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Article: **Gender and Age-Related Differences Among ICT Self-Efficacy, Self-Directed Learning, E-Learning Readiness, and Student Engagement**

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Gender and Age-Related Differences Among ICT Self-Efficacy, Self-Directed Learning, E-Learning Readiness, and Student Engagement

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Abstract

The goal of this study was to look into the effects of gender and age on students' ICT self-efficacy (ICT-SE), self-directed learning (SDL) e-learning readiness (ELR), and engagement (SE) among middle and late teens. Using convenience sampling technique, data was obtained from students at various schools, colleges, and universities in Rawalpindi and Islamabad. The total sample size was 300 students, with 144 boys (n=144) and 156 girls (n=156) ranging in age from 15 to 21. ICT self-efficacy scale (ICTSES), Self-directed learning with technology scale (SDLTS), E-learning readiness scale (ELRS), and Student engagement scale (SES) were used in the current study consent form along with demographic information sheet. Students had a high degree of ICT self-efficacy, whereas no significant gender differences were seen on the SDL, ELR, or SE. Furthermore, when compared to middle adolescents, late adolescents scored much higher on SDL, ELR, and SE.

Keywords: college teachers, emotional distress, motivation, work performance

Introduction

The abilities required for communication in social situations such as education, the workplace, and so on have changed dramatically as Information and Communication Technology (ICT) has advanced. For equal participation in all circumstances of life, society must adapt to these modern abilities and skills. It is still observed that modern students or learners are not well versed in the modern skills required to use technology, particularly in developing countries such as Pakistan. According to the

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(2016-2017) United Nations Population Fund Report, 63 % out of 207 million of the country's population fall below the age of 15 with a sex ratio of 105 males per 100 females. This high rate of youth (adolescents) instigates us to put more focus on them as an asset. Therefore the use of information technology by adolescents increases their social and intellectual skills (wellbeing, group connectedness and self-esteem, and creativity). As this age is a period of storm and stress many adolescents undergo a variety of physical, social, and emotional experiences. Therefore, there is a strong need to investigate gender and age differences in ICT self-efficacy, self-directed learning, e-learning readiness, and student engagement at the national and international levels.

ICT self-efficacy or ICT self-confidence is defined as the perception of students about their skills to perform computer and internet tasks effectively (Hong et al., [2014](#)). Broos and Roe ([2006](#)) and Durndell and Haag ([2002](#)) reported boys having high ICT self-efficacy while Hohlfeld et al. ([2013](#)) reported that girls had higher ICT self-efficacy as compared to boys. Self-directed learning refers to the psychological processes of learners that purposively direct themselves to gain knowledge and understand how to solve problems (Long, [1994](#)). Self-directed learning is linked with frontal cortex functioning which matured in late adolescence and early adulthood in accordance with biological perspective (Goldberg, [2001](#); Long, [2000](#)). Moreover, there are mixed findings based on gender in self-directed learning. Hence, it is important to find gender and age-related differences in self-directed learning. Borotis and Poulymenakou ([2004](#)) defined E-Learning Readiness as the “mental or physical preparedness of an organization for some e-learning experience or action” (p. 1622). E-learning readiness has been studied in distant learning and face-to-face learning but very few studies have been carried out to find out the readiness level of students (Yilmaz, [2017](#)). Lopes ([2007](#)) stated that technology, human resources, financial resources, and culture affect e-learning readiness. Moreover, there are mixed findings about the readiness of learners in international literature. Student engagement refers to “the extent to which learners’ thoughts, feelings, and activities are actively involved in learning” (Lewis et al., [2011](#)). Research indicates that sustained student engagement is a primary factor in ensuring student success in an online learning environment (Wolverton, [2018](#); Fredrickson, [2015](#)). Moreover, as the

students moved from childhood to adolescence they face many changes which cause frantic emotions in students and expose them to psychological difficulties which in turn leads to decreased student engagement (Hartono et al., [2019](#); Inchley et al., [2020](#), Santos et al., [2021](#)). Furthermore, there are contrasting results in the gender-related finding of student engagement. Therefore, it is important to find gender and age-related differences among adolescents.

Literature Review

Individuals with high self-efficacy are said to be suitable for an e-learning environment because they are enthusiastic and accommodating (Chen, [2014](#)). Lenahan-Bernard ([2014](#)) investigated the relationship between computer self-efficacy, self-directed learning, and completion of online courses. A significant positive correlation exists between computer self-efficacy and self-directed learning, according to the findings. Furthermore, Rafiee and Abbasian-Naghneh ([2019](#)) conducted a study to investigate the factors influencing e-learning readiness and acceptance. According to the findings, online communication self-efficacy has a significant relationship with e-learning readiness and acceptance. Chen ([2017](#)) investigated the relationship between computer self-efficacy, learning performance, and learning engagement as a mediator in a study. Computer self-efficacy and learning engagement were found to be positively correlated. It was also discovered that the relationship between computer self-efficacy and learning performance was completely mediated by learning engagement.

Cavusoglu ([2019](#)) investigated the relationship between self-directed learning and online learning readiness. The study included 550 students and professionals from hospitality and tourism colleges as well as the hospitality and tourism industry. Self-directed learning readiness and online learning readiness were found to be positively and significantly correlated. Furthermore, Tao et al. ([2018](#)) investigated the relationship between Smartphone use, self-directed learning, student engagement, and individual impact. The results showed that self-directed learning and student engagement were significantly and positively correlated. Furthermore, Kim et al. ([2019](#)) investigated the impact of e-learning on students' academic achievement, using digital readiness and academic engagement as

mediators. The findings revealed a significant and positive relationship between digital readiness and academic engagement.

Tomte and Hatlevik (2011) investigated gender differences in ICT self-efficacy and ICT user profiles in Finland and Norway. Men in Finland reported higher levels of ICT self-efficacy in internet and high-level tasks than women. In Norway, women reported high ICT self-efficacy in internet tasks, while men reported high ICT self-efficacy in high-level tasks. Shen et al. (2013) investigated the relationship between online learning self-efficacy and learning satisfaction, as well as the role of demographic variables in online learning self-efficacy. Female students outperformed male students, according to the findings. Furthermore, Scherer and Siddiq (2015) investigated gender differences in computer self-efficacy among teachers in a study. Male teachers reported higher computer self-efficacy in basic and advanced operational skills than female teachers. Gnams (2021) conducted another study that looked at gender differences in ICT self-confidence and literacy. Adolescent boys had higher ICT self-confidence than adolescent girls according to the findings.

A study conducted by Aesaert and Braak (2014) examined the factors that were related to ICT self-efficacy of primary school students. Findings showed a non-significant relationship between ICT self-efficacy and age. Another study conducted by Jan (2015) showed that men and women participants scored the same on computer self-efficacy. However, participants over the age of thirty-five and above showed higher scores on computer self-efficacy as compared to participants' age ranging from eighteen to thirty-four.

A study conducted by Demir et al. in (2014) explored the relationship between the attitude toward computer usage and self-directed learning with technology among students and reported a strong positive correlation between attitude towards computer usage and self-directed learning with technology. Moreover, no significant relationship was reported between male and female students. Another study conducted by Said et al. (2015) examined self-directed learning readiness in students of Pakistan. Results showed that undergraduates have acceptable levels of self-directed learning. Moreover, male undergraduates scored higher on self-directed learning skills as compared to female undergraduates. However, a study conducted

by Tekkol and Demirel (2018) explored the self-directed learning skills of undergraduate students. Findings showed that female students scored higher on self-directed learning skills as compared to male students.

A study conducted by El-Gilany and Abusaad (2013) examined the correlation between self-directed learning and learning style among Saudi undergraduates. Findings showed no significant association between self-directed learning and learning styles. Moreover, no significant difference was found between age and gender groups. Agonács and Matos (2019) conducted a study that investigated self-directed learning in an online learning environment. The findings revealed a significant relationship between age and self-directed learning. Older students scored higher on self-directed learning.

Coşkun et al. (2018) investigated e-learning readiness among Turkish medical students in a study. The findings revealed that medical students are adequately prepared for e-learning. Furthermore, male students were more prepared for e-learning than female students. However, a study conducted by Firat and Bozkurt (2020) investigated demographic variables as indicators of online learning readiness and found that female students scored significantly higher than male students. Chung et al. (2020) conducted another study on online learning readiness. Students demonstrated a high level of readiness for internet/computer self-efficacy, a moderate level for self-directed learning, and a low level for online communication self-efficacy. Furthermore, there was no significant gender difference between male and female students. Rafique et al. in (2021) investigated students' readiness for online learning during a pandemic in Pakistan. Students were not fully prepared for online learning, even though they were confident in their technological abilities and motivated. Furthermore, significant age differences in two dimensions of computer/internet self-efficacy and online communications self-efficacy were reported, indicating that older students had more computer and internet skills and were more likely to use these skills for communication.

Kew and Tasir (2021) investigated the cognitive engagement of students in an e-learning discussion forum using content analysis. According to the findings, half of the students reported a low level of engagement.

Furthermore, the findings revealed that there was no statistically significant relationship between gender and student engagement. Similarly, Chan et al (2021) studied the relationship between online learning engagement and learning satisfaction. The findings revealed a positive and significant relationship between online learning engagement and learning satisfaction. Furthermore, no significant differences were discovered between male and female students.

Santos et al. (2021) investigated the role of emotion regulation strategies on student engagement and the mediating role of age and gender. The findings revealed that students have medium levels of engagement, with females scoring higher than male students. Furthermore, late adolescents and younger adolescents outperformed middle adolescents in terms of student engagement.

Objectives

1. To identify the Gender and Age-related differences in study variables.

Hypotheses

1. Adolescent girls will score high on ICT self-efficacy as compared to adolescent boys.
2. Adolescent girls will score high on self-directed learning as compared to adolescent boys.
3. Adolescent girls will score high on E-learning readiness as compared to adolescent boys.
4. Adolescent girls will score high on student engagement as compared to adolescent boys.

Method

Sample

The data was collected from 300 adolescents using a comparative cross-sectional research design and convenience-based sampling. Gender (boys, n= 144; girls, n= 156) and age categories (middle adolescence & late

adolescent) were used to split the data (15-21). Data was gathered from students at Rawalpindi and Islamabad's schools, colleges, and universities.

Instruments

ICT Self-Efficacy Scale

Alahakoon and Somaratne (2020) created this scale, which included 23 items. It's a 5-point Likert scale ranging from "not at all confident" to "very confident." The scale's Cronbach's alpha reliability is $\alpha = .94$.

Self-Directed Learning with Technology Scale

This scale was developed by Teo et al. (2010), comprised of 6 items which are divided into two factors, self-management (1, 2) and intentional learning (3, 4, 5, 6). It is a 6-point Likert scale ranging from (All the time=6) to (Not at all=1). Scale demonstrated good reliability (Cronbach's $\alpha = 0.63$ for self-management; $\alpha = 0.85$ for intentional learning).

E-learning Readiness Scale

This scale was developed by Alem et al. in 2016, comprised of 17 items which are divided into 5 dimensions. Self-competence (1,2,3), Self-directed learning (4,5,6,7,8), Motivation (9,10,11), Financial (12,13,14), and Perceived usefulness (15,16,17). A 7-point Likert scale ranging from (strongly disagree=1) to (strongly agree=7). Cronbach's alpha reliability coefficients calculated by the author were as .96 for the self-competence sub-dimension, .91 for self-directed learning, .76 for motivation, .75 for financial, and .94 for perceived usefulness sub-dimension.

Student Engagement Scale in E-learning Environment

This scale was developed by Lee et al. (2019), and consisted of 24 items. This scale is further divided into 6 factors; Psychological motivation (item numbers 1,2,3,4,5,6), Peer collaboration (7,8,9,10,11), Cognitive problem solving (12,13,14,15,16), interactions with instructors (17,18) community support (19,20,21), and learning management (22,23,24). A 5-point Likert scale ranging from (strongly agree=1) to (strongly disagree=5). Cronbach's

α coefficient was 0.89 for (psychological motivation), 0.88 for (peer collaboration), 0.83 for (cognitive problem solving), 0.76 for (interactions with instructors), 0.82 for (community support), and 0.72 for (learning management).

Procedure

Initially, the researcher gathered a sample of N=300 students, both boys and girls, ranging in age from 15 to 21, from various Rawalpindi and Islamabad schools, colleges, and universities. First of all, the researcher took approval from higher authorities for conducting research. After that participants were informed about the purpose of the study and then they were given an informed consent form. After getting the consent form participants were given a questionnaire comprised of a demographic sheet, ICT self-efficacy scale, Self-directed Learning with Technology scale, E-Learning Readiness Scale, and Student Engagement Measure in e-learning environment. Participants were thanked for their participation at the end, and the researcher expressed special gratitude to the institutes' heads and teachers for their cooperation.

Results

Table 1

Details of Sample Characteristics of Pilot Study (N=100)

Sample Characteristics	Categories	Sample (N=100) <i>f</i> %
Gender	Males	44 (44)
	Females	56 (56)
Age group	Middle adolescents	39 (39)
	Late adolescents	61 (61)
Socioeconomic status	Upper class	18 (18)
	Middle class	77 (77)
	Lower class	5 (5)

Table 2

Descriptive Statics and Alpha Reliability Coefficient of the Study Variables for Pilot Study (N=100)

Scales	k	M	SD	α	Range	Skewness	Kurtosis
ICT Self-Efficacy	23	86.36	19.23	.93	31-115	-.57	-.05
Self-Directed Learning	6	25.27	6.40	.79	6-36	-.56	.17
Self-management	2	6.76	2.78	.52	2-12	.06	-.83
Intentional Learning	4	18.51	4.68	.84	4-24	-.78	.19
E-Learning Readiness	17	81.86	16.19	.88	44-119	-.20	-.22
Student Engagement	24	75.93	18.06	.95	28-120	-.12	.66

Table 2 shows descriptive statics of the main study, which include mean (M), standard deviation (SD), Alpha coefficients (α), range, skewness, and kurtosis on a large sample of study variables (N=300). The values for ICTSE (M= 86.36, SD= 16.78, α = .93, Skewness= -.64, kurtosis=.34), for SDL (M=25.64, SD= 5.93, α = .82, Skewness= -.74, Kurtosis= .08), for ELR (M=81.73, SD=15.04, α =.89, Skewness=-.47, kurtosis=.24), for SE (M=77.22, SD=18.58, α =.96, Skewness=-.36, Kurtosis=.14). All the values of Skewness, and kurtosis are lying within the range of (-1 to +1) thus, conforming the normality of the data for regression.

Table 3

Gender-Related Differences of ICT Self-Efficacy, Self-Directed Learning, E-Learning Readiness, and Student Engagement (N=300)

Variables	Males (n=144)		Females (n=156)		t (298)	p	CI 95%		Cohen 's d
	M	SD	M	SD			LL	UL	
ICT Self-Efficacy	90.0	17.6	83.5	15.3	3.4	.1	2.7	10.2	.39
Self-Directed Learning	25.6	6.27	25.6	5.62	.01	.9	1.3	1.34	.001
	3		4				9	6	

Variables	Males (n=144)		Females (n=156)		t (298)	p	CI 95%		Cohen 's d
	M	SD	M	SD			LL	UL	
E-Learning Readiness	83.1	16.1	80.4	13.8	1.6	.1	.64	6.18	.18
Student Engagement	77.8	21.7	76.6	15.1	.57	.5	3.0	5.53	.07
	6	4	2	5		7	5		

Table 3 shows that only one study variable shows significant gender-related difference i.e. ICT self-efficacy shows that males have more ICT self-efficacy than females, while other study variables i.e. self-directed learning (SDL), e-learning readiness (ELR), and student engagement (SE) do not show any significant gender-related differences.

Table 4

Age-related Differences in ICT Self-efficacy, Self-directed Learning, E-Learning Readiness, and Student Engagement (N=300)

Variables	Middle adolescents (n=164)		Late adolescents (n=136)		t (298)	P	CI 95%		Cohen 's d
	M	SD	M	SD			LL	UL	
ICT Self-Efficacy	85.29	15.74	88.37	17.86	1.59	.11	6.90	.74	.18
Self-Directed Learning	24.74	5.92	26.71	5.79	2.90	.004	3.31	.63	.34
E-Learning Readiness	79.63	14.39	84.27	15.46	2.69	.008	8.04	1.25	.31
Student Engagement	75.15	18.69	79.71	18.20	2.13	.03	8.77	.34	.25

Table 4 shows significant age-related differences among three variables of study i.e. self-directed learning, e-learning readiness, and student

engagement variable, while no significant age-related difference emerged in ICT self-efficacy.

Discussion

The current study looked at gender and age-related differences in ICT self-efficacy, self-directed learning, e-learning preparedness, and student engagement among adolescent students. The current study looked at the characteristics of a group of adolescents from Rawalpindi and Islamabad, Pakistan, who came from various schools, colleges, and universities. To achieve the study's goals, a descriptive data analysis was performed initially (see Table 1). The findings also revealed that the descriptive values are within an acceptable range, implying that the data is normal.

According to first hypothesis of the study it was assumed that “Adolescents girls will score high on the ICT self-efficacy scale as compared to adolescent boys”. It was hypothesized by considering intuitively that 21-century females are dominating in every field and are digital natives, moreover, in line with previous literature, where they said that female participants had stronger beliefs about their abilities and confidence in ICT related tasks as compared to male participants (Hohlfeld et al., [2013](#)). However, the results of the current study contradict the hypothesis and adolescent boys outperformed girls (see Table 3). This means that despite of being digital natives girls use ICT for leisure activities, and consider computers as useful tools but they don't have a deeper understanding of technology for educational purposes (Janneck et al., [2013](#)), while boy's use of the internet is more, they use it for longer periods of time and access more domains of the internet (Kraut et al., [1998](#)). The results of current research are in line with previous literature where boys were more confident than girls in ICT-related tasks (Gnamb, [2021](#); Scherer & Siddiq, [2015](#)). Moreover, current findings also confirm that a traditional perception about boys having more ICT skills and confidence still exists in Pakistan. In a recent meta-analytic study done by Qazi et al. ([2022](#)) also confirmed the findings. This study explained the results with participants self-concept related to computer skills .they further claimed that males students from Asian countries exhibit high level of self-concept of computer abilities than females students (see also., Musharraf et al., [2019](#)).Whereas,

on all other study variables i.e. self-directed learning, e-learning readiness and student engagement, no significant gender differences were found. Previous studies also confirmed the findings. For example, Zeb et al. (2018) found no significant differences gender differences among [in self-directed learning readiness amongst medical students of Pakistan](#). Similarly, [Chung et al. \(2020\)](#) did not find any significant difference in attitude and behavior of male and female students on all five dimensions of the readiness for online learning (see also, Demir et al., [2014](#); Chan et al., [2021](#)). However, these findings are contradictory to findings by Rafique et al. (2021). One description of such contradictory findings is the SES or cultural differences between the participants of these studies.

The current study also highlights the significant age-related differences found among three variables of the study i.e. self-directed learning, e-learning readiness, and student engagement (see Table 4). The findings of the study revealed that the level of SDL, ELR, and SE was high in late adolescents than in middle adolescents. In line with the biological/maturational perspective, self-directed learning skills are closely related to certain aspects of executive control functioning in the frontal cortex that matures in late adolescence and early adulthood (Goldberg, [2001](#); Long, [2000](#)). The current results are consistent with the previous literature in which it is stated that with increasing age individual's confidence, experience and skills also develop, therefore, with increasing age adolescents become more self-directed and are more ready to engage in e-learning environment. (Agonács & Matos, [2019](#); Rafique et al., [2021](#); Santos et al., [2021](#)).

Limitations and Suggestions

Although the present study has provided a huge contribution to the existing literature in Pakistan, in the context of e-learning, still there are some limitations which are as follows;

- The first limitation was cross-sectional research design was used to examine variables while a longitudinal design could provide a clearer picture of variables' patterns over time. Therefore, it is recommended for future research to use longitudinal design for better and deeper understanding.

- Secondly, the current study utilized convenient sampling technique. However, there are benefits to using this technique but in this way, generalizable results cannot be obtained. Future researchers must use random sampling to get more generalizable results.
- Thirdly, the sample comprised urban adolescents enrolled in institutions of Islamabad and Rawalpindi. Hence, it is recommended for future researchers to do a comparative study by incorporating rural adolescents to understand their interaction with technology and the e-learning environment.

Implications

Findings from the current study may help policymakers, teachers, and administrators in schools, colleges, and Universities to incorporate ICT-related programs as part of their curriculum so that both adolescent boys and girls have equal growth related to their ICT skills and there would be no gender disparity among adolescent regarding ICT self-efficacy. Current research results can be taken into consideration for practice by enhancing a technology-rich environment for self-directed learning, especially in primary school students. Teachers should provide younger students with strategies that could boost their skills of self-directed learning e.g., scaffolding where teachers assist, give social guidance, and support to their students that promote in development of better understanding and cognitive skills (O'Donnell et al., [2011](#)).

Conclusion

Findings revealed that boys have more confidence in their ICT-related skills as compared to girls. Moreover, late adolescents have more self-directed skills, e-learning readiness, and engagement in e-learning as compared to middle adolescents. This means that as adolescents growing their skills related to technology and autonomy also increases which leads to high level of their engagement.

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