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Development and implementation of a self-directed learning readiness scale for undergraduate health professional students

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Abstract:

BACKGROUND: To motivate students toward the path of lifelong learning, it is important to train them for a self-directed learning (SDL) approach, where they identify the need of learning the content as well as look forward to attaining the learning outcome, independently. The level of readiness for SDL will allow the learner to be self-disciplined, self-organized, an effective team builder and communicator, a self-assessor, and a self-reflector, thus being a self-learner with the ability to accept and give constructive feedback. The aim of the study was to develop, validate, and implement the SDL readiness scale for health professional students.

MATERIALS AND METHOD: The readiness scale of 43 items was used in four sub-titles (awareness, learning strategies, and style, motivation, team building) was developed using the Delphi method with 12 experts and was implemented for the medical students at Karamsad, Gujarat as a cross-sectional survey after a pilot trial scale from May 2021 to September 2021, using mean, the standard deviation for each item, and arrived sub-titles. The ANOVA test was used to find differences in readiness scores as per different years of the medical program.

RESULT: The result demonstrates that the maximum score was obtained for the first-year medical student (149.89 ± 24.72), which dropped in year 2 (136.35 ± 32.26) but increased by the final year (147.67 ± 56.66), although not as high as the initial joining year. However, a statistically significant difference per gender was identified for a few items of the scale [(items 24 ($P < 0.034$), 26 ($P < 0.0005$), 37 ($P < 0.035$), and 40 ($P < 0.013$)]. The logistic regression analysis showed no statistical significance for the DSVS-self-directed learning readiness scale (SDLRS) score and demographic variables.

CONCLUSION: The outcome of the study strongly suggests training/sensitization sessions for students to highlight the importance of a SDL approach in a digital millennium. Moreover, a longitudinal follow-up needs to be conducted for the readiness score of the students based on the developed scale and subsequent training sessions need to be organized for students as well as faculty for better outcomes for the students toward SDL sessions.

Keywords:

Delphi technique, lifelong learner, self-directed learning, SDLRS score

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Introduction

The exponential growth of knowledge and skills along with technological advances in a healthcare delivery system requires professionals to be lifelong learners.^[1]

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Self-directed learning (SDL) is a process that can motivate students toward the path of continuous learning. Keeping in mind the significance of inculcating lifelong learning skills, the Competency-Based Medical Education (CBME) curriculum,^[2] implemented in Indian medical schools since

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2019, under the National Medical Commission (NMC) has designated specific hours for conducting SDL sessions in each specialty.^[3]

Malcolm Knowles,^[4] recognized as the father of the andragogical theory, has defined SDL as “A process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes.”^[4]

This makes SDL a student-centric learning approach^[5] where the learner initiates their learning by identifying their learning goals and objectives, gathering information from various sources, and finally evaluating their learning outcome by summarizing and reflecting on the process.^[6,7] Hence, medical students are made responsible for their learning process as well as outcomes. SDL is a way of facilitating students’ learning, and a successful outcome depends on multiple factors, including the amount of responsibility the learner takes for his or her learning.^[1,7] The readiness of the learner to engage in the SDL sessions is expected to influence the extent to which they gain and inculcate lifelong learning skills. Thus, before we initiate the process of SDL in the curriculum, there is a need to identify the readiness of students for the SDL sessions.

The literature search shows different readiness scales mostly for nursing and higher education and one for medical students.^[8-13] The Fishers’ 40-item self-directed learning readiness scale (SDLRS) identified for nursing students contains three domains: self-management (SM), desire for learning (DL), and self-control (SC).^[8,9] Researchers have validated this readiness scale for Indian students and implemented them after modification, demonstrating overall construct validity for 36 items rather than 40.^[14] The 20 item-based self-directed learning instrument (SDLI)^[11] developed and validated by Cheng and colleagues is categorized into four dimensions of SDL: motivation, plan and execution, self-monitoring, and interpersonal relationships do not explore all the items for assessing the readiness of the undergraduate student for SDL.

The Guglielmino’s SDL readiness scale (SDLRS)^[13] tool is a 58-item instrument, using a five-point Likert scale designed for medical students to measure the complex attitudes, skills, and characteristics that comprise an individual’s current level of readiness to manage their own learning.^[12] This readiness instrument is costly so its validity and use as per the Indian continent is an issue. The 60-item tool developed for higher education and nursing education by Williamson^[10] as a self-rating scale of self-directed learning (SRSSDL) shows to

enhance the requisite skills for becoming independent and lifelong learners. A study by Williamson and Seewoodhary^[15] explored the views, opinions, and experiences of the Foundation Degree Health and Social Care (FdSc) students’ in using the SRSSDL tool, showing a clear impact of this tool on their learning, confidence development, and their positive experiences.^[15] However, items like “1.9 I have a break during long periods of work”; “2.3 I find ‘role play’ is a useful method for complex learning” do not fit in as per the Indian health professions’ curriculum.

Literature limits the scope of having a specific SDL readiness scale for undergraduate medical students in India. Researchers have identified challenges, in terms of dependence on hierarchical sources and pressure of achievement to be higher for SDL in Asian students compared to Western students.^[16] Cultural impacts are observed in communication and learning strategies other than the development of readiness for SDL.^[17] Indian literature, for SDL readiness score validation, showed that intense studying for admission into a medical institute by attending special coaching classes from grade 9th or 11th was found to make them feel “burnt-out” and tired.^[6] Researchers have specified that in India, the learning culture, shows that the prime goal of some students is to pass the exam and achieve high grades, rather than have a better understanding of the course.^[18] Some Indian parents even ask their children to focus on grades rather than deeper learning.^[6]

Thus, the culture of SDL needs to be initiated from the first year of undergraduate programs so that students adopt the approach of identifying their learning needs, resources to enhance their learning, and ability to work as a group as well as independently, other than having a deeper learning approach. There is a need to develop an indigenous SDL readiness scale that is culturally and socially suitable, and reliable for the undergraduate medical and allied health professions in the Indian sub-continent.

The aim of the research study was to develop, validate, implement, and analyze the SDLRS for undergraduate medical students.

Materials and Methods

Study design and setting

The development of the SDL readiness scale for undergraduate medical professional students, in an Indian context, was initiated by carrying out an extensive literature search at Bhiakaka University. This was done to prepare a list of attributes, skills, and competencies of a self-directed learner, utilizing guidance from the works of Knowles.^[4,9,10,13]

The Delphi technique was used for validating this scale^[19] because the development of the scale required collective and subjective judgments or decisions, in terms of time differences, distance, and personality conflicts.^[20] The final scale was implemented as a cross-sectional, observational study for 550 undergraduate students across all phases of medical studies at Pramukhswami Medical College (PSMC), Bhaikaka University, Karamsad.

Fifty items for the Self-directed Learning Readiness (SDLR) were identified after reading and reflecting on the required behavior of self-directed learners for use in an Indian context, depicted in the items used in the scales by the above authors. These items were further improved after discussing with medical and allied health professional colleagues within the institute. Special attention was paid to writing short and simple sentences to keep the meaning clear and unambiguous.

A panel of 12 experts comprising eight medical professionals (two from international medical institutes, four from Indian medical colleges, and two from within the institute), two each from physiotherapy and nursing colleges, was formed. The experts were purposively sampled from health professional institutions and teaching hospitals. The inclusion criteria for choosing the expert were a postgraduate qualification with a minimum of ten years of teaching experience and five years of research experience in the field of medical or health profession education. Every expert member was informed about the purpose of the study and verbal consent was taken to participate in the study as an expert. The SDLRS was emailed to the expert panel members individually, and they responded individually and independently. Responses were obtained for each item using a five-point Likert scale, with a score of one for “never true” and a score of five for “always true”. An additional “remarks” column was included for the experts to comment on or modify or delete any item. The item was retained on the scale if 75% of experts agreed. Items for which agreement was less than 75% were retained after modification and were placed in the subsequent round. Items with less than 25% agreement were deleted.

Thus, content validity for the SDLRS was established through experts’ judgment using the Delphi technique. After the experts’ judgment, the content validity ratio (CVR) for each item was calculated for accuracy as per a study by Lawshe.^[21] The CVR was +1 for 38 items and ranged from 0.67 to 0.833 for 5 items, thus adding to a content validity index (CVI) of 0.973. An SDLRS with 43 items was developed and items were categorized under four themes (awareness-12 items, learning strategies, and style-15 items, motivation-06 items, and team building-10 items) which were validated by the expert panel team.

Study participants and sampling

A pilot test was done for the developed SDL readiness scale on first-year undergraduate students of the 2019-2020 cohort ($n = 20$), who were selected on a voluntary basis and Cronbach’s Alpha was calculated.

A total of 550 undergraduate students across all phases of medical studies at PSMC, Karamsad, were invited to fill the finalized SDLRS (DSVS-SDLRS) via an online Google Form including an initial component for demographic details (age, gender, language as medium of education in the school, type of school board, place of permanent residence, and present residence). The purpose and objectives of the study were explained to the participant students. Their participation was voluntary, and their response was considered informed consent for participating in the study. Complete confidentiality of data collected was maintained.

Data collection tool and technique

All the participants, who responded, were assigned a serial number which was used for the collection, compilation, and storage of the data. The quantitative data for the scores was assessed by calculating the mean and standard deviation of the response. Unpaired t-tests, logistic regression analysis, and ANOVA were applied for demographic variables.

Ethical consideration

The study was approved by the Institutional Ethical Committee, Bhaikaka University, Karamsad, in Gujarat, India (IEC/BU/129/Faculty/21/97/2021; dated 13/04/2021).

Results

Results of the Delphi technique

In the first Delphi round, the SDLRS contained 50 items: 7 items were deleted as they were not approved by 20–25% of the experts; modifications were suggested for 10 items. Thus, in the first round, 43 items were approved by 80–90% of the experts and were retained. In the second round, 43 items (inclusive of 10 modified items) were re-submitted to the experts. No items were deleted, grammatical corrections were suggested for two items, and 43 items with 80–85% agreement of the experts were retained [Table 1]. The possible score on the scale ranged from 43 to 215. The respondent’s level of self-direction would be classified according to three individual score ranges: low (43–100); medium (101–158); high (159–215).

Results of the SDLRS

Out of 550 students, 408 undergraduate medical students voluntarily participated in the study.

Table 2 shows the descriptive statistics for variables and all 43 items of the developed DSVS-SDLRS scale.

The statistical significance of gender was observed for items 24 ($P < 0.034$), 26 ($P < 0.0005$), 37 ($P < 0.035$), and 40 ($P < 0.013$), whereas the significance of the presence of a medical doctor in the family was observed for items 3 ($P < 0.001$), 4 ($P < 0.016$), 11 ($P < 0.02$), 19 ($P = 0.004$), 20 ($P = 0.013$), 27 ($P = 0.036$), 31 ($P = 0.044$), 33 ($P = 0.026$), 39 ($P = 0.008$), and 43 ($P = 0.005$).

Table 3 shows the descriptive statistics of four themes of the SDL readiness scale with a mean percentage of total readiness scale score of 66.84%, scores for each theme were awareness: 64.55%, learning strategies and style: 67.69%, motivation: 67.97%, and team building: 67.63%.

Table 4 shows that the logistic regression analysis for the DSVS-SDLR score as a dependent variable with that of the demographic variables including a year of the medical program shows a value for Nagelkerke R Square 0.027 which is more than 0.001. The Hosmer and Lemeshow test shows no significance (Sig 0.474) with a Chi-square value of 7.596. The table shows no significant change in the SDLRS values due to gender, medium of study in school, board of study, locality of residence, place of stay after college, presence of a doctor in a family, and year of the program because the Sig. value is more than 0.05.

Table 5 shows the descriptive statistics for the themes and total score per year of the medical program with a maximum score for SDLRS observed in first-year medical students, which decreased as they moved to the second year and subsequently increased by years 4 and 5.

Table 1: Delphi rounds consensus to select items for the self-directed learning readiness scale (DSVS-SDLRS) for students

Delphi round number	Total number of items	Number of items deleted	Number of items retained	Number of items for modification	Number of items added
1	50	07	43	10	00
2	43	00	43	2	00

The reliability statistics of Cronbach's Alpha for these 43 items (with 20 students' responses) was 0.933

Table 2: Descriptive statistics for demographic data and items for the self-directed learning readiness scale (DSVS-SDLRS)

	Mean±SD	Std. error of mean	Readiness scale items	Mean±SD	Std. error of mean
Gender	1.55±0.52	0.02560	Item-22	3.18±1.3	0.06452
Board of study at class+12	2.55±0.82	0.04070	Item-23	3.27±1.11	0.05487
Medium of study in school	1.82±0.98	0.04854	Item-24	3.98±1.12	0.05530
Locality of residence	1.23±0.42	0.02087	Item-25	3.50±1.27	0.06276
Place of stay after college	1.26±0.52	0.02591	Item-26	2.67±1.19	0.05913
Presence of doctor in the family	1.68±0.47	0.02314	Item-27	3.61±1.24	0.06136
Item-1	3.44±1.01	0.05445	Item-28	3.46±1.14	0.05627
Item-2	3.34±1.13	0.05580	Item-26	3.73±1.14	0.05622
Item-3	4.10±1.07	0.05318	Item-29	3.23±1.13	0.05601
Item-4	2.93±1.16	0.05719	Item-30	3.44±1.15	0.05673
Item-5	3.57±1.3	0.06417	Item-31	3.20±1.14	0.05658
Item-6	3.10±1.14	0.05644	Item-32	3.32±1.18	0.05829
Item-7	3.59±1.12	0.05535	Item-33	3.77±1.14	0.05633
Item-8	3.19±1.24	0.06132	Item-34	3.41±1.24	0.06134
Item-9	3.06±1.16	0.05733	Item-35	3.56±1.21	0.05974
Item-10	2.41±1.24	0.06125	Item-36	3.35±1.29	0.06364
Item-11	3.36±1.13	0.05593	Item-37	3.29±1.19	0.05899
Item-12	2.64±1.35	0.06674	Item-38	2.43±1.37	0.06793
Item-13	3.21±1.31	0.06485	Item-39	3.93±1.08	0.05350
Item-14	3.16±1.24	0.06153	Item-40	3.53±1.13	0.05616
Item-15	3.38±1.41	0.06914	Item-41	3.18±1.4	0.06912
Item-16	2.89±1.21	0.05967	Item-42	3.37±1.28	0.06357
Item-17	3.4±1.32	0.06529	Item-43	3.73±8.9	0.43963
Item-18	3.17±1.18	0.05821	Awareness		38.73±8.87
Item-19	3.71±1.19	0.05887	Learning strategies and styles		50.77±11.05
Item-20	4.12±1.1	0.05445	Motivation		20.39±4.96
Item-21	3.52±1.19	0.05909	Team building		33.82±8.32

Std: Standards

Table 3: Descriptive statistics of four themes of the self-directed learning readiness scale (DSVS-SDLRS)

<i>n</i> =408	Total SDLRS Score (TS) (Max. 215)	Awareness Score (AS) (Max. 60)	Learning Strategies Score (LsS) (Max. 75)	Motivation Score (MS) (Max. 30)	Team building Score (TbS) (Max. 50)
Mean	143.70	38.73	50.7647	20.3922	33.8162
Std. error of mean	1.37	0.43963	0.54790	0.24593	0.41264
Std. deviation	27.66	8.88015	11.06707	4.96752	8.33500
Median	147.5000	40.0000	52.0000	20.0000	35.0000
Minimum score	53.00	12.00	15.00	6.00	10.00
Maximum score	215.00	60.00	75.00	30.00	50.00
Skewness	-0.535	-0.406	-0.788	-0.280	-0.316
Std. error of skewness	0.121	0.121	0.121	0.121	0.121

Std: Standard

Table 4: Logistic Regression Analysis (Variables in the Equation) between the dependent variable (score of DSVS-SDLRS) and its demographic variables

	Independent Variables	B	S.E.	Wald	df	Sig.	Exp (B)	95.0% C.I. for EXP (B)	
		Lower	Upper	Lower				Lower	Upper
1	Gender	-0.157	0.197	0.630	1	0.417	0.427	0.855	0.581
2	Medium of study in school	0.025	0.136	0.033	1	0.531	0.855	1.025	0.785
3	Presence of a doctor in the family	0.061	0.119	0.263	1	0.149	0.608	1.063	0.842
4	Board of Study	-0.422	0.252	2.802	1	0.815	0.094	0.656	0.400
5	Locality of residence	-0.116	0.195	0.356	1	0.129	0.550	0.890	0.608
6	Place of stay after college	0.311	0.219	2.024	1	0.472	0.155	1.365	0.889
7	Year of Program	-0.154	0.094	2.651	1	0.104	0.104	0.858	0.713
Dependent Variable	Score of DSVS-SDLRS	0.477	0.723	0.436	1	0.509	1.611		

Table 5: Descriptive statistics for four themes and total score of the self-directed learning readiness scale (DSVS-SDLRS) as per year of the medical program

Year of program joining	Awareness Score	Learning Strategies Score	Motivation Score	Team-building Score	Total Score
First (<i>n</i> =142)	39.46±8.01	52.73±9.34	21.73±4.42	35.98±7.64	149.89±24.72
Second (<i>n</i> =111)	37.01±10.1	47.77±13.79	20.05±5.47	31.52±9.25	136.35±32.26
Third (<i>n</i> =95)	38.49±7.54	49.89±8.37	19.28±4.47	32.79±7.66	140.46±22.37
Fourth (<i>n</i> =57)	40.54±9.05	53.11±9.96	19.56±4.52	34.56±7.64	147.77±26.02
Fifth (<i>n</i> =03)	40.33±18.21	52.00±26.17	20.67±6.55	34.67±8.65	147.67±56.66

Table 6 shows the ANOVA results for the themes of SDLRS for different medical professional milestones. The table shows statistical significance of total SDLRS ($P = 0.002$), learning strategies ($P = 0.004$), motivation ($P = 0.002$), and team-building scores ($P = 0.0001$) with undergraduate medical program years. The mean difference by the Bonferroni posthoc test shows significant values for years 1 and 2 regarding total score (13.31), learning strategies (4.88), and team-building scores (4.53), and posthoc significance is identified for years 2 and 4 for learning strategies (5.31) and years 1 and 3 for the motivation score (2.42) and team building score (3.20).

Discussion

The aim of the study was to develop, validate, and implement the SDLRS for Indian students undergoing health profession education programs. The newly developed 43-item SDL readiness scale (DSVS-SDLRS) was prepared after a related literature review and

through the judgment of twelve experts who participated in the Delphi technique.

The responses from all undergraduate medical students revealed that first-year undergraduate medical students had the highest score on the SDL readiness scale (149.89 ± 24.72), although cohorts had a moderate score level, showing that novice medical students have more experience as self-directed learning is talked about. The important observation in the collected data was a significant dip in the level of SDL readiness score for medical students in year 2 (136.35 ± 32.26) with a gradual increase by the final year (147.67 ± 56.66), although not as high as the first-year readiness score. Moreover, this significant difference was observed for all the subheadings of the item groups except the awareness score. Although the study is cross-sectional, the findings for DSVS-SDLRS are discrete and standalone.

These results aligned with those of Premkumar *et al.*,^[6] who used Guglielmino's SDLRS and found that the

Table 6: ANOVA test for four themes of the self-directed learning readiness scale (DSVS-SDLRS) for students from different years of the medical program

	Sum of squares	Df	Mean square	F	Sig.
Awareness score (AS)					
Between Groups	548.2	4	137.050	1.751	0.138
Within Groups	31546.6	403	78.279		
Total	32094.8	407			
Learning strategies score (LsS)					
Between Groups	1881.4	4	470.338	3.952	0.004*
Within Groups	47968.1	403	119.027		
Total	49849.4	407			
Motivation score (MS)					
Between Groups	415.0	4	103.752	4.343	0.002*
Within Groups	9628.3	403	23.891		
Total	10043.3	407			
Team building score (TbS)					
Between Groups	1420.4	4	355.094	5.329	0.0001*
Within Groups	26,854.9	403	66.637		
Total	28,275.2	407			
Total score					
Between Groups	13,024.9	4	3256.213	4.397	0.002
Within Groups	298,426.7	403	740.513		
Total	311,451.5	407			

Df: Degrees of freedom; Sig.: Significance

medical students' SDL readiness score was the highest at the time of admission and gradually reduced until they reached internship. They found a positive impact on school education, culture, and the type of prior schooling students have before they join medical college. A study by Shah *et al.*^[22] showed a progressive shift in students learning approach from deep to superficial after the completion of an academic year. Datta *et al.*^[23] showed that the majority of the students work for their summative assessment just before exam dates and focus on preparation for postgraduate entrance exams; they suggested curricular reforms for better deeper learning by medical undergraduates.

Kar *et al.*'s^[24] study showed a high mean SDL readiness score in Indian medical students using Fishers' 40-item scales, probably due to the problem-based learning and other student-centric approaches from the basic science year of the medical program. Another study conducted in Nepal reported higher mean readiness and individual domain scores in the first-semester MBBS students than in fifth-semester students.^[8] Similarly, Balamurugan and Kumar^[25] showed higher values for SDL readiness scores using Fisher's scale among first (145.2) and final-year medical students (146.3) compared to students from other years (144.4 and 142.1).^[25]

Although the aim of the study was not to explore the gender variability for SDLRS, the results did find a statistical difference in the scores for items 24 ($P < 0.034$), 26 ($P < 0.0005$), 37 ($P < 0.035$), and 40 ($P < 0.013$), whereas significance of the presence of a doctor in the family

was observed for items 3 ($P < 0.001$), 4 ($P < 0.016$), 11 ($P < 0.02$), 19 ($P = 0.004$), 20 ($P = 0.013$), 27 ($P = 0.036$), 31 ($P = 0.044$), 33 ($P = 0.026$), 39 ($P = 0.008$), and 43 ($P = 0.005$). Kar *et al.*^[24] showed that males had high scores than females ($P = 0.045$), whereas Cadorin *et al.*^[26] and Balamurugan and Kumar^[25] found the opposite dynamics in SDLR scores per gender. However, other researchers showed no difference in scores between genders.^[6,27,28]

The results demonstrate that this instrument can be used to assess the readiness as well as to prepare the SDL strategies of teaching-learning processes to inculcate lifelong learning skills in Indian health profession students. However, the logistic regression analysis did not show any statistical significance between the DSVS-SDLRS and its identified demographic variables. There is a need to explore parameters that can influence the student's score. However, this instrument can guide faculties to plan and integrate SDL skills into the curriculum so that students' readiness scores across the program remain high and make them lifelong learners. The faculty can modify the curriculum via innovative educational strategies and create a student-centric learning environment to promote students' mastery of the approach of SDL. The developed scale will make students self-aware and help identify strategies to benefit from their strengths and improve upon their weaknesses for a better outcome to be lifelong learners. This scale would also encourage faculty to focus on specific attributes of the students for making them lifelong learners.

Limitation and recommendation

To strengthen this instrument, data from a larger sample and other health services students would be required. Moreover, a factor analysis of the instrument would give better clarity in terms of grouping the items of the scale. There is also a need to conduct longitudinal studies to find out the relationship between the student's SDL readiness scores with that of their academic performance. A qualitative study with different stakeholders needs to be conducted to identify various parameters which can influence the score of health professional students.

It also would be interesting to investigate students' perceptions of the DSVS-SDLRS as an instrument for assessing their self-directed learning skills and analyzing how the instrument would motivate them to be self-directive.

Conclusions

The DSVS-SDLRS developed in this study using the modified Delphi technique is a valid and reliable instrument for assessing learners' levels and approaches toward SDL in the Indian context. Further research for the same would strengthen the usage of this instrument and guide and motivate educators to explore modalities to modify the curricular teaching strategies to make undergraduate students lifelong learners.

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Conflicts of interest

There are no conflicts of interest.

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