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TECHNOLOGY SELF-EFFICACY AND DIGITAL LITERACY AMONG ODL STUDENTS: THE MODERATING ROLE OF GENDER

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ABSTRACT

This study investigated Open Distance Learning (ODL) students' technology self-efficacy and digital literacy levels and how the relationship between their technology self-efficacy and digital literacy is moderated by gender. The study adopted a quantitative survey research approach and data was collected from 522 students from a selected ODL institution in Nigeria using an online survey. A structured questionnaire consisting of 3 domains namely, demographic, technology self-efficacy and digital literacy were used as a data collection instrument for the study. Data generated from the study were analysed using descriptive statistics of percentages, frequency count, mean and standard deviation while correlation and factor analyses were performed to estimate the model's consistency and construct validity. The moderating role of gender was done using the process macro (Model 1) developed by Hayes, (2018). Results revealed amongst others that ODL students' technology self-efficacy is very high and their digital literacy rate is high. Also, technology self-efficacy was shown to exhibit a substantial positive influence on digital literacy among the students. However, the results indicated that gender played an insignificant moderating role in the relationship between technology self-efficacy and digital literacy. Based on the results, it was recommended that efforts at increasing digitization in ODL delivery in Nigeria should take into consideration these factors. Also, policy actions aimed at engaging ODL learners in more technologically sophisticated learning platforms must be anchored on students' belief in their ability to use the learning platforms to achieve their desired learning outcomes irrespective of their gender.

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Introduction.

Open distance learning (ODL) has become an increasingly popular mode of education in recent years due to the way it has been transforming the educational landscape by providing flexible and accessible learning opportunities to learners across the globe (Itasanmi, 2022). The term ODL refers to an educational process, whether formal, informal or non-formal that is mediated by technology in which learners are separated from their instructors (Itasanmi et al., 2020). In essence, ODL is a mode of education that delivers instruction to learners using technology. The main goal of ODL is to widen participation and overcome geographical, social, and economic barriers limiting educational access (Baloyi, 2012).

Due to the increase in access to educational opportunities especially higher education through ODL, it has been embraced worldwide and has become an invaluable option in educational delivery in many developing countries (Benson, et al., 2021). However, the current landscape of distance learning continues to be influenced by the growing demand for ODL as more learners continue to seek flexible and accessible learning options that fit their lifestyles; diverse course offerings beyond the traditional academic courses to include professional development, vocational training and personal enrichment courses; and technology advancements that play a significant role in the growth of distance learning (Hanna, 2019; Kant, 2019).

The evolving nature of ODL makes adapting to an open distance learning environment challenging especially for students regarding technology use for learning. Adapting to open distance learning environments requires the willingness of learners to learn new technologies and their ability to navigate the digital environment to enhance the learning experience with a corresponding impact on their academic success (Karagul et al., 2021; Schlebusch, 2018).

Technology self-efficacy and digital literacy have been identified as critical factors in learners' success in distance learning environments (Prior et al., 2016; Tang & Chaw, 2016; Carraher Wolverton et al., 2020). Technology self-efficacy on one hand refers to an individual's confidence in his/her ability to use technology to achieve their goals (Schlebusch, 2018). Antecedents of students' technology self-efficacy have been identified to include factors related to their prior experience with technology, the complexity of the technology, and the individual's perceived control over the technology (Burkhard & Roldan, 2009; Hauser et al., 2012). High technology self-efficacy is associated with greater motivation to learn and use technology while low technology self-efficacy may lead to anxiety and avoidance of technology use (Njiku et al., 2022).

On the other hand, digital literacy refers to an individual's ability to use digital technologies to find, evaluate, create, and communicate information. It includes not only technical skills, such as using software and hardware but also critical thinking skills, such as assessing the credibility of online sources and understanding the impact of technology on society (Heitin, 2019). Digital literacy is becoming increasingly important in a world where technology is ubiquitous and plays a vital role in education, work, and daily life (Lestari & Santoso, 2019).

Generally, technology self-efficacy and digital literacy are both important concepts in understanding students' ability to use and engage with technology. While technology self-efficacy and digital literacy are related, they are distinct concepts. Technology self-efficacy focuses on an individual's confidence in their ability to use technology, digital literacy emphasizes an individual's overall competency in using digital technologies (Schlebusch, 2018; Lestari & Santoso, 2019).

Since ODL programmes rely heavily on technology for communication, collaboration and the delivery of course materials and using new technologies for learning by students requires having 21st-century skills including digital literacy and confidence to use it (Yeşilyurt & Vezne, 2023), exploring technology self-efficacy and digital literacy levels among ODL students is an important step towards understanding their ability to use and engage with technology for learning.

Also, considering how technology self-efficacy and digital literacy are becoming important in a world where technology is ubiquitous and plays a vital role in ODL delivery, examining ODL students' technology self-efficacy and digital literacy levels becomes imperative to help support the development of digital literacy in students and build their technology skills and confidence needed to navigate the digital landscape of the ODL learning environments (Maphosa & Bhebhe, 2019).

Hence, this study aims to investigate technology self-efficacy and digital literacy levels among ODL students in a selected Nigerian university. This may help prompt a better understanding of their readiness and capacity to utilize technology effectively for learning. Equally, the role of gender has been explored in many studies related to technology use, self-efficacy and digital skills (Burkhard & Roldan, 2009). However, the results of such studies have been largely inconsistent (Tømte & Hatlevik, 2011; Jannah, 2019; Omar et al., 2022; Zeng et al., 2022; Ossai, 2022). Understanding the moderating role of gender in the relationship between technology self-efficacy and a digital literacy becomes an important area of research. This may help provide insight into how gender can impact the development of technology-related skills and confidence among ODL students.

Specifically, the current study aims to examine the technology self-efficacy and digital literacy levels among ODL students and test the relationship between technology self-efficacy and digital literacy. Similarly, the following two hypotheses will be tested:

1. H_1: There is a significant positive relationship between TSE and DL.
2. H_2: Gender significantly moderates the relationship between TSE and DL.

Methodology.

Design.

This study adopted a quantitative survey method to investigate ODL students' technology self-efficacy and digital literacy levels and to understand the relationship between the variables as well as the moderating role of gender in the relationship. This method is considered appropriate because it enables the researcher to describe the current technology self-efficacy and digital literacy levels of the study's participants and provide useful data that could sufficiently help determine the relationship among the variables.

Participants.

The participants of the study comprised five hundred and twenty-two (522) ODL students from the Distance Learning Centre (DLC) of Nigeria's premier university, the University of Ibadan. The Centre was chosen based on its leading role in distance learning provision in Nigeria. The participants participated in the study via an online survey invitation sent to them through their dedicated email addresses. The study targeted registered ODL students for the 2020/2021 academic session. The invitation for participation mail sent to the participants sought their consent to participate in the survey after providing information about the objectives of the study. Participation in the survey was made voluntary and they were assured of the confidentiality of the information provided. Before conducting the study, relevant permission was sought and granted by the researcher's department (Department of Adult Education) and the management of the DLC.

Instrument.

A structured questionnaire consisting of 3 domains namely, demographic, technology self-efficacy and digital literacy were used as a data collection instrument for the study. The demographic domain focused on the biodata of the participants and questions in it covers age, gender, marital status, employment status and programme level. The technology self-efficacy domain is a 5 items scale adapted from Kass, (2014) while the digital literacy domain is a 12 items scale adapted from Liza and Andriyanti, (2020). Both scales were anchored on a 5 Likert scale of strongly disagree/very low (1), disagree/low (2), neutral/unsure (3), agree/high (4) and strongly agree/very high (5).

Data analysis.

Data generated from the study were analyzed using Statistical Package for the Social Sciences (SPSS, V24) and AMOS 18. Descriptive statistics and correlation analyses were performed through SPSS while factor analysis to estimate the model's consistency and construct validity was done using AMOS. The moderating role of gender was performed using the process macro (Model 1) developed by Hayes, (2018). Model 1 was chosen for the analysis, which included 5000 bootstrap samples and 95 per cent confidence intervals. Technology self-efficacy and digital literacy levels were categorised based on the weighted average score ≤2 = very low, 2>x ≤3 = low, 3>x ≤4 = high and >4 = very high.

Results.

Table 1: Participants' Demographic Characteristics.

		All (n-522)	Male (n-273)		Female (n-249)		
1	2	3	4	5	6	7	8
Items	Types	Freq.	%	Freq.	%	Freq.	%
Age	16-20	33	6.3	13	4.8	20	8.0
	21-25	115	22	54	19.8	61	24.5
	26-30	148	28.4	64	23.4	84	33.7
	31-35	80	15.3	50	18.3	30	12.0
	36-40	63	12.1	37	13.6	26	10.4
	41-45	50	9.6	34	12.5	16	6.4
	46-50	24	4.6	16	5.9	8	3.2
	51-55	6	1.1	2	0.7	4	1.6
	56-60	3	0.6	3	1.1	0	0

Table 1.

1	2	3	4	5	6	7	8
Marital Status	Single	300	57.5	158	57.9	142	57.0
	Married	215	41.2	111	40.7	104	41.8
	Separated/Divorced/Widowed	7	1.4	4	1.5	3	1.2
Employment Status	Employed	242	46.4	128	46.9	114	45.8
	Self-employed	187	35.8	99	36.3	88	35.3
	Unemployed	93	17.8	46	16.8	47	18.9
Programme Level	100	78	14.9	37	13.6	41	16.5
	200	154	29.5	85	31.1	69	27.7
	300	96	18.4	44	16.1	52	20.9
	400	62	11.9	36	13.2	26	10.4
	500	132	25.3	71	26.0	61	24.5

Table 1 reveals that the majority (28.4%) of the study's participant fall within the age bracket of 26-30 and over half of them (57.5%) are single. Also, it was revealed that almost half (46.4%) of the students are employed while 29.5% of the study's participants are in the second year of their academic programme.

Table 2: Respondents' Technology Self-Efficacy Level.

S/N	Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
1	I feel confident in my ability to use social media to have meaningful interactions.	28 (5.4)	22 (2.1)	33 (6.3)	190 (36.4)	260 (49.8)	4.23	1.038
2	I feel confident in my ability to use technology for entertainment.	22 (4.2)	28 (5.4)	77 (14.8)	219 (42.0)	176 (33.7)	3.96	1.039
3	I feel confident in my ability to use Internet tools to conduct research and find trustworthy articles on a topic.	24 (4.6)	23 (4.4)	51 (9.8)	170 (32.6)	254 (48.7)	4.16	1.072
4	I feel confident in my ability to use technology to create an engaging presentation.	21 (4.0)	33 (6.3)	87 (16.7)	203 (38.9)	178 (34.1)	3.93	1.058
5	I feel confident in my ability to use new applications on my smartphone or tablet.	29 (5.6)	16 (3.1)	48 (9.2)	189 (36.2)	240 (46.0)	4.14	1.076
W.A.= 4.08 (Very high)								

Table 2 shows that the ODL students' technology self-efficacy level is very high (W.A.=4.08). The ODL students expressed a high confidence level in their ability to use social media to have meaningful interactions ($\bar{X}$=4.23), use internet tools to conduct research and find trustworthy articles on a topic ($\bar{X}$=4.16), and use new applications on their smartphones or tablets ($\bar{X}$=4.14).

Table 3: Respondents' Digital Literacy Level.

S/N	Items	Very low	Low	Unsure	High	Very high	Mean	SD
1	Generally, my level of digital literacy skills is?	4 (.8)	65 (12.8)	50 (9.6)	296 (56.7)	105 (20.1)	3.83	.922
2	The frequency at which I use the internet, computer, multimedia, and social networks in a week is?	6 (1.1)	45 (8.6)	26 (5.0)	219 (42.0)	226 (43.3)	4.18	.950
3	The rate of my skills in using word processing, power points, web search, multimedia, and communication application is?	17 (3.3)	87 (16.7)	88 (16.9)	234 (44.8)	96 (18.4)	3.58	1.068
4	The rate of knowledge I have that is related to digital technology issues is?	13 (2.5)	66 (12.6)	102 (19.5)	259 (49.6)	82 (15.7)	3.63	.975
5	The rate of my ability in organizing and evaluating information is?	11 (2.1)	46 (8.8)	100 (19.2)	262 (50.2)	103 (19.7)	3.77	.937
6	The rate of my ability in analyzing information is?	5 (1.0)	55 (10.5)	85 (16.3)	283 (54.2)	94 (18.0)	3.78	.896
7	The rate of my ability in solving technical problems of digital technology devices is?	26 (5.0)	101 (19.3)	130 (24.9)	199 (38.1)	66 (12.6)	3.34	1.080
8	The rate of my ability in using digital applications is?	14 (2.7)	52 (10.0)	74 (14.2)	268 (51.3)	114 (21.8)	3.80	.980
9	The rate of my ability in installing applications is?	9 (1.7)	58 (11.1)	66 (12.6)	238 (45.6)	151 (28.9)	3.89	1.002
10	The rate of my knowledge about digital technology devices is?	14 (2.7)	58 (11.1)	79 (15.1)	265 (50.8)	106 (20.3)	3.75	.990
11	The rate of my ability in interpreting visual, audio, and audio-visual media is?	12 (2.5)	64 (12.3)	82 (15.7)	252 (48.3)	111 (21.3)	3.74	1.008
12	The rate of my ability in installing digital technology devices is?	18 (3.4)	74 (14.2)	105 (20.1)	216 (41.4)	109 (20.9)	3.62	1.070
13	The rate of my ability in downloading and saving files from websites is?	8 (1.5)	50 (9.6)	45 (8.6)	223 (42.7)	196 (37.5)	4.05	.991
14	The rate of my ability in using video-call or video conferencing tools is?	9 (1.7)	48 (9.2)	64 (12.3)	226 (43.3)	175 (33.5)	3.98	.99
15	The rate of my ability in creating and editing photos and videos is?	23 (4.4)	83 (15.9)	97 (18.6)	224 (42.9)	95 (18.2)	3.54	1.094
W.A. = 3.8 (High)								

Table 3 reveals that ODL students' digital literacy level is high (W.A.= 3.8). It was indicated that the ODL students' frequent use of the internet, computer, multimedia, and social networks in a week ($\bar{X}$=4.18) and their ability in downloading and saving files from websites ($\bar{X}$=4. 4.05) is very high. Similarly, ODL students rate their ability in using video-call or video conferencing tools ($\bar{X}$=3.98) to be high just as they view their level of digital literacy skills generally ($\bar{X}$=3.83) to be high.

Hypotheses testing.

Estimating the validity and reliability of the study's constructs, the Composite Reliability (CR), Cronbach Alpha test (CA) and Average Extracted Variance (AVE) for the variables were calculated. Table 4 revealed that the CR and CA values obtained are above the recommended threshold value of 0.7 (Hair et al., 2010). Also, the Average Extracted Variance (AVE) values are all above 0.5 as suggested by Fornell and Larcker, (1981). These results imply the existence of internal consistency in the constructs.

Table 4: Construct validity and reliability test.

	CA	CR	AVE	TSE	DL
TSE	0.707	0.873	0.532	**0.729**	
DL	0.764	0.916	0.714	0.469	**0.845**

Note: In bold is the square root of AVE

Ascertaining the normality of the data, table 5 revealed that the skewness (-1.673 to -0.819) and kurtosis (0.224 to 2.809) values for all variables indicate that the data were normally distributed. The Pearson correlation coefficient between variables in the study was determined individually for both male and female participants. While TSE was considerably and strongly connected with DL in females (r =0.432, p <0.05), TSE and DL were significantly and positively correlated in males (r = 0.500, p <0.01).

Table 5: Mean, standard deviation, skewness, kurtosis and Pearson's correlation results.

Variables	Mean	Standard deviation	1	2
Total Sample n=522) TSE DL			 1 0.469**	 1
Females (n=249) TSE DL	 4.063 3.681	 0.884 0.761	 1 0.432*	 1
Males (n=273) TSE DL	 4.103 3.841	 0.970 0.782	 1 0.500**	 1
Skewness			-1.673	-0.819
Kurtosis			2.809	0.224

** $p < 0.05$, (2-tailed test).

Moderation analyses.

The results in table 6 revealed that TSE exhibited a substantial positive influence on DL, based on the bootstrap results (β = 0.3715, 95 per cent CI = [0.2752, 0.4678], t = 7.5786, p <0.01). Also, it was indicated that gender played an insignificant moderating role in the relationship between TSE and DL (β= 0.0165, 95 per cent CI = [-0.5174, 0.5504], t = 0.0607, p > 0.05). Therefore, only hypothesis 1 is supported by these facts.

Table 6: Bootstrap results.

Variable	Coeff	SE	T-statistic	p-value	LLCI	ULCI
Constant	2.1716	0.2038	10.6566	0.0000	1.7713	2.5720
TSE	0.3715	0.0490	7.5786	0.0000	0.2752	0.4678
Gender	0.0165	0.2718	0.0607	0.9516	-0.5174	0.5504
Int_1	0.035	0.650	0.4843	0.6284	-0.0962	0.1591
R^2	0.4786					
R^2-change	0.0003					
F	51.2929					

N=522

To further the analysis, a simple slope regression chart developed by Aiken et al, (1991) was used to determine gender's moderating effect on TSE's influence on DL. Figure 2 shows that gender does not moderate the relationship between the variables.

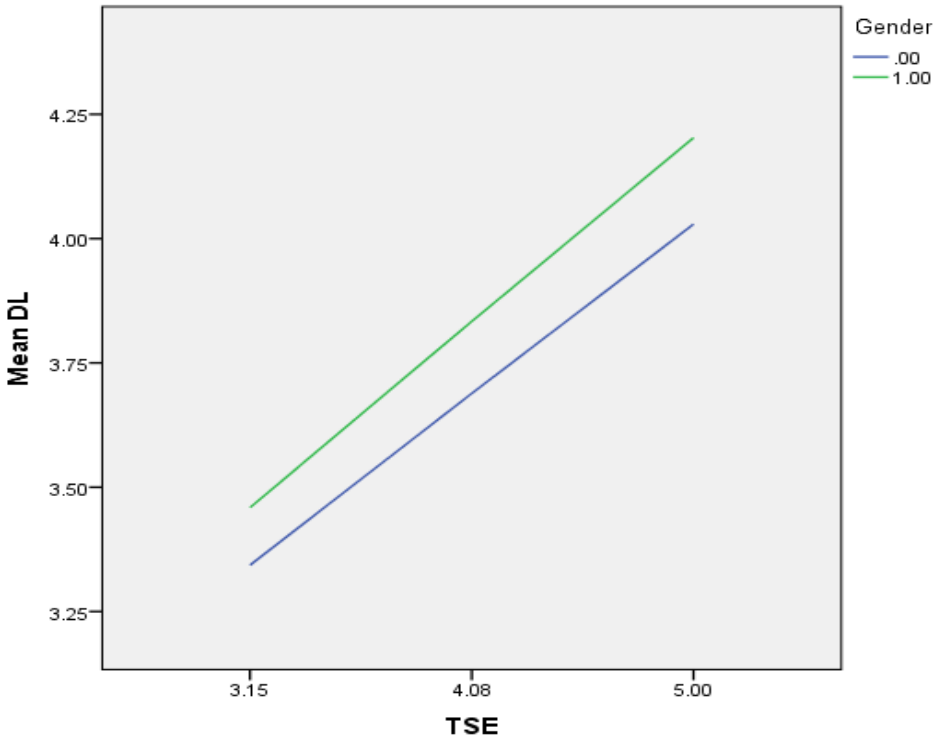

Figure 1. Interaction of Gender and TSE on DL.

Discussion.

The core objective of this study was to assess ODL students' technology self-efficacy and digital literacy levels and how gender moderates the relationship between the two variables in a selected ODL institution in Nigeria. Results revealed that the technology self-efficacy level of the ODL students is very high and their digital literacy skills are high. This result is similar to findings from other studies (Osuji, 2010; Esterhuizen et al., 2012; Karagul et al., 2021; Daya, 2022). This result could be attributed to the fact that ODL students already have their learning separated by space and time and the use of technology to enhance learning becomes handy for them. Therefore, it is expected of them to display a high level of technology self-efficacy and digital literacy skills to utilize the available technology for learning. Attaining high levels of technology self-efficacy and digital literacy by ODL students is necessary to effectively navigate the digital landscape of open and distance learning environments (Maphosa & Bhebhe, 2019; Karagul et al., 2021; Itasanmi, 2022).

The results also indicate that technology self-efficacy significantly positively influenced digital literacy skills among ODL students. This result aligns with the research findings of Kahveci (2021). Due to open and distance learning environments that typically rely heavily on technology for communication, collaboration, and delivery of course materials, students who have higher levels of technology-self efficacy are more likely to have the confidence and motivation to use the technology effectively and engage with course materials (Farah, 2011). Thus, increasing their digital literacy levels compared with students with low technology self-efficacy. Specifically, it is a considered opinion that ODL students who possess high technology self-efficacy tend to be more comfortable experimenting with new technologies for learning and using online resources to enhance their learning experience. They are also more likely to be resilient when encountering technical difficulties or obstacles as they believe in their ability to overcome those obstacles (McGee, 2015; Tilton, 2016). This may therefore positively influence their digital literacy skills. In contrast, ODL students with low technology self-efficacy may struggle to engage with the technology required to be successful in distance learning environments as they are likely to feel anxious and overwhelmed by the technology and avoid using it. This can therefore lead to a lower level of digital literacy among them. In other words, the higher the technology self-efficacy level of the students, the higher their digital literacy skills and vice versa.

On the moderating role of gender in the relationship between technology self-efficacy and digital literacy among ODL students, results revealed that gender had an insignificant moderating role

in the relationship between self-efficacy and digital literacy. Though male ODL students had a higher technology self-efficacy and digital literacy compared to females based on the mean value, however, gender does not moderate the relationship between the variables. This result is similar to findings from Omar et al. (2022) and Zeng et al. (2022) but inconsistent with Tømte and Hatlevik (2011). This result implies that the development of technology-related skills and confidence is not significantly impacted by the ODL student's gender. While some studies (Maxwell & Maxwell, 2014; Rizal et al., 2021) have suggested that male students tend to have higher levels of technology self-efficacy and digital literacy than females, other research (Jannah, 2019), have found females to have higher technology self-efficacy and digital literacy than male. However, a study (Ossai, 2022) suggested that technology self-efficacy and digital literacy are not significantly influenced by gender.

Conclusion and Recommendations.

The study established the fact that ODL students' technology self-efficacy level is very high and their digital literacy skills are high also. This, therefore, suggest that the students have the required skills to navigate the distance learning environment, access digital resources, and engage in collaborative learning activities which is the hallmark of the distance learning programme. It is recommended that efforts at increasing digitization in ODL delivery in Nigeria should take into consideration these factors. Equally, the study indicated that technology self-efficacy influences ODL students' digital literacy skills. Thus, to help support the development of digital literacy in ODL students, it is important to address technology self-efficacy. It is therefore recommended that ODL stakeholders should invest in training students to help them build their technology skills and confidence. This will assist them to become more comfortable using technology and increase their overall digital literacy. Additionally, ODL course tutors should provide opportunities for students to engage in learning using different technologies and online resources. This will influence the development of technological skills and confidence needed to effectively participate in technology-driven learning platforms. Further, the study revealed that ODL students' technology self-efficacy and digital literacy were not moderated by gender. Therefore, policy actions aimed at engaging ODL learners in more technologically sophisticated learning platforms must be anchored on students' belief in their ability to use the learning platforms to achieve their desired learning outcomes irrespective of their gender.

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