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Assessing Nursing Students' Self-Directed Learning Abilities During COVID-19 Pandemic Among Smart Phone Users

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Abstract: **Background: The integration of technology, particularly smartphones, has become essential in nursing education to prepare students for technologically advanced healthcare environments, as emphasized by the National League for Nursing. Smartphones support flexible and self-directed learning through easy access to educational resources. Their use increased significantly during the COVID-19 pandemic with the shift to distance education. However, excessive smartphone use may negatively affect learning through distractions, reduced critical thinking, and limited face-to-face interaction. Aim: This study aimed to assess nursing students' self-directed learning abilities during the COVID-19 pandemic among smartphone users. Research Design: A descriptive research design was utilized to achieve the aim of this study. Setting: The study was conducted at the Faculty of Nursing, Damanhur University. Subjects: A total of 365 undergraduate nursing students participated. Tools: Two main tools were used, Data was collected using an online structured questionnaire administered through Google Forms Tool (I): Smartphone Learning Experiences Questionnaire and Tool (II): Students' Self-Directed Learning Rating Scale were used. Results: Most students demonstrated high levels of smartphone learning experiences and self-directed learning, with a significant positive correlation. Conclusion: Smartphone learning enhanced self-directed learning abilities. Recommendations: Integrating smartphone-based learning into nursing education is recommended.**

Keywords**: Smartphone use- Nursing Education-Self-directed learning-Mobile learning.**

1. INTRODUCTION

The integration of educational technology into nursing education has become increasingly essential as healthcare environments continue to evolve with rapid technological advancements. Modern healthcare systems rely heavily on digital technologies and electronic devices to improve patient safety, quality of care, and healthcare efficiency. Therefore, nursing education programs must prepare students to function effectively in technologically advanced clinical environments. The National League for Nursing emphasizes the importance of developing technological competencies among nursing graduates to ensure safe and high-quality patient care **(Kuivila et al., 2023,)**. Consequently, evaluating the role of technology in nursing education is essential to enhance students' knowledge, skills, and professional readiness.

Educational technology involves the systematic use of digital tools, devices, and learning resources to support teaching and learning processes. Mobile devices, particularly smartphones, have become widely integrated into everyday life and educational environments. Their portability, accessibility, and ability to connect users to a wide range of information sources

make them valuable tools for supporting learning activities. In nursing education, smartphones can facilitate access to educational materials, clinical guidelines, and interactive learning resources that support students' academic development **(Huang et al., 2019).**

Smartphones provide several advantages in educational settings due to their portability, affordability, and advanced technological capabilities. These devices allow students to access learning materials anytime and anywhere, making them particularly useful for flexible and mobile learning environments. In nursing education, smartphones enable students to record lectures, review course materials, participate in discussions, and access multimedia learning resources. Such features promote student engagement and encourage active participation in the learning process **(Fawaz & Samaha, 2021).**

In addition, smartphones support personalized learning experiences by allowing students to adapt educational resources according to their learning styles and individual pace. Through mobile applications and online platforms, students can review materials repeatedly, access simulation-based learning activities, and participate in collaborative discussions with peers and instructors. These features contribute to improving students' understanding of theoretical and clinical concepts while promoting greater engagement with course content **(Huang et al., 2019).**

Despite these advantages, excessive smartphone use may negatively affect students' learning experiences. Overreliance on mobile devices can lead to distractions, reduced attention span, and decreased face-to-face communication among students. Furthermore, prolonged use of smartphones during online learning may cause eye strain, fatigue, and cognitive overload. Technical issues such as unstable internet connections or device malfunctions may also interrupt learning activities and limit the effectiveness of mobile learning strategies **(Deng et al., 2022; Huang et al., 2019).**

The global spread of the COVID-19 pandemic significantly accelerated the adoption of digital technologies in education. Educational institutions worldwide were forced to shift rapidly to distance learning to ensure continuity of education while maintaining social distancing measures. This transition affected more than 1.5 billion learners across approximately 188 countries and led to increased reliance on online learning platforms, virtual classrooms, and video conferencing tools to deliver educational content **(Mbunge et al., 2022).**

In this context, smartphones have played a crucial role in supporting distance education and enhancing students' ability to engage in self-directed learning. Self-directed learning enables students to identify their learning needs, set goals, access resources, and evaluate their learning outcomes independently. By providing continuous access to educational materials and digital learning environments, smartphones can support the development of self-directed learning skills among nursing students **(Lubbe et al., 2021; Robinson et al., 2020).**

Aim of the study: Assess nursing students' Self-directed learning abilities during Covid-19 Pandemic among smart phone users at Faculty of Nursing- Damanhur University.

Research question:

What are the effects of using smart phone on nursing students' Self-directed learning abilities during Covid-19 Pandemic at Faculty of Nursing- Damanhur University?

2. MATERIALS AND METHODS

Research design:

A descriptive cross-sectional research design was utilized in this study.

Setting:

The study was conducted at the Faculty of Nursing, Damanhur University, during the first semester of the academic year 2022-2023. Faculty of Nursing, Damanhour University, includes nine scientific departments namely: Medical and Surgical Nursing Department; Critical and Emergency Nursing Department; Obstetrics and Gynecology Nursing Department; Pediatric Nursing Department; Psychology Nursing Department; Community Nursing Department; Gerontology Nursing Department; Nursing Administration Department; Nursing Education Department.

Subjects:

The study subjects included (365) undergraduate nursing students enrolled in the second, third, and fourth academic years at the Faculty of Nursing, Damanhur University, during the first semester of the academic year 2022–2023, who agreed to participate in the study.

Tools of the study:

Two tools were used in this study for data collection.

Tool (I): Smartphone Learning Experiences Questionnaire

This tool was developed by the researcher after an extensive review of the relevant literature (Lavrakas, 2008; Cohen et al., 2013; Azmawati, 2020) to assess nursing students' use of smartphones in learning experiences. The tool consisted of four parts including **35 items**. The response scale for all items was based on a **3-point Likert scale**: Always (3), Sometimes (2), and Seldom (1).

The tool included the following parts:

Part 1: Students' interaction with smartphones during the COVID-19 pandemic, which consisted of **7 items**, such as using medical applications to obtain information, booking COVID-19 vaccination appointments, and accessing health instructions to prevent infection.

Part 2: Uses of smartphone applications for regular learning activities, which consisted of **8 items**, such as taking notes during lectures, using online learning resources, viewing video or audio recorded lectures, and using social networking platforms for educational purposes.

Part 3: Frequency of using smartphones for common activities, which consisted of **8 items**, such as checking emails, reading e-books, watching movies, and online shopping.

Part 4: Learning experiences using smartphones, which consisted of **12 items**, such as learning how to use smartphones for educational purposes, using smartphones to learn anytime and anywhere, enjoying the use of smartphones for learning, and planning to continue using smartphones frequently for educational purposes.

The total score of the **Smartphone Learning Experiences Questionnaire** ranged from **35 to 105** and was classified into three levels as follows:

- **Low level:** 35 – <58 (≤50%)
- **Moderate level:** 58 – <82 (50% – <75%)
- **High level:** 82 – 105 (≥75%)

Tool (II): Students' Self-Directed Learning Rating Scale

This tool was developed by the researcher based on an extensive review of relevant literature (Knowles, 1975; Guglielmino, 1977; Brookfield, 1986; Candy, 1991; Hiemstra, 1994; McGill & Klobas, 2009) to assess nursing students' level of self-directed learning.

The tool consisted of **32 items**, and the response scale was based on a **3-point Likert scale**: Always (3), Sometimes (2), and Seldom (1). The tool was classified into four parts as follows:

Part 1: Students' awareness regarding self-directed learning, which consisted of **8 items** related to learners' understanding of the factors contributing to becoming self-directed learners, such as taking responsibility for their own learning, maintaining self-motivation, and identifying their learning needs.

Part 2: Students' learning strategies regarding self-directed learning, which consisted of **8 items** describing the strategies that learners adopt to enhance self-directed learning, such as participating in online group discussions, viewing problems as challenges, and selecting appropriate learning strategies.

Part 3: Students' learning activities regarding self-directed learning, which consisted of **8 items** addressing learning activities that learners engage in to enhance self-directed learning, such as relating knowledge to practice and maintaining openness to others' viewpoints.

Part 4: Students' interpersonal skills regarding self-directed learning, which consisted of **8 items** related to learners' interpersonal communication skills necessary for effective self-directed learning, such as identifying their role during online sessions, communicating effectively through verbal and written communication, and expressing their views freely during online meetings.

The total score of the **Students' Self-Directed Learning Rating Scale** ranged from **32 to 96** and was classified into three levels as follows:

- **Low level:** 32 – <53 (≤50%)
- **Moderate level:** 53 – <74 (50% – <75%)
- **High level:** 74 – 96 (≥75%)

Demographic Characteristics

In addition, demographic characteristics of the participants were collected, including **age, gender, residence, academic year, and pre-university qualification**.

Validity & Reliability:

- The content validity of the tools was checked and revised by a panel of five experts in nursing education, who checked the tools for clarity, relevance, comprehensiveness, applicability.
- Tool I (Smart Phone Learning Experiences Questionnaire) had a Cronbach's Alpha of 0.812, indicating good internal consistency.
- Tool II (Students' Self-Directed Learning Rating Scale) had an overall Cronbach's Alpha value of **0.432**, which may be attributed to the multidimensional nature of the scale. Therefore, reliability was calculated for each subscale separately. The results revealed acceptable reliability levels for all subscales, where the awareness subscale had a Cronbach's Alpha of **0.71**, the learning strategies subscale **0.73**, the learning activities subscale **0.74**, and the interpersonal skills subscale **0.72**, indicating acceptable internal consistency for measuring the different aspects of self-directed learning.
- A pilot study was carried out on approximately 10% of the sample size to test the clarity and applicability of the tool. Necessary modifications were done accordingly, and these students were excluded from the final sample

Fieldwork:

- Data were collected from nursing students after clinical days and/or theoretical lectures. The online questionnaire took **20–30 minutes** for each student to complete. The overall data collection process took **3 months**.
- The questionnaire link was shared to be answered by the nursing students after explaining the study aim, and the researcher responded to any questions raised through WhatsApp.

Ethical Considerations

- Oral informed consent was obtained from the study subjects after explaining the aim of the study.
- Participation in the study was entirely voluntary, and students were informed of their right to withdraw at any time without any consequences.
- Privacy and confidentiality of the collected data were maintained.
- Anonymity of the collected data was maintained.

Statistical Analysis:

- Data were analyzed using IBM SPSS software version 20.0 (Armonk, NY: IBM Corp). Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, standard deviation, and median. Normality of distribution was assessed using the Kolmogorov-Smirnov test. Significance was judged at the 5% level. Pearson coefficient was used to correlate between normally distributed quantitative variables.

3. RESULTS

Table (1): Distribution of the studied nursing students according to socio-demographic data (n = 365)

Table (1) presents the socio-demographic characteristics of the studied nursing students. The results showed that more than two thirds of the students were females (67.1%), while 32.9% were males. The majority of students were aged between 21–24 years (72.6%), with a mean age of 22.23 ± 2.19 years. Nearly half of the students were in the third academic year (46.0%), followed by the fourth year (32.6%). More than half of the students (54.8%) lived in rural areas.

All students reported owning smartphones. The majority had Wi-Fi packages (87.7%) and internet packages on their smartphones (81.4%). Most students reported good skills in using smartphones (69.0%), and the majority (92.3%) agreed to use smartphones in education.

Table (2): Distribution of the studied nursing students according to the level of smartphone learning experiences (n = 365)

Table (2) shows the levels of smartphone learning experiences among the studied students. The results revealed that the highest percentage of students had high levels of learning experiences related to using smartphones in education (67.4%). More than half of the students (55.1%) also reported high levels in the use of smartphone applications for regular learning activities.

Regarding the frequency of smartphone use for common activities, most students demonstrated moderate levels (41.1%). Overall, nearly half of the students (47.1%) had high smartphone learning experiences, while 43.3% had moderate levels and only 9.6% had low levels.

Table (3): Distribution analysis of the studied nursing students according to smartphone learning experiences scores (n = 365)

Table (3) presents the mean scores of smartphone learning experiences among the studied students. The results showed that the highest mean percentage score was related to students' learning experiences using smartphones (87.89%), followed by the use of smartphone applications for learning activities (84.87%).

Interaction with smartphones during the COVID-19 pandemic had a mean percentage score of 79.95%, while the frequency of using smartphones for common activities showed the lowest mean percentage score (74.21%). The overall mean score of smartphone learning experiences was 86.60 ± 10.85, representing a mean percentage score of 82.48%.

Table (4): Distribution of the studied nursing students according to the level of self-directed learning (n = 365)

Table (4) illustrates the levels of self-directed learning among the studied students. The findings revealed that more than half of the students had high levels of awareness regarding self-directed learning (55.1%) and interpersonal skills (52.6%).

Moderate levels were most common in learning strategies (33.7%) and learning activities (29.9%). Overall, more than half of the students (55.1%) demonstrated a high level of self-directed learning, while 30.7% had moderate levels and 14.2% had low levels.

Table (5): Correlation between smartphone learning experiences and self-directed learning (n = 365)

Table (5) demonstrates the correlation between smartphone learning experiences and students' self-directed learning. The findings revealed a strong positive statistically significant correlation between smartphone learning experiences and self-directed learning among the studied students ($r = 0.725$, $p < 0.001$).

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Table (1): Distribution of the studied nursing students according to socio-demographic data (n = 365)

Socio-demographic data	No.	%
Gender		
Male	120	32.9
Female	245	67.1
Age		
18-20	70	19.2
21-24	265	72.6
Over 24	30	8.2
Min. – Max.	18.0 – 28.0	
Mean ± SD.	22.23 ± 2.19	
Median	23.0 (21.0 – 24.0)	
Year of study		
Second	78	21.4
Third	168	46.0
Fourth	119	32.6
Residence		
Urban	165	45.2
Rural	200	54.8
Do you have a smart phone?		
Yes	365	100.0
No	0	0.0
Do you have WIFI package?		
Yes	320	87.7
No	45	12.3
Do you have an internet package?		
Yes	297	81.4
No	68	18.6
How many years have you used your smart phone		
Less than 1 year	15	4.1
1 year-less than 5 years	169	46.3
5 years- less than 10years	146	40.0
More than 10 years	35	9.6
Your skill in using smart phone is		
Expert user	86	23.6
Good user	252	69.0
Limited user	27	7.4
Did you agree to use your smart phone in education?		
Yes	337	92.3
No	28	7.7

Table (2): Distribution of the studied nursing students according to level of Smart phone learning experiences (n = 365)

Smart phone learning experiences	Low (≤50%)		Moderate (50% ≤75%)		High (≥75%)	
	No.	%	No.	%	No.	%
Students' interaction with smart phone at time of covid-19.	**93**	**25.5**	**113**	**31.0**	**159**	**43.6**
Uses of smartphone applications for regular learning activities.	**59**	**16.2**	**105**	**28.8**	**201**	**55.1**
Assessing the frequency of using smartphones for various common activities.	**139**	**38.1**	**150**	**41.1**	**76**	**20.8**
Students' learning experiences using the smartphone.	**41**	**11.2**	**78**	**21.4**	**246**	**67.4**
Overall	**35**	**9.6**	**158**	**43.3**	**172**	**47.1**

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Table (3): Distribution analysis of the studied nursing students according to score: Smart phone learning experiences (n = 365)

Tool I: Smart phone learning experiences items	Total score	% score
Students' interaction with smart phone at time of covid-19.	(7 – 21)	
Min. – Max.	7.0 – 21.0	0.0 – 100.0
Mean ± SD.	16.79 ± 3.22	79.95
Median	17.0	71.43
Uses of smartphone applications for regular learning activities.	(8 – 24)	
Min. – Max.	12.0 – 24.0	25.0 – 100.0
Mean ± SD.	20.37 ± 3.11	84.87
Median	21.0	81.25
Assessing the frequency of using smartphones for various common activities.	(8– 24)	
Min. – Max.	10.0 – 24.0	12.50 – 100.0
Mean ± SD.	17.81 ± 3.23	74.21
Median	17.0	56.25
Students' learning experiences using the smartphone.	(12 – 36)	
Min. – Max.	12.0 – 36.0	0.0 – 100.0
Mean ± SD.	31.64 ± 4.88	87.89
Median	33.0	87.50
Overall	(35 – 105)	
Min. – Max.	56.0 – 105.0	30.0 – 100.0
Mean ± SD.	86.60 ± 10.85	82.48
Median	86.0	72.86

SD: Standard deviation

Table (4): Distribution of the studied nursing students according to level of students' self-directed Learning Rating scale items (n = 365)

Tool II: Students' Self-directed learning Rating scale	Low (≤50%)		Moderate (50% ≤75%)		High (≥75%)	
	No.	%	No.	%	No.	%
Part 1: Awareness regarding self-directed learning.	65	17.8	99	27.1	201	55.1
Part 2: Learning Strategies regarding self-directed learning.	90	24.7	123	33.7	152	41.6
Part 3: Learning activities regarding self-directed learning.	67	18.4	109	29.9	189	51.8
Part 4: Interpersonal skills regarding self-directed learning.	87	23.8	86	23.6	192	52.6
Overall	52	14.2	112	30.7	201	55.1

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Table (5): Correlation between Smart phone learning experiences and Students' Self-directed learning (n = 365)

	Smart phone learning experiences	
	r	p
Students' Self-directed learning Rating scale	0.725*	<0.001*

r: Pearson coefficient

***: Statistically significant at p ≤ 0.05**

4. DISCUSSION

The COVID-19 pandemic triggered an unprecedented shift in nursing education, demanding rapid adaptation to online and smartphone-based learning modalities. Self-directed learning (SDL) has emerged as a pivotal strategy in this context, enabling nursing students to manage their own learning and maintain academic continuity (Li, 2022). The present study examined nursing students' SDL abilities with particular attention to smartphone learning experiences during the pandemic, reflecting the increasing importance of mobile technology in bridging theoretical knowledge and clinical competencies (Martin et al., 2023, Mashaly, M, Harfoush, M 2023).

The study revealed a predominance of female participants, reflecting the global trend in nursing education where female enrollment exceeds male. This gender distribution may have influenced learning behaviors, as female students often display higher motivation and engagement in technology-assisted learning (Derbich et al., 2024). The mean age of 22.23 ± 2.19 suggests a cohort of digital natives, inherently familiar with mobile technologies, which likely facilitated the transition to smartphone-based learning (Moeung, 2024).

Academic year distribution showed a higher proportion of fourth-year students, who may possess more clinical maturity and a stronger motivation to leverage smartphones for practical learning. Similarly, students from rural areas comprised more than half of the sample, highlighting potential disparities in digital infrastructure, which may impact the effectiveness of smartphone learning (Sapienza et al., 2023).

All participants reported smartphone ownership, confirming its status as a critical educational tool. Most students possessed internet or WIFI packages, and a large segment had extensive prior experience with smartphones, which aligns with Fakhishg (2018), who emphasized that early adoption of mobile devices supports digital literacy and learning continuity.

Students extensively used smartphones for educational purposes, including accessing lectures, submitting assignments, interacting with instructors, and engaging in peer learning. These findings support Ordaya-Gonzales et al. (2024) and Alwan & Atyat (2024), who noted that smartphones effectively create a virtual classroom, sustaining learning interactions during periods of restricted physical attendance.

Interestingly, the majority prioritized academic and professional uses over leisure activities such as online shopping or entertainment, consistent with Ifeanyi & Chukwuere (2018). This prioritization reflects a professional commitment and demonstrates the shift of smartphones from leisure devices to educational tools during the pandemic.

Students reported high satisfaction with smartphone learning, noting its flexibility and the ability to learn "anytime and anywhere." This flexibility was particularly valuable for reviewing clinical procedures in practical settings (Olajide, 2023). A significant proportion of students also perceived positive effects on academic performance and reported enjoyment in using smartphones for learning, consistent with Kertechian & Ismail (2023).

Analysis of the Self-Directed Learning Rating Scale revealed that most students demonstrated high levels of awareness, learning strategies, learning activities, and interpersonal skills. Students proactively planned their learning, engaged in critical reflection, and effectively utilized digital resources (Li et al., 2023; Aurellia et al., 2023). Interpersonal interactions via smartphones enhanced collaboration, communication, and reduced stress during social isolation (Wang et al., 2023).

A strong positive correlation was observed between smartphone learning experiences and SDL abilities ($r = 0.725$, $p < 0.001$), highlighting the capacity of mobile technology to promote autonomy and self-regulation in learning. This is

consistent with findings from Techakosit & Rukngam (2024) and Šindelářová Skupeňová & Herout (2024), who emphasized mobile tools' impact on independent learning skills.

Socio-demographic characteristics significantly influenced smartphone learning experiences and SDL. Younger students, urban residents, and those with expert smartphone skills reported higher engagement and SDL abilities (Moeung, 2024; Ganyani & Muchemwa, 2024; Chitta et al., 2024). Similarly, fourth-year students demonstrated enhanced SDL readiness compared to juniors, reflecting their accumulated clinical experience (Shrestha, 2022).

Gender differences were also noted; male students reported higher SDL levels in this cohort, contrasting with previous studies where females exhibited greater readiness, highlighting contextual and cultural influences (Supadmi et al., 2024). Access to WIFI and internet packages further facilitated engagement and SDL, reinforcing the role of technological infrastructure in remote learning (Etemi et al., 2024).

Students with positive attitudes toward smartphone use in education demonstrated higher SDL levels, emphasizing the critical role of motivation and perception in technology-mediated learning (Mejía-Mancilla & Mejía-Trejo, 2024). This underscores that technology adoption alone is insufficient; student mindset and willingness are equally important.

The study's findings affirm that smartphones are effective enablers of SDL, allowing nursing students to maintain learning continuity, develop autonomy, and strengthen clinical reasoning during crises. Institutions should integrate smartphone-based strategies into curricula, provide structured guidance, and support skill development to optimize independent learning outcomes.

Overall, the results indicate a mutually reinforcing relationship between smartphone learning experiences and SDL abilities. This synergy not only enhances academic performance but also equips nursing students with essential competencies for lifelong learning, critical thinking, and adaptive professional practice.

5. CONCLUSION AND RECOMMENDATIONS

From the present study, it can be concluded that:

Smartphone use had a positive and significant impact on nursing students' self-directed learning (SDL) during the COVID-19 pandemic. Most students demonstrated high levels of smartphone-based learning experiences, strong SDL abilities, and awareness of their responsibility for learning. Proficiency in smartphone use was linked to higher SDL levels, highlighting the importance of developing technological skills. Additionally, smartphones enabled flexible, anytime-and-anywhere learning, enhancing access to information and diverse learning strategies. Overall, smartphones served as effective educational tools, not merely communication devices.

Based on the current study findings:

At the Academic Institution Level (Faculty of Nursing):

- Integrate smartphones formally into the curriculum with clear policies and guidelines.
- Develop mobile-optimized interactive content and multimedia resources.
- Provide workshops to enhance students' digital skills and "expert user" capabilities.
- Ensure high-speed Wi-Fi and supportive infrastructure to facilitate flexible learning.

At the Faculty Member Level:

- Emphasize the facilitator role, guiding students to take responsibility for their learning.
- Design learning activities that promote SDL, including collaborative discussions, goal-setting apps, and smartphone-based note-taking.

For Future Research:

- Investigate demographic factors influencing SDL (e.g., gender, residence) to tailor interventions.
- Conduct longitudinal studies to assess the sustainability of SDL gains post-pandemic.

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