


Self-directed learning readiness and learning styles among Omani nursing students: Implications for online learning during the COVID-19 pandemic

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Abstract

Objective: The emergence of the COVID-19 pandemic compelled many academic institutions to resort to distance learning and online education, requiring a higher degree of student self-direction and motivation to learn. This study explored self-directed learning (SDL) readiness among nursing students in Oman, their learning styles (LS), and the association of demographic variables and LS with SDL.

Methods: The study, which followed a descriptive, cross-sectional design, surveyed 236 Omani nursing students via an online questionnaire containing two standardized scales: the Self-Directed Learning Readiness Scale for Nursing Education and the Learning Style Scales.

Results: Nursing students were identified as having a low level of SDL (mean = 149.58). Probation status ($\beta = -0.165$; $p = 0.021$) was negatively associated with SDL. In terms of LS, solitary ($\beta = 0.217$; $p = 0.001$), competitive ($\beta = 0.201$; $p = 0.005$), imaginative ($\beta = 0.19$; $p = 0.012$), and perceptive LS ($\beta = 0.437$; $p = 0.0$) were positively associated with SDL. An analytical LS was negatively associated with SDL ($\beta = -0.155$; $p = 0.022$).

Conclusion: Academic probation status and an analytical LS both yielded lower SDL scores. Perceptive, solitary, competitive, or imaginative learners tended to have higher SDL scores. Deliberate planning and strategies are necessary to help probation students cope with academic demands, especially with the advent of intensified digital education. Because no single learning environment can fulfill the needs of every LS, nurse educators must implement SDL-aimed teaching and learning strategies that appeal to a variety of learners.

KEYWORDS

COVID-19, learning styles, nursing students, Oman, online learning, self-directed learning

1 | INTRODUCTION

The COVID-19 pandemic has posed substantial challenges for education worldwide. Massive school closures in over 200 countries have displaced approximately 1.6 billion learners, equivalent to over 94% of the student population worldwide.^{1,2} The crisis propelled academic institutions to shift to other learning platforms, such as distance learning and online education, as an immediate solution.^{1,3} However, reports have revealed that a sizeable portion of the academic sector has been unprepared to meet the demands of this bold, futuristic direction.^{4,5}

The Sultanate of Oman responded robustly to contain the spread of the virus by instituting national quarantine and lockdown measures. Since March 15, 2020, schools at all levels have been physically closed and shifted to emergency remote teaching (ERT). Essentially an immediate remedy to a crisis situation, ERT comprises an urgent albeit temporary solution to provide remote methods of delivering instruction until the emergency subsides.⁶ In response to the exigent nature of the transition, administrators and educators across the country transitioned to the online platform, adopting videoconferencing, videorecording of lectures, and synchronous and asynchronous online discussions. Alternative strategies for clinical and laboratory experiences such as posting clinical case scenarios for comprehensive discussion and uploading available videos covering nursing procedures were implemented. In contrast, before the pandemic, nursing schools all over the country had relied primarily on traditional face-to-face teaching. Thrusting students into fully online education has been a unique and extraordinary solution to an unanticipated situation. Traditional versus online education platforms feature completely different structures, contexts, requirements, preparations, and demands.⁷ Moreover, success in online learning requires students to have a high degree of self-direction and motivation.⁸

Self-directed learning (SDL) goes by the principle of adult learning. The literature employs various terms for this educational method, including student-centered learning, self-instruction, self-teaching, prescriptive learning, and individualized learning.⁹ Meanwhile, learning styles (LS) represent an individual learner's preferred set of cognitive and behavioral feedback concerning a learning task.¹⁰ LS influence learners' motivation and attitude to learn and may affect their academic performance.¹⁰ In the area of healthcare education, nurse educators are key players in helping nursing students develop their readiness and skills for SDL through the prudent exercise of control and a teaching method designed to meet students' needs and LS.^{11,12}

2 | LITERATURE

The demand for lifelong learning and SDL skills in the nursing curriculum has expanded considerably, as seen by the current integration of these concepts into the overall nursing program, program registration, and accreditation processes.¹³ Nursing schools have made

efforts to integrate SDL into the nursing curriculum, as exemplified by the inclusion of problem-based learning, team-based learning, simulations, hands-on clinical experience, reflective journals, and case studies, as well as the emergence of online learning.^{13,14}

Furthermore, as a vital element in the development of life-long learning, SDL is an integral skill of the 21st-century nurse professional.¹⁵ Mounting evidence has strongly linked SDL with enhanced learning outcomes and academic performance in nursing students^{14,16} as well as ensuring adequate preparation of nursing students for their future role as healthcare professionals.^{9,11} Nursing students who have high SDL skills tend to exhibit better learning and studying strategies, such as the ability to deduce the most relevant information, relate previous learning with current knowledge, master test-taking skills, and enjoy a more optimistic attitude.¹⁷ Furthermore, their awareness of their own learning process puts nursing students in a better position to initiate and plan for future learning.⁹ In view of the essential nature of SDL, teaching and learning strategies that use this approach must be deliberately incorporated into the nursing curriculum.^{11,14}

To date, many studies have examined SDL and LS among students in higher education, including those enrolled in nursing programs.^{11,18–20} However, studies evaluating how LS is associated with SDL readiness among student nurses are scarce. Accordingly, this study, set in Oman, explored nursing students' readiness for SDL, their LS, and the association of their demographic variables and LS with their SDL. The current global situation, where many nursing schools are employing an online learning platform, has compelled students to exercise self-direction in their learning, making this study's potential contribution more valuable than ever. To the best of the authors' knowledge, this study is the first that links students' demographics and LS with SDL within the realm of nursing education during the COVID-19 pandemic, thus contributing new knowledge on this relevant topic.

3 | METHODS

This study followed a descriptive, cross-sectional approach using online data collection. Typically employing population-based surveys taken at a single point in time, such a design describes the predominant characteristics of phenomena as well as the association between or among the variables under study.²¹ Hence, this approach is highly suited to shed light on the study topic of inquiry.

3.1 | Samples and settings

Nursing students from three institutions of higher education in Oman were recruited to participate in the study. The study's inclusion criteria required each eligible student to (1) be currently registered in a nursing institution, (2) be a full-time student, and (3) have consented to participate in the study. Power analysis using the G power program showed that the minimum required sample size was 172 to achieve

80% power (where effect size was 0.10 and $\alpha = 0.05$). This estimated effect size offered an adequate sample to identify significant correlations between the study variables. The online questionnaire was sent to 350 students, and 236 students responded (response rate = 67%) during a 2-month data collection period from June to July 2020, 2 months shortly after the commencement of ERT through online learning at the onset of COVID19-related school closure.

3.2 | Instruments

Data were collected using a three-part online questionnaire. The first section inquired about the nursing students' demographic characteristics. The second and third sections consisted of the following two psychometrically valid scales, used with the permission of the original authors.

*Self-Directed Learning Readiness Scale for Nursing Education (SDLRSNE).*²² This scale consists of 40 items where the respondents indicate their degree of agreement or disagreement in describing their own characteristics using a 5-point Likert scale (5 = *strongly agree* and 1 = *strongly disagree*) for each item. The items on the scale are categorized into three subscales: self-management (13 items), desire for learning (12 items), and self-control (15 items). Four negatively worded items are reverse-scored. A total score greater than 150 implies readiness for SDL. According to previous research, the validity of the SDLRSNE was primarily established by a Delphi technique among a panel of experts, and the scale was determined to have an internal consistency reliability value of 0.924.²² In this study, Cronbach's alpha for the internal consistency of the scale was $\alpha = 0.87$, and the subscales ranged from 0.88 to 0.95.

*Learning Style Scales (LSS).*²³ As a relatively new tool, the LSS was psychometrically tested among Muslim nursing students in Iran and Malaysia. This normative scale consists of 22 items scored with a 6-point Likert scale (6 = *strongly agree* and 1 = *strongly disagree*) that identifies students' LS as solitary (2 items) versus sociable (2 items), competitive (3 items), imaginative (4 items), perceptive (7 items), or analytical (4 items). The scale has demonstrated excellent face and content validity, according to an expert panel, as well as internal consistency reliability, with Cronbach's α of ≥ 0.80 and ≥ 0.70 for its subscales.²³ In the current study, Cronbach's alpha for the internal consistency of the scale was $\alpha = 0.90$, and the values for the subscales ranged from 0.75 to 0.94. The LSS is short, simple, and easy to use. The current study's objectives, along with the similarity of the sample characteristics in terms of religion, culture, and geographical proximity as well as the challenges of online data collection during a lockdown, made the LSS seem well-suited for this study.

3.3 | Data collection and ethical considerations

Ethical clearance was obtained from the main author's research and ethics committee [CON/NF/2020/13] and, subsequently, from each study site's respective research ethics committee. Data collection

was conducted through an online questionnaire using Google Forms. An email communication containing the full disclosure of respondents' rights as participants, the purpose and nature of the study, and the benefits and risks that could be derived from the study results was sent to all eligible respondents. Completion and submission of the survey form indicated each participant's consent. The principal investigator had exclusive control and access to the online survey database. No personal identifiers were requested from the respondents.

3.4 | Data analysis

The collected data were analyzed using SPSS version 25.²⁴ A univariate descriptive statistical analysis was used to analyze independent variables. Mean scores were calculated for the students' overall SDL readiness and its subscales. For LS, items corresponding to a specific style were grouped, and cumulative mean scores were calculated. Additionally, Pearson's chi-squared test, a *t*-test, and ANOVA were conducted to identify relationships between the relevant variables (bivariate analysis). Multiple linear regression was used to determine the association of students' demographic variables and LS with their SDL. Data analysis was set at a 95% confidence interval and statistical significance of $p < 0.05$.

4 | RESULTS

A total of 236 out of 350 students completed the online survey (response rate = 67%). The participating students' ages ranged from 18 to 37 years, with a mean age of 21 ($SD = 3.02$). Most of the participants were female (85.2%), single (94.9%), and currently enrolled in the BSN degree (83.9%). Less than half (41.9%) indicated being at a first-year level. More than a third reported a semester GPA between 3.0 and 3.49 (39.4%) and a cumulative GPA between 2.5 and 2.99 (33.1%), and most had never been on probation status (CGPA or SGPA < 2.0) (82.2%) (Table 1).

The mean scale score in the SDLRSNE was 149.58 ($SD = 29.07$). Out of 236 students, 147 (62%) scored > 150 . The mean scores for the SDLRSNE subscales were as follows: self-management = 46.85 ($SD = 8.56$), desire for learning = 45.94 ($SD = 9.71$), and self-control = 56.79 ($SD = 11.96$). The LS that obtained higher means were perceptive LS (mean = 4.7) and imaginative LS (mean = 4.54), while analytical LS (mean = 4.29) and sociable LS (mean = 3.96) obtained the lowest means (Table 2).

Bivariate analysis revealed a significant relationship between students' SDL readiness and their SGPA ($F = 5.31$, $p = 0.001$), CGPA ($F = 3.45$, $p = 0.008$), and probation status ($t = -2.73$, $p = 0.008$). Moreover, all LS correlated positively and significantly with the SDL (all $p < 0.001$). However, no significant relationship emerged between students' SDL and their age, gender, academic degree, year level, marital status, area of residence, monthly family income, leadership assignment in academic-related activities, participation in

TABLE 1 Students' characteristics (*n* = 236)

Variables	Category	Mean	SD
Age (range: 18–37)		21.44	3.02
		N	%
Gender	Male	35	14.8
	Female	201	85.2
Academic degree	Diploma in Nursing	13	5.5
	Bachelor of Science in Nursing	198	83.9
	Bridging Program	25	10.6
Year level	Year 1	99	41.9
	Year 2	29	12.3
	Year 3	35	14.8
	Year 4	37	15.7
	Year 5	26	11
	Year 6	10	4.2
Semester GPA	<2.0	8	3.4
	2.00–2.49	33	14
	2.50–2.99	63	26.7
	3.0–3.49	93	39.4
	>3.5	39	16.5
Cumulative GPA	<2.0	6	2.5
	2.00–2.49	41	17.4
	2.50–2.99	78	33.1
	3.0–3.49	73	30.9
	>3.5	38	16.1
Probation status	Yes	42	17.8
	No	194	82.2
Marital status	Single	224	94.9
	Married	12	5.1

Note: Year Level: Nursing program in Oman starts with a mandatory 1 year-Foundation Program where students learn English, mathematics, computer and general study skills (Year 1). After which, they are admitted into their respective nursing programs. Diploma in Nursing (DN) spans 3 years (Year 2–4); Bachelor of Science in Nursing (BSN) lasts 5 years (Year 2–6); and Bridging Program lasts 2 years (Year 5–6). The Bridging Program is offered only to students who have completed the DN program and aspire to continue their studies to the BSN level.

Abbreviation: GPA, grade point average.

extracurricular activities, and leadership assignment in extracurricular activities (Table 3).

Table 4 displays the results of the hierarchical regression analyses. Variables that significantly correlated with SDL in the bivariate analysis were clustered into two groups (students' demographic variables and LS) and entered into the hierarchical regression model. Model 1 involved students' demographic variables; the regression analysis indicated that probation status (being under probation)

TABLE 2 Students' SDL readiness and LS

Scale/subscales	Mean	SD
Overall SDL readiness	149.58	29.07
Self-management	46.85	8.56
Desire for Learning	45.94	9.71
Self-control	56.79	11.96
Learning styles		
Solitary	4.32	1.41
Sociable	3.96	1.45
Competitive	4.47	1.18
Imaginative	4.54	1.19
Perceptive	4.70	1.21
Analytical	4.29	1.19

Abbreviations: LS, learning styles; SDL, self-directed learning.

explained 11% of the variance in the SDL measure ($F = 4.241$, $p < 0.001$). Probation status was associated with SDL ($\beta = -0.165$, $p = 0.021$) in that students under probation reported a decreased score for SDL. After entry of LS in Model 2, five LS demonstrated an additional 66.8% of the variance in the SDL measure ($F = 32.545$, $p < 0.001$). At this point, probation status yielded no significant relationship with SDL. Higher scores in solitary LS ($\beta = 0.217$, $p = 0.001$), competitive LS ($\beta = 0.201$, $p = 0.005$), imaginative LS ($\beta = 0.19$, $p = 0.012$), and perceptive LS ($\beta = 0.437$, $p = 0.0$) were associated with a significant increase in SDL scores. Meanwhile, a lower score in analytical LS ($\beta = -0.155$, $p = 0.022$) was associated with a significant increase in SDL score.

5 | DISCUSSION

This study examined the SDL readiness and LS of Omani nursing students and the association of their demographic profile and LS with their SDL readiness. The mean scale score of the SLDLRSNE was 149.58, which was slightly lower than the cutoff score of ≥ 150 , suggesting low SDL readiness. Compared to previous studies, the mean scale score in the present study was generally lower^{19,22,25,26} but higher than that reported in one study.¹¹ Notably, in terms of individual scoring, 62% scored >150 , which was comparable to other findings.^{19,25} In particular, the nursing students obtained the highest score in the self-control subscale, followed by self-management and desire for learning subscales, similar to other studies' findings.^{25,27} Self-control, otherwise known as self-regulation or self-discipline, is when students become fully cognizant of and responsible for what and how to learn.²⁸ These results are optimistic, indicating that Omani nursing students may be able to manage their own learning in light of the current online educational platform during the pandemic.^{29,30} A possible explanation for the students' SDL readiness score could be related to the study sites' prepandemic curriculum

TABLE 3 Association between students' SDL, their demographics and LS

Variables	Category	Mean	SD	Statistical test	p value
Age				$r = 0.048$	0.46
Gender	1. Male	142.57	28.46	$t = -1.575$	0.122
	2. Female	150.81	29.07		
Academic degree	1. Diploma in Nursing	140.85	21.31	$F = 0.694$	0.501
	2. Bachelor of Science in Nursing	149.83	29.77		
	3. Bridging Program	152.20	26.93		
Year level	1. Year 1	150.86	28.43	$F = 2.326$	0.06
	2. Year 2	150.14	22.41		
	3. Year 3	139.77	36.45		
	4. Year 4	143.81	24.67		
	5. Year 5	161.04	33.28		
	6. Year 6	161.30	10.67		
Semester GPA	1. <2.0	131.50	28.14	$F = 5.31$	0.001
	2. 2.00–2.49	132.52	35.03		2 < 3,4,5*
	3. 2.50–2.99	150.67	26.57		
	4. 3.0–3.49	152.04	29.95		
	5. >3.5	160.13	16.47		
Cumulative GPA	1. <2.0	123.83	30.07	$F = 3.45$	0.008
	2. 2.00–2.49	146.68	31.23		3 < 4*
	3. 2.50–2.99	144.26	27.93		
	4. 3.0–3.49	157.53	26.63		
	5. >3.5	152.45	29.62		
Probation status	1. Yes	136.24	36.20	$t = -2.73$	0.008
	2. No	152.47	26.52		1 < 2
Marital status	3. Single	150.38	28.34	$t = 1.356$	0.199
	4. Married	134.83	38.96		
Area of residence	1. Rural	149.51	26.99	$t = 0.03$	0.972
	2. Urban	149.65	30.85		
Monthly income	1. <500 OMR	146.46	29.97	$F = 0.67$	0.643
	2. 500–999 OMR	150.88	31.24		
	3. 1000–1499 OMR	155.54	21.70		
	4. 1500–1999 OMR	142.07	32.89		
	5. 2000–2499 OMR	147.42	26.48		
	6. >3000 OMR	155.67	21.98		
Assigned as leader in academic-related activities	1. Never	144.54	28.27	$F = 0.65$	0.640
	2. Rarely	151.17	29.60		
	3. Sometimes	151.42	28.33		
	4. Often	152.11	24.80		
	5. Always	147.23	44.95		

TABLE 3 (Continued)

Variables	Category	Mean	SD	Statistical test	p value
Participation in extracurricular activities	1. Never	151.89	26.68	$F = 1.80$	0.120
	2. Rarely	148.89	28.60		
	3. Sometimes	150.79	31.09		
	4. Often	132.71	34.97		
	5. Always	165.00	9.64		
Assigned as leader in extracurricular activities	1. Never	152.06	25.67	$F = 0.70$	0.614
	2. Rarely	147.67	31.30		
	3. Sometimes	144.55	36.23		
	4. Often	144.43	32.16		
	5. Always	154.33	18.82		
Solitary LS				$r = 0.620$	0.001
Sociable LS				$r = 0.276$	0.001
Competitive LS				$r = 0.687$	0.001
Imaginative LS				$r = 0.733$	0.001
Perceptive LS				$r = 0.753$	0.001
Analytical LS				$r = 0.592$	0.001

Abbreviations: LS, learning styles; SDL, self-directed learning.

* $p < 0.05$.

design, which had combined the use of learning management systems such as Moodle and EduWave with face-to-face education, diverse teaching and learning strategies, and the provision of sufficient physical space, learning resources, and educational technical support. The elective nursing courses for one of the three study sites were also available online. Along similar lines, previous research documented that a supportive learning environment played a significant role in determining nursing students' SDL readiness.¹⁶

While the participating students' SDL readiness in this study seems satisfactory, it is not yet optimal, especially in light of the pandemic where online or hybrid learning may be the new normal.^{4,31} Evidence suggests that autonomous and self-directed learners have thrived more in the remote learning environment over the course of COVID-19.^{32,33} SDL readiness can be developed and enhanced through various mechanisms, such as promoting students' awareness of their own SDL skills and LS assessment; employing learning contracts; increasing learning approaches that stimulate creativity, innovation, critical thinking, and independence; using assessment strategies that promote SDL; and providing the right technical and administrative support systems.³⁴ Studies reporting the success of restructuring traditional clinical courses to remote courses at the onset of the pandemic may be useful to address the continuation of laboratory and clinical learning among nursing students.³⁵⁻⁴⁰ In terms of SDL resources and strategies, course activities included providing educational resources for self-study, use of a virtual workstation for independent review of unfamiliar cases, a flipped classroom and interactive online conferences,³⁵ interactive online simulation

programs,³⁶⁻³⁸ and interprofessional telehealth education and simulation.^{39,40} Nurse educators must explore these types of innovative strategies, which may improve students' SDL and preserve the quality of education in the digital environment.

Many of the available studies correlated students' demographic variables (e.g., age, gender, and year level) with SDL.^{11,13,18,19,27,41} This study's bivariate analysis revealed significant correlations between probation status, CGPA, SGPA, LS, and SDL. However, hierarchical regression yielded significant results for probation status and LS. Though the significant association of probation status with SDL appeared only in Model 1, vanishing in Model 2, the result in Model 1 still suggests an association of probation status with SDL that is worth reporting in this study.

Students who were under probation tended to have a lower score in the SDL measure. Many previous studies have found that students exhibiting lower academic performance (e.g., GPA) had lower levels of SDL readiness.^{14,16,42} Evidence suggests that students on academic probation have poor study habits, test preparation techniques, time management, and self-regulation skills.⁴³ Crucially, they perceive their academic work as overwhelming, have difficulty coping, and believe that support from teaching and administrative staff is lacking.⁴⁴ Thus, this study's results highlight the importance of providing substantial support to improve SDL among students under probation.

Different approaches are being implemented to curb probation status among students. Notably, offering short courses on learning skills and academic success to students on probation has proven

TABLE 4 Hierarchical regression analysis on the predictors of self-directed learning

Variables	Model 1					Model 2				
	B	SE	β	t	p value	B	SE	β	t	p value
(Constant)	137.399	13.212		10.399	0	51.838	9.653		5.37	0
SGPA (R: SGPA on probation status)										
Normal SGPA	-13.994	13.389	-0.167	-1.045	0.297	-6.187	8.319	-0.074	-0.744	0.458
Moderate SGPA	8.352	13.076	0.127	0.639	0.524	-1.724	8.198	-0.026	-0.21	0.834
High SGPA	7.572	12.665	0.128	0.598	0.551	1.539	7.795	0.026	0.197	0.844
Very High SGPA	18.138	12.907	0.232	1.405	0.161	8.063	8.021	0.103	1.005	0.316
CGPA (R: CGPA on probation status)										
Normal CGPA	18.402	14.797	0.24	1.244	0.215	10.917	9.275	0.143	1.177	0.24
Moderate CGPA	2.374	15.004	0.039	0.158	0.874	3.682	9.423	0.06	0.391	0.696
High CGPA	11.866	15.037	0.189	0.789	0.431	6.85	9.314	0.109	0.735	0.463
Very high CGPA	3.126	14.825	0.04	0.211	0.833	-0.48	9.223	-0.006	-0.052	0.959
PROBATION (R: not on probation status)										
On probation status	-12.495	5.362	-0.165	-2.33	0.021	-3.427	3.368	-0.045	-1.018	0.31
Solitary LS						4.48	1.292	0.217	3.468	0.001
Sociable LS						-0.745	1.128	-0.037	-0.66	0.51
Competitive LS						4.95	1.748	0.201	2.832	0.005
Imaginative LS						4.625	1.819	0.19	2.543	0.012
Perceptive LS						10.473	1.997	0.437	5.245	0
Analytical LS						-3.779	1.641	-0.155	-2.303	0.022
R ²	0.144					0.689				
Adjusted R ²	0.11					0.668				
F	4.241*					32.545*				

Abbreviations: CGPA, cumulative grade point average; LS, learning styles; SGPA, semester grade point average.

* $p < 0.001$.

fruitful.^{43,45} As a result, students adopted effective learning reinforcement techniques, strengthened their time management and self-regulation skills,⁴³ moved off of probation status, improved their academic performance, transitioned to higher years smoothly, and completed their studies without delay.⁴⁵ While such courses may help, institutional efforts should go beyond these. For example, academic advisors play a key role in following up and ensuring that the learned strategies are applied consistently over the long term. Additionally, students at risk tend to welcome close academic advising involving the provision of ongoing support and counseling, which strengthens their internal motivation and deepens their commitment to academic success.⁴⁶ Research has shown that students who received relatively more intensive advising had higher CGPAs and retention rates.⁴⁷ Although the current pandemic is a complicating factor, academic advising may be implemented through emails as well as WhatsApp and other videoconferencing tools to follow up on students and ensure proper academic guidance.

This study also explored students' LS and the association of LS with SDL. Due to the lack of studies using a similar Learning Style

Scale, comparing and contrasting the results is not ideal. However, the original author recommended other scales' depiction of LS that may be comparable to the LSS.²³ Items and definitions of LS provided by other scales were also compared and streamlined for similarities with the LS in the LSS in an effort to shape a rich discussion for this study. The study determined that most of the students identified themselves as perceptive learners, which may be similar to the results of previous studies using other LSS.^{25,48-50} This finding suggests that the students in this study best learned with the optimal use of their five senses and understood better via direct observation and hands-on experience.⁵⁰⁻⁵² Conversely, the lowest-rated LS was the sociable LS. This outcome may reflect the general Muslim culture where people are more conservative and intermixing of genders in informal or formal academic activities is not yet widely accepted.^{50,53}

A key study finding involved the association between students' LS and SDL. In particular, students who identified themselves as having solitary, competitive, imaginative, or perceptive LS tended to be self-directed learners. Meanwhile, students who identified themselves as analytical learners were less likely to be self-directed in learning.

Perceptive learners were more likely to have high SDL skills, similar to the findings of a prior study.⁵⁴ This outcome may be related to their goal- and task-oriented ways, quick decision-making and problem-solving skills, and practical approach to situations.⁵⁵ Ideal ways to support their learning would include multisensory learning approaches, sufficient hands-on experiences, step-by-step demonstrations, and adequate time to master their skills.^{48,50} Given the challenges of the pandemic, alternative teaching strategies that have proven effective may be explored to reach perceptive learners, such as the use of virtual workstations and interactive online simulation programs.^{35–38}

Imaginative learners tended to score higher on the SDL measure. This result may be linked to their natural insightfulfulness, inquisitiveness, and imagination, along with the need to find meaning in what they learn and discover the best alternative solutions to problems.^{55,56} Imaginative learners are essentially motivated to learn and can readily transform concrete information to abstract form, and vice versa, as well as integrate them simultaneously.⁵⁰ Hence, they require an environment that motivates them to think critically, similar to the class environment in one study where course activities were recreated, prompting students' ability to make imaginative links to learning concepts.⁵⁶

This study showed that competitive learners were more likely to yield a high score in the SDL measure. In general, competitive learners desire teacher-centered learning environments, rewards and appreciation for academic achievement, and feedback for correction.^{50,57,58} Clear expectations and timely constructive criticism provide the support that students with this LS most need. While their aspiration for recognition fuels them, they find inner satisfaction from setting goals, taking control of what and how they must learn, and exploring other opportunities to fulfill their inquisitiveness.⁵⁰ Since they tend to be more autonomous and internally driven, they are more likely to exhibit a higher SDL score.

The solitary LS was also associated with a higher SDL score. Solitary learners generally prefer to work alone and mostly rely on themselves to enforce their learning.^{50,57,58} They prefer to learn what they perceive is important and require less supervision.⁵⁸ Consequently, they tend to be more confident about their learning and are independent and internally motivated; thus, they are more self-directed learners.^{50,57,58}

Conversely, students who had an analytical LS tended to demonstrate lower SDL. Because analytical learners learn systematically by focusing on details, they must achieve a sense of mastery at every level and need adequate time to process all information.^{48,56} They also aim for precision, which may require additional direct guidance from their teachers to guarantee their completion of tasks and assignments.^{50,56} This characteristic may explain this LS's negative association with SDL. Analytical learners tend to perform better when activities include lectures, reading, and note-taking.⁵⁶

Students may have a combination of prominent LS characterizing their best approach to learning rather than the monopoly of a single style.⁴⁹ However, this topic is beyond the scope of this study. While nurse educators must design teaching strategies best suited to their students' LS,⁵⁹ it is wise to acknowledge the difficulty of creating an ultimate learning space that will completely cater to the

learning needs, style, and convenience of all students, especially at this critical time.⁶⁰

6 | IMPLICATIONS

Though the accompanying disruptions in education have been wide and complex, COVID-19 has opened doors of opportunity to transform teaching and learning. While SDL is an indispensable and valuable skill, different factors play a crucial role. First, nurse educators must move out of their comfort zone and become self-directed teachers. Accordingly, they must make the necessary effort to expose students to a diverse, wide array of creative, innovative, interactive, and engaging learning approaches that cater to the LS of students while improving their SDL and facilitating maximum learning outcomes.^{36,37,39} Furthermore, educators must shift their mindset from that of classroom experts to that of facilitators of learning. They must be willing to encourage students to take charge of their own learning, support them in discovering their learning passion, and help both capable and disadvantaged students equally.⁶¹ Compassion in assisting students to be self-directed and life-long learners is indeed paramount. Second, academic advisors must be more emphatic, assertive, and vigilant in communicating and following up with their advisees, especially those who are on probation or at risk of probation. Third, students must take advantage of the opportunity to exercise self-direction and discipline to learn with minimal supervision in a remote environment. Students must also be motivated to explore other styles to ensure the inclusion of both theoretical and clinical components in nursing.^{48,49,55} Last, a collaborative effort is essential among government agencies, higher education providers, administrators, and educators to promote a resilient and high-quality education that may prove useful and have lasting advantages post-pandemic.^{4,31,33} Beneficial strategies for supporting students' digital learning include knowledge sharing of best practices, curriculum redevelopment, and the provision of technical infrastructure and professional technical skills development for teachers and students.^{4,62}

6.1 | Study limitations

This study has limitations that must be contemplated when interpreting the results. For example, the limited sample size affects the generalizability of the findings. Moreover, using online self-report questionnaires makes response bias unavoidable. Another limitation to keep in mind is that the LSS used in this study is a relatively new scale; only two studies published by the original author were found to use the scale. Comparison of the LS results with the findings of studies using other scales was made based on the recommendation of the author²³ and the similarities of items and definitions of the other scales to the LSS., one of the aims of this study was to identify the LS of students and the association of students' LS with their SDL readiness. Future studies may explore whether students use a combination of LS and seek to identify which LS students may use in tackling different learning tasks.

7 | CONCLUSION

The Omani nursing students in this study exhibited a low level of SDL readiness; moreover, most of them preferred the perceptive, imaginative, and competitive LS. Students who displayed a perceptive, solitary, competitive, or imaginative LS tended to have higher SDL. In contrast, students with an analytical LS revealed lower SDL. Students who were on academic probation status demonstrated lower SDL readiness. Thus, deliberate planning and strategies must be implemented to motivate students on probation and help them cope with academic demands, especially with the advent of intensified digital education. Nurse educators must judiciously introduce teaching and learning strategies that require SDL skills while considering students' LS. Because no single learning environment can satisfy a specific LS, offering a variety of teaching strategies that cater to a multiplicity of learners is vital.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTIONS

Cherry Ann C. Ballard: conceptualization, methodology, investigation, data curation, formal analysis, writing—original draft, writing—review and editing, visualization, project administration, resources, supervision. **Leodoro Jabien Labrague:** conceptualization, methodology, investigation, data curation, formal analysis, writing—original draft, writing—review and editing, visualization. **Arcalyd Rose R. Cayaban:** investigation, data curation, formal analysis, visualization, writing—original draft, resources. **Oscar M. Turingan:** investigation, data curation, formal analysis, visualization, writing—review and editing, visualization, resources. **Siham Mahmoud Al Balushi:** investigation, data curation, writing—review and editing, resources.

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