. However, without access to computer education, the prospect of nurturing independent learners or thinkers remains a mirage.

The importance of environment and its interaction with behavior is a key tenet of the SCT. Here, the place where the participants lived provided additional explanations for their computer skills, need for OL, and being (in)dependent learners. While the participants who lived in regional and district areas indicated that they had high computer skills and were independent learners, those living in rural areas indicated that they were dependent learners and expressed the need for

more academic skills. This finding is highly relevant and plausible in a context where there is a disparity between urban and rural dwellers. In rural communities, there is an absence of basic services and support required for students living in such areas (Addy, 2013). In Ghana, rurality is synonymous with scarcity, poverty, and deplorable living conditions (Addy, 2013). Students in such communities have limited access to the basic amenities that their urban counterparts take for granted (Addy, 2013; Acheampong & Gyasi, 2019). It is unsurprising that the participants living in rural areas were dependent learners and expressed the need for more OL. They likely had access to the basic infrastructure that would enable them to access OL. The government of Ghana has been advocating for equitable access to education such that all children can study and explore their potential (Ministry of Education, 2013). However, disparity in access to basic amenities can affect the chances of students in rural communities in terms of accessing education. This finding calls for a more affirmative approach toward developing rural communities to ensure that all students can access online education in Ghana.

Per Bandura's proposition, the learner's gender is central to the learning process. An association was found between gender and some of the measures. Interestingly, male preservice teachers indicated high academic skills, a high need for OL, and high computer skills, whereas female preservice teachers indicated being more dependent learners than their male counterparts. This finding is slightly consistent with previous studies that found that men had higher computer skills and OL experiences than women (Markauskaite, 2006). This finding is relevant in the Ghanaian context wherein there is an intricate relationship between gender and culture. For example, culturally, men are described as being more capable and are expected to perform or have better cognitive skills than women. These cultural stereotypes have had serious ramifications for the development of female children because they are consequently less advanced in education and other ICT related fields. The statistics have shown that there are few women in areas such as ICT and science compared to men (Markauskaite, 2006; Tezci, 2011). Moreover, more women are uninterested in learning subjects related to ICT and science (Tezci, 2011). Indeed, women may have accepted their role as dependents to be led by their male counterparts. In the effort to promote accessible education to all, there is a need to provide equal learning opportunities for women in areas such as ICT to enhance their participation and interest in OL.

Limitations

Caution must be exercised in the generalization of the findings reported herein. First, the research team did not have access to the social media platforms wherein the questionnaire was shared with the participants. These outlets were accessible only to the students; thus, a representative had to share the questionnaire on behalf of the research team. Training was provided to the students who were administrators of the online platforms before they shared the questionnaire. Second, questions pertaining to difficulties faced by students or clarifications on items on the scale were handled by an intermediary and not the research team, namely, by the students' representatives, who helped collect the data. Nevertheless, the research team provided voice or video recordings to explain concepts or questions raised by the students during the data collection. Third, the study was conducted in four out of the over 40 institutions across Ghana. Because Ghana is a unitary state, people move freely from one region to the other to access education. Thus, we believe that the population dynamics herein are comparable to situations and patterns in the other institutions across Ghana. Furthermore, despite the aforementioned limitations, the findings of the present research have provided a glimpse of the perceptions regarding the association between the computer skills, OL, and academic performance of preservice teachers.

CONCLUSION AND POLICY IMPLICATIONS

Here, Bandura's SCT was used as a framework to investigate the perspectives of preservice teachers regarding their computer skills and need for OL. The education sector has been hit hard by the COVID-19 pandemic, with schools being forced to operate remotely. However, in an environment wherein access to computers and basic amenities is limited, exploring preservice teachers' perceptions of their computer skills and its association with their academic performance became necessary. As hypothesized by Bandura, interaction between the learner, their cognition, and their environment are fundamental to an individual excelling in school. Indeed, interesting results were obtained with respect to the role of the learners, their cognitive abilities, and the environment regarding OL in Ghana. Notably, the preservice teachers ranked themselves as either low or ambivalent on all the measures. In addition, in terms of the learners and their environments, differences were observed between where the students lived, their preferred mode of learning, their gender, and whether they had taken ICT courses. Another important observation was the predictors of academic skills. Specifically, in terms of cognitive abilities, independent learning contributed the largest variance in terms of academic skills.

The study is relevant in an era where education has been moving slightly away from a traditional mode to a blend of online and face-to-face teaching. Preservice teachers are expected to provide online education to their future students. Thus, their education in and perceptions of online education is fundamental for a successful implementation or provision of online education in the future. First, there is the need for the expedition of ICT education to preservice teachers who will likely teach online. ICT education has been noted to be central to online teaching. In view of this, a formidable training in ICT is needed to ensure that preservice teachers are prepared for online teaching. Second, consideration should be given to developing the confidence of female teachers with respect to their capacities for computer skills and OL. This targeted training could focus on training female teachers to believe in themselves and their ability to provide accessible online education. Third, policymakers should consider the

provision of resources to all parts of Ghana to bridge the gap between regional and rural areas. This would ensure that all students, regardless of where they live, will be given a fair access to online education. As with other pandemics, COVID-19 may live with us for some time. Therefore, some of these recommendations should be considered in light of the formulation of education policies to enable all persons to enjoy their fundamental rights to education.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Abetifi College of Education/Ghana Education Service. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

WN, MO, AM, EK, RT and EK contributed to the conception of the study. WN, RT, EK and EK collected the data. MO, EK and AM analyzed and interpreted the data. MO, RT, EK, WN and AM were major contributors in writing the manuscript. All authors read and approved the final.

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