Development of a self-directed learning readiness scale for nursing education

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Self-directed learning is a method of instruction used increasingly in adult education. A scale was developed in response to a need for a valid and reliable instrument to measure self-directed learning readiness. Such a scale will allow nurse educators to diagnose students' attitudes, abilities and personality characteristics, necessary for self-directed learning.

This study was undertaken in two stages. In the first, the Delphi technique utilizing a panel of 11 nurse educator experts was used to assess the content and construct validity of a number of items perceived to reflect self-directed learning readiness. Each panel member was asked to independently rate the relevance of each item on a Likert scale. The second stage involved the administration of the questionnaire to a convenience sample of 201 undergraduate nursing students. The questionnaire was analysed using principal components factor analysis with varimax rotation, Chronbach's coefficient alpha, and item-to-total correlations to measure the scale's construct validity, internal consistency (reliability), and unidimensionality, respectively.

The resulting self-directed learning readiness scale appears homogeneous and valid. The scale will assist nurse educators in the diagnosis of student learning needs, in order for the educator to implement teaching strategies that will best suit the students. Furthermore the development of this scale will provide valuable data for curriculum development. © 2001 Harcourt Publishers Ltd

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Introduction

Self-directed learning (SDL) is a method of instruction used increasingly in adult education within tertiary institutions. Self-directed learning can be defined in terms of the amount of responsibility the learner accepts for his or her own learning. The self-directed learner takes control and accepts the freedom to learn what they view as important for themselves. The degree of control the learner is willing to take over their own learning will depend on their attitude, abilities and personality characteristics. Readiness for SDL exists along a continuum and is present in all individuals to some extent. The literature supports the contention that matching teaching delivery with SDL readiness offers the best opportunity for learning (Guglielmino 1977, Wiley 1983, O'Kell 1988, Grow 1991). In both undergraduate and postgraduate nursing programs, there is wide use of SDL in the form of clinical logs, contracts, problem-based packages and distance learning packages. This study aimed to develop an instrument designed to measure SDL readiness in nursing students undertaking studies in a tertiary educational setting.

Literature review

Defining self-directed learning

In the original work of Knowles (1975, p.18) SDL is defined 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'. In defining SDL, two aspects need to be explored: firstly SDL as a process or method of learning (Knowles 1975, Long 1990) and secondly, in terms of personality characteristics that are required and developed as an outcome of SDL (Oddi 1986, 1987).

Knowles (1975, 1990) described two opposite poles of a continuum of learning, with teacher- or other-directed (pedagogical) learning at one end and self-directed (andragogical) at the other. According to Knowles (1990) the pedagogical learner is dependent on the teacher to identify learning needs, formulate objectives, plan and implement learning activities and evaluate learning. The pedagogical learner prefers to learn in highly structured situations such as lectures and tutorials. Conversely, the andragogical learner prefers to take responsibility for meeting his or her own learning needs. The continuum of teacher-versus self-direction can be described in terms of the amount of control the learner has over their learning and the amount of freedom given to them to evaluate their learning needs and to implement strategies to achieve their learning goals.

Self-directed learning readiness

Self-directed learning readiness is defined as 'the degree the individual possesses the attitudes, abilities and personality characteristics necessary for self-directed learning' (Wiley 1983, p.182). Inherent in this definition are several assumptions about SDL readiness. Firstly, adults are inherently self-directing, i.e. readiness for SDL exists along a continuum and is present in individuals to an extent. Secondly, competencies required for self-direction can be developed to some extent and the best way to learn autonomous behavior is to behave autonomously. Finally, the ability to learn independently in one situation or context can be generalized to other settings (Candy 1991, Guglielmino 1989).

This final assumption must be met with caution. It would be inadvisable to assume that a person who possesses high levels of readiness for self-direction in a given situation would still possess the same amount of readiness in a new, unfamiliar context. This is not to say that several skills and personality characteristics would not be transferable to a different situation. However, for a person to be self-directed in a specific content area, that person must possess a certain level of knowledge in that area. For example, a person highly self-directed in mathematics may not possess the same amount of readiness for English. It is therefore concluded that measuring SDL readiness needs to be done within a specific context.

Readiness for SDL is individualized, which accounts for the varying degrees along the continuum. The Staged Self-directed Learning Model was developed to allow for the individual differences inherent in such a continuum (Grow 1991, Tennant 1992). Evidence has found that those students who have low readiness for SDL and are exposed to a SDL project, exhibit high levels of anxiety, and similarly those learners with a high readiness for SDL who are exposed to increasing levels of teacher direction also exhibit high anxiety levels (Grow 1991, Wiley 1983).

There has been considerable research conducted to determine the relationship between SDL readiness, preference for structure and teaching preference of nurses. Wiley (1983) concluded that students who indicated preference for high levels of structure and are subjected to a SDL project, score low in SDL readiness. In contrast, those students who prefer low structure and are subjected to a SDL project score high in SDL readiness. O'Kell's (1988) study matched lesson type with SDL readiness and concluded that students who scored low in SDL readiness preferred more teacher-led discussion, demonstration and lectures rather than independent projects, case studies and private tutorials. These results indicated that there is a definite correlation between SDL readiness and student preference for structured teaching sessions.

Self-directed learning projects are not for everyone and may cause extreme anxiety and frustration in some students (Dyck 1986). Richardson (1988), in evaluating self-directed independent study contracts with undergraduate nursing students, identified that a negative experience resulted from either over-direction or under-direction from the teacher. Since readiness for SDL is individualized, so should be the

amount and type of teacher direction. If students resent independent learning projects, a more pedagogical approach to instruction needs to be utilized.

Self-directed learning readiness scales

The instrument most widely used in educational and nursing research to measure SDL readiness is Guglielmino's (1977) Self-directed Learning Readiness Scale (SDLRS) (Wiley 1983, O'Kell 1988, Linares 1989, 1999). Issues have been raised concerning the cost, validity and use of this instrument. Based on problems with validity testing of this instrument, Field (1989) and Candy (1991) suggest discontinuing this tool. Furthermore, there has been significant questioning of the construct validity of the SDLRS (Field 1989, 1991; Straka 1995, Straka & Hinz 1996). Field (1989) identified that the strongest item-to-score correlations for the SDLRS were produced by those items dealing with love and/or enthusiasm for learning (17.6% of total variance) and those items that appear to be intimately connected with readiness for SDL have low correlations with total SDLRS scores (less than 5% for each factor).

Replication of the eight-factor structure model of the SDLRS has proved difficult (Field 1989, 1991; Straka 1996). Some studies have raised questions about the reliability of Guglielmino's SDLRS when used in different racial and class populations (Long & Agyckum 1983, 1984; Straka 1995). Long and Agyckum (1984) failed to validate the SDLRS when comparing SDL readiness scores and teacher ratings and concluded that it was possible that the SDLRS does not measure self-direction in learning. Bonham (1991) also reports concerns about the construct validity of the SDLRS by questioning the meaning of low scores. It was concluded that low scores do not measure low readiness for SDL, but rather dislike for any kind of learning, therefore, construct validity was questionable for low SDLRS scores.

Even though scales such as Guglielmino's SDLRS have been developed, they are not readily available and incur a cost for their use. The development of a new scale allows for the problems associated with the use of the other scales to be addressed. This study aimed to develop and pilot an instrument measuring SDL readiness.

Method

This study was conducted in 2 stages. Stage 1 used a modified Reactive Delphi technique to develop and determine content validity of the SDLR scale. Stage 2 incorporated the distribution of the scale to a convenience sample of undergraduate nursing students to determine scale construct validity and internal consistency. Ethics approval for the study was obtained from the University of Sydney Human Ethics Committee.

Stage 1: Instrument development

The literature was extensively surveyed to compile a list of attitudes, abilities and personality characteristics of a self-directed learner. A bank of items was developed drawing from the work of Chickering (1964), Gugliemino (1977), Knowles (1975, 1990) and Candy (1991). Considerable attention was given to developing clear and unambiguous items. When items were developed, care was taken to use simple language and short sentences that were neither double-barrelled nor leading. The completed bank comprised 93 items which were deemed to reflect the perceived attributes, skills and motivational factors required of self-directed learners.

The Delphi technique

The Delphi technique utilizes an expert panel to reach consensus for a specific purpose. This approach is widely applied to the development of research scales. In this study, a modified Reactive Delphi technique was used to gain consensus among an expert panel about the characteristics required for SDL. Each member of the panel individually and independently of other members responded to the item bank. The expert panel comprised 11 nurse academics and nurse educators with previous research and teaching experience in the area of SDL.

Panel inclusion criteria

Each panel member was required to have a qualification in education and a minimum of

5 years' teaching experience in nursing and/or tertiary education. The members of the expert panel were drawn from universities and hospitals, with representation from the Australian Nurse Teachers' Society. Each panel member was invited to participate in the study by telephone or mail. The item bank, an outline of the research proposal and a consent form were mailed to each panel member.

Each panel member independently evaluated each item to determine the degree to which the item measures a characteristic of a self-directed learner. Each item was assessed using a 5-point Likert scale where a score of 1 denoted 'strongly disagree' and a score of 5 denoted 'strongly agree'. Panel members were given space to modify the item if they chose. The responses were returned to the researchers by mail using reply-paid envelopes.

The data were collated, coded and analysed using the Statistical Package for the Social Sciences (SPSS-X). For an item to be retained, a panel consensus for the item of at least 80% agreement had to be achieved. Items where agreement was not achieved, but where less than 20% disagreed (i.e. 80% either 'agreed', 'strongly agreed' or were 'unsure') were retained for the subsequent round.

Stage 2: Pilot study

A convenience sample of 201 students enrolled in the Bachelor of Nursing at the University of Sydney was used. The questionnaire was administered to the student sample during the semester. The researchers distributed the instrument and an information sheet. Students were invited to seek clarification, if needed. Students anonymously returned the completed questionnaires to a labelled box. The students were asked to describe themselves by indicating on a 5-point Likert scale the extent to which the item was descriptive of their own characteristics.

Data analysis

Principal components analysis with Varimax rotation was used to search for a general factor (SDL readiness) underlying all items in the instrument. To determine internal consistency, Cronbach's coefficient alpha was used. Correlations between individual scale items and total score on the scale were also computed.

Results

Table 1 summarizes the results of the Delphi rounds. Following the first round of the Delphi technique, 18 items were deleted from the item-bank as there was less than 80% agreement amongst the expert panel for those items. Seventeen items did not reach consensus, but less than 20% disagreed (i.e. 80% either 'agreed', 'strongly agreed' or were 'unsure') and were retained for the subsequent round. Agreement consensus was achieved for 58 items. A total of 75 items were included in the second Delphi round.

After the second Delphi round, 23 items were deleted as agreement consensus was not achieved. Forty-five items did achieve agreement consensus. Seven items did not reach consensus, but less than 20% of the panel disagreed (i.e. 80% either 'agreed', 'strongly agreed' or were 'unsure'). Despite consensus not being achieved for these items, the researchers believed that these items were important to the structure of the scale and were kept for further analysis. A third Delphi round was not attempted because it was believed that the refinement was better achieved by piloting the 52 items and using item–total correlations for item selection.

Item unidimensionality

A unidimensional scale is one in which each item measures the same underlying concept, in this case SDL. To test for unidimensionality, i.e.

Table 1 Summarized results of the Delphi rounds

Round	Total items	Items deleted	≥80% agreement	Unsure but retained for following stage
1	93	18	58	17
2	75	23	45	7

whether the response on a particular item reflects the response on other items, item–total correlation coefficients were conducted with the results reported in Table 2. The higher the coefficient for each item the more clearly the item belongs to the scale. Generally, a coefficient of less than 0.30 suggests that the item should be dropped from the scale. Ten of the 52 items produced a coefficient less than 0.30 and hence were dropped from the scale.

Factor analysis

A principal components analysis was performed on the remaining 42 items to determine whether the combined item pool could be summarized by a smaller set of component scores. In this procedure, scores for the 201 respondents were intercorrelated and subjected to a principal components analysis. To assess whether the set of items in the correlation matrix was suitable for principal components analysis, the Kaiser-Meyer Olkin (KMO) measure of sampling adequacy was computed. If the KMO statistic yields high values above 0.70, then correlations among items are sufficiently high to make factor analysis suitable (deVaus 1991). For this study, the KMO computed was 0.844.

The scree test from the initial principal components analysis suggested that three components be retained for interpretation, which together accounted for 36.4% of the variance in the item pool. As some of the components were possibly correlated, these were initially rotated to approximate a simple structure using both oblique (direct oblimin) and orthogonal (varimax) procedures. As the results of this preliminary analysis indicated little degree of overlap between the resulting components, the outcomes of the varimax rotation are presented in Table 3.

The traditional criterion of 0.30 was used to determine loadings that should be retained for interpretation. On the basis of this criterion, most of the items loaded uniquely on one of the three components. In cases where items cross-loaded, the item was located with the higher component loading. Two items (*I need to be in control of what I learn*; and *I often review the way nursing practices are conducted*) did not load on any of the components using a cutoff loading of 0.30. These items were therefore dropped from the scale.

As shown in the pattern matrix, Component I was defined by 13 of the pooled items. This component was labelled 'self-management' as the items reflected these characteristics. Component II was defined by 13 items. As these items related to the desire for learning, this component was labelled 'desire for learning'. Component III was defined by 15 items, which related to characteristics of self-control.

Internal consistency reliability

The internal consistency for each component was estimated using Cronbach's coefficient alpha. The computed values of Cronbach's coefficient alpha for the total item pool ($n = 40$), self-management subscale ($n = 13$), the desire for learning subscale ($n = 12$) and the self control subscale ($n = 15$) were 0.924, 0.857, 0.847 and 0.830 respectively. According to deVaus (1991), a scale with a computed alpha greater than 0.70 is considered to have an acceptable level of internal consistency (although the consistency for other types of scales, such as achievement tests, is generally expected to be at or above 0.80).

Discussion

The Guglielmino SDLRS has inherent problems relating to construct validity and reliability. Research has failed to confirm the factor structure of the Guglielmino SDLRS (Field 1989, 1991; Straka 1996). The purpose of this study was to develop a reliable and valid scale that measures SDL readiness in nursing students. The resulting scale, comprised of 40 items, appeared to be both homogeneous and valid. Exploratory factor analysis revealed three subscales. Table 4 presents the sample measures of central tendency and dispersion for the total scale and subscales. Given that the total scores for this sample were normally distributed, it can be concluded that a total score greater than 150 indicates readiness for SDL.

Evidence of content validity has been established by the development of the scale items from the literature, assessment by a panel of experts using the Delphi technique and testing with exploratory factor analysis. However, additional research is required to provide further evidence of content validity. Further testing is necessary to determine whether this scale can

Table 2 Item-total correlation statistics

Item	Mean	SD	Corrected item–total correlation	Alpha if item deleted
I solve problems using a plan	4.3	1.059	.350	.920
I prioritize my work	4.9	.316	.386	.920
I like to solve (answer) puzzles/questions	4.2	.632	**.251**	.922
I manage my time well	4.9	.316	.559	.918
I have good management skills	4.5	.527	.504	.919
I set strict time frames	3.9	.876	.532	.919
I prefer to plan my own learning	4.6	.516	.345	.920
I prefer to direct my own learning	4.8	.422	**.294**	.921
I believe the role of the teacher is to act as a resource person	4.2	.632	**.189**	.922
I am systematic in my learning	3.8	.789	.477	.919
I am able to focus on a problem	4.2	.632	.375	.920
I often review the way nursing practices are conducted	4.4	.699	.317	.921
I need to know why	4.3	.675	.305	.921
I critically evaluate new ideas	4.4	.699	.477	.919
I prefer to set my own learning goals	4.6	.516	.484	.919
I am willing to change my ideas	4.3	.823	**.197**	.921
I will ask for help in my learning when necessary	4.5	.972	**.281**	.921
I am willing to accept advice from others	4.5	.707	**.239**	.921
I learn from my mistakes	4.4	.843	.381	.920
I will alter my practices when presented with the facts	4.2	.789	**.289**	.921
I am open to new learning opportunities	4.6	.699	**.291**	.921
I am open to new ideas	4.5	.707	.302	.921
When presented with a problem I cannot resolve, I will ask for assistance	4.1	.994	.363	.920
I am responsible	4.4	.516	.467	.919
I like to evaluate what I do	4.3	.483	.574	.918
I have high personal expectations	4.1	.568	.497	.919
I have high personal standards	4.0	.667	.486	.919
I have high beliefs in my abilities	4.0	.943	.407	.920
I am aware of my own limitations	4.1	.568	.419	.920
I am assertive	3.9	.876	**.261**	.921
I am confident in my ability to search out information	4.8	.422	.409	.920
I enjoy studying	4.3	.675	.445	.920
I have a need to learn	4.3	.675	.522	.919
I enjoy a challenge	4.3	.823	.532	.919
I want to learn new information	4.2	.789	.520	.919
I enjoy learning new information	4.2	.789	.514	.919
I set specific times for my study	4.1	1.197	.551	.918
I am self disciplined	4.6	.516	.562	.918
I like to gather the facts before I make a decision	4.2	.632	.496	.919
I am organized	4.5	.707	.517	.919
I am logical	4.1	.738	.490	.919
I am methodical	3.9	.738	.568	.918
I evaluate my own performance	4.3	.675	.554	.918

I prefer to set my own criteria on which to evaluate my performance	4.1	.876	.467	.919
I am responsible for my own decisions/actions	4.3	.949	.396	.920
I can be trusted to pursue my own learning	4.7	.483	.507	.919
I can find out information for myself	4.6	.516	.341	.920
I need minimal help to find information	4.0	.816	**.228**	.921
I like to make decisions for myself	4.1	.994	.334	.920
I prefer to set my own goals	4.4	.699	.464	.919
I am in control of my life	4.0	.471	.332	.920
I need to be in control of what I learn	4.1	.876	.368	.920

identify contrasting groups, i.e. high versus low readiness for SDL, across diverse cultural groups. A criticism of the Guglielmino SDLRS is poor reliability and an inability to replicate its factor structure across different racial groups. Research is required to confirm the factor structure of the current scale when applied to different racial groups. Furthermore, research is required to provide evidence of the ability of this scale to predict student performance. There is also a need to determine whether a positive correlation exists between SDL readiness scores and academic performance, when students are subjected to SDL as a teaching strategy.

Prior to the use of this scale, some of the items need to be rephrased into negatively worded items and a reverse scoring system used. This will prevent responder bias and reduce the opportunity for respondents to just scan over the items and give a similar score to each item. Suggested items for this purpose include *I am poor at managing my time: I dislike studying; I am disorganized*; and *I am not in control of my life*. As a result of these changes, a confirmatory factor analysis is required.

The Delphi technique used in this study was modified. Firstly, the statistical summary of the panel's response for each item was not provided to the panel members at the administration of the second round of the questionnaire. It was believed that this feedback may have influenced the panel members' responses, particularly for the items where respondents found it difficult to make a choice. Therefore each panel member was blind to the other members opinions. Secondly, the scale was only subjected to two rounds of the Delphi technique. A third round was considered unnecessary as consensus had been achieved for 90.5% of items in round two. According to Couper (1984), two rounds may be sufficient to

reach consensus and produce a forecast when the Delphi sequence is initiated with a predetermined list of items. Rather than conducting a third round, the items were pilot tested and subsequently analysed, as it was believed that item to total correlations provided a more accurate method of item selection.

The development of this scale will allow teachers to match their instructional design with student's readiness for SDL. Grow (1991) outlines a staged self-directed learning model where learners advance through stages of increasing self-direction. Through their method of teaching and level of control, teachers can help or hinder the learner's development through the stages. It is anticipated that this scale will provide the diagnostic data which teachers can use to assess either individuals or groups of student's readiness for SDL. The scale was developed in order to measure readiness for SDL in nursing students. The initial item bank included items with specific nursing context. However, after distributing the item bank to a panel of nurse experts and piloting the scale on nursing students, the subsequent scale no longer contains items that refer specifically to nursing. Consequently, this scale could potentially be used in other student populations.

Conclusion

In conclusion, the Self-directed Learning Readiness Scale developed and piloted in this study appears homogeneous and valid. This scale will be readily available to nurse educators, making it a cost-efficient research and educational tool. This scale will assist nurse educators in the diagnosis of student learning needs, in order for the educator to implement teaching strategies that will best suit the students.

Table 3 Rotated Factor Matrix

Item	Factor 1	Factor 2	Factor 3
I manage my time well	**.758**	.019	.182
I am self disciplined	**.701**	.217	.113
I am organized	**.694**	.093	.179
I set strict time frames	**.615**	.175	.158
I have good management skills	**.606**	.053	.230
I am methodical	**.597**	.189	.304
I am systematic in my learning	**.573**	.156	.118
I set specific times for my study	**.514**	.177	.223
I solve problems using a plan	**.510**	.278	−.135
I prioritize my work	**.487**	.095	.022
I can be trusted to pursue my own learning	**.423**	.209	.322
I prefer to plan my own learning	**.363**	.051	.195
I am confident in my ability to search out information	**.315**	.207	.223
I want to learn new information	.172	**.845**	.007
I enjoy learning new information	.194	**.830**	−.002
I have a need to learn	.338	**.745**	−.046
I enjoy a challenge	.157	**.690**	.180
I enjoy studying	.339	**.611**	−.083
I critically evaluate new ideas	.204	**.465**	.224
I like to gather the facts before I make a decision	.282	**.438**	.225
I like to evaluate what I do	.334	**.419**	.367
I am open to new ideas	−.023	**.404**	.176
I learn from my mistakes	.067	**.403**	.299
I need to know why	−.055	**.384**	.304
When presented with a problem I cannot resolve, I will ask for assistance	.152	**.308**	.220
I often review the way nursing practices are conducted	−.012	**.295**	.285
I need to be in control of what I learn	.183	**.267**	.260
I prefer to set my own goals	.103	.067	**.681**
I like to make decisions for myself	−.037	.027	**.600**
I am responsible for my own decisions/actions	−.042	.335	**.527**
I am in control of my life	.232	−.107	**.474**
I have high personal standards	.231	.209	**.473**
I prefer to set my own learning goals	.263	.128	**.452**
I evaluate my own performance	.433	.219	**.447**
I am logical	.417	.102	**.443**
I am responsible	.360	.052	**.439**
I have high personal expectations	.218	.339	**.434**
I am able to focus on a problem	.228	.102	**.412**
I am aware of my own limitations	.149	.245	**.408**
I can find out information for myself	.216	.044	**.381**
I have high beliefs in my abilities	.215	.239	**.380**
I prefer to set my own criteria on which to evaluate my performance	.295	.236	**.362**

Table 4 Subscale and total scores and measures of central tendency

	Subscale 1: Self-management	Subscale 2: Desire for learning	Subscale 3: Self-control	Total score
Mean	44.26	47.31	58.98	150.55
SD	8.04	6.62	6.98	18.34
Median	44	47	58	149
Mode	46	47	58	150
Minimum	24	27	41	101
Maximum	65	60	74	194

This will promote an educational climate that will foster adult learning principles, gradually promoting student autonomy and mutual responsibility for learning in a non-threatening environment and, hence, a reduction in student anxiety. Furthermore the development of this scale will provide valuable data for curriculum development.

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