RESEARCH ARTICLE

Readiness for Self-directed Learning and Academic Performance in an Abilities Laboratory Course

Zachariah M. Deyo, PharmD, Donna Huynh, PharmD, Charmaine Rochester, PharmD, Deborah A. Sturpe, PharmD, and Katie Kiser, PharmD

University of Maryland School of Pharmacy, Baltimore

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Objective. To assess the relationship between readiness for self-directed learning, academic performance on self-directed learning activities, and resources used to prepare for an abilities laboratory course.

Methods. The Self-directed Learning Readiness Scale (SDLRS) was administered to first-year (P1) doctor of pharmacy (PharmD) candidates at the University of Maryland. Additional data collected included final course grades, quiz scores, resources used to prepare for laboratory activities, and demographics.

Results. The mean SDLRS score was 148.6 ± 13.8 . Sixty-eight students (44%) scored > 150 , indicating a high readiness for self-directed learning. These students were more likely to complete assignments before the laboratory, meet in study groups, and report postgraduation plans to enter noncommunity pharmacy. No significant association was found between academic performance and the SDLRS.

Conclusions. Readiness for self-directed learning is associated with self-directed learning habits, but may not be necessary for learning foundational knowledge, provided students are given specific instructions on what to study. Whether high readiness for self-directed learning is necessary for more complex learning or for self-identification of learning needs is unknown.

Keywords: academic performance, learning, practice laboratory, self-directed learning, Self-directed Learning Readiness Scale

INTRODUCTION

The andragogical model of learning assumes that the learner is self-directing, experienced, and internally motivated.¹ Learners are ready and stimulated to learn when they encounter a gap in their current and desired knowledge.¹ Self-directed learning is defined by Malcolm Knowles as “a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes.”² Garrison expanded upon Knowles’ definition by presenting a comprehensive model of self-directed learning that includes the dimensions of self-management, self-monitoring, and motivation.³ In this context, self-management describes a learner setting goals and managing available resources and support. Self-monitoring

encompasses cognitive and metacognitive processes required to construct individual meaning of new concepts by adding to or modifying existing knowledge. Last, motivation refers to the influence of internal and external factors on the believed value to and success of the learner in a learning experience. This final dimension is important at the time the decision is made to enter into a learning activity and to continue in that activity.³

Possessing self-directed learning qualities is important to the growth and success of the pharmacy profession, beginning with the education of pharmacy students. In the 2007 Accreditation Standards and Guideline’s (Standard 11 and 12), the Accreditation Council for Pharmacy Education (ACPE) expressed the importance of colleges and schools integrating teaching and learning methods and outcome statements that help students transition from dependent to active, self-directed lifelong learners;⁴ yet learners vary in the degree to which they possess self-directed learning skills. These skills are individualized and can be affected by attitude, ability, and personality characteristics of a learner.⁵ As self-directed learning is incorporated into curricula, convincing students of its importance

Corresponding Author: Zachariah M. Deyo, University of North Carolina Hospital, 101 Manning Drive, Chapel Hill, NC 27514. Tel: 919-966-2407. Fax: 919-966-7163. E-mail: zdeyo@unch.unc.edu

can be challenging because students may not associate it with adult learning or may think it is intended to reduce teachers' workloads.⁶

The SDLRS is a validated tool used to measure the degree an individual possesses the attitudes, abilities, and personality characteristics necessary for self-directed learning.^{5,7} Two validated SDLRSs exist to assess readiness for self-directed learning. These scales were developed by Guglielmino in 1977⁸ and Fisher in 2001⁵ and have been used to study self-directed learning in medical, nursing, pharmacy, and non-medical education.⁹⁻¹³ Fisher established construct validity and internal consistency through a pilot study of undergraduate nursing students.^{5,14} Content validity for both scales was determined using Delphi surveys.^{5,8} Fisher used principal component factor analysis to search for the underlying components of all items of the scale, and discovered 3 components based on Garrison's self-directed learning principles: self-management, desire for learning, and self-control.^{3,5} Fisher's 40-item scale has a 200-point maximum, and a score greater than 150 indicates high readiness for self-directed learning. The Fisher scale was selected as our assessment tool because it is based on Garrison's self-directed learning principles, and was used previously at our institution to evaluate readiness for self-directed learning in pharmacy students before and after advanced pharmacy practice experiences (APPEs).¹³

As a component of a major curricular revision, a new course for P1 PharmD candidates began in the fall of 2009 at the University of Maryland School of Pharmacy. Several components of this laboratory course emphasized self-directed learning. The course assists student pharmacists in achieving proficiency in professional abilities through the integration of knowledge, skills, behaviors, and values, to function as an independent pharmacy practitioner in a variety of health care environments. Self-directed learning components of the course include self-paced learning activities related to prescription and nonprescription medications, pharmaceutical calculations, medical terminology, and medical abbreviations. Although students were left to learn this content on their own without the assistance of lecture-based instruction or review sessions, they were instructed on the expectations for learning (eg, which pages of the calculations book to cover or which drugs to study). Recall and application level assessments of these components are administered through weekly quizzes and a final examination, with quizzes counting 24% and the final examination counting 20% of the final grade. Non-self-directed learning activities include community pharmacy dispensing activities, intravenous compounding laboratories, patient counseling, assessment of vital signs, and professionalism, and these

activities contributed to the remaining 66% of the course grade.

The relationship between self-directed learning readiness and academic performance has been evaluated in traditional classroom settings and Web-based courses in medical and non-medical education.⁷ However, to our knowledge, the relationship between self-directed learning and academic performance has not been assessed in pharmacy education. The objectives of this study were to assess the relationship between readiness for self-directed learning and academic performance on course assessments, and resources used to prepare and study for the laboratory course.

METHODS

This was a descriptive, cross-sectional, study. A survey instrument was administered to 169 volunteer P1 PharmD candidates at 2 campuses of the University of Maryland School of Pharmacy during the final laboratory session of the fall 2009 semester. Students were asked to provide their school identification number if they chose to participate. This number was used to link survey results with measures of academic performance. This study was approved by the Institutional Review Board at the University of Maryland.

The SDLRS was administered simultaneously with a 16-item survey instrument that collected demographic data and information regarding resources used to prepare for laboratory activities. Demographic data included age, gender, race, previous academic degree(s), and postgraduation plans. The course syllabus and recommended textbooks were used to develop questions about potential resources to be used to prepare for the laboratory. The survey tool assessed the frequency that students obtained individual off-campus tutoring, studied in groups, completed pre-laboratory assignments; or used recommended or alternative textbooks, drug information resources, or conducted Internet searches. In addition, the survey instrument assessed the students' completion of supplemental textbook activities or pharmaceutical calculation problems. The average time spent studying each week for the laboratory and the frequency that students completed pre-laboratory assignments prior to attending laboratory sessions also were assessed. The entire assessment tool, including the SDLRS and 16-item survey instrument, was piloted with 7 fourth-year (P4) PharmD candidates to assess appropriateness of the survey instrument's length, vocabulary, format, sensitivity to cultural barriers, and language for respondents. The pilot study determined that 20 minutes would be sufficient time for students to complete the assessment. Other components were determined to be appropriate and changes were not made after piloting the tools.

Explicit directions and an instructor's guide were developed to ensure consistency of verbal directions and dissemination when administering both tools by different instructors across 2 campuses. In addition, a cover sheet provided students with an explanation of self-directed learning, research objectives, and described voluntary participation. Each survey tool and answer sheet were numbered and distributed together to determine the number of respondents. Academic performance data in the form of scores for all quizzes, final examinations, and final course grades linked to student identification number was provided by the course instructor who was the primary investigator.

Data from the SDLRS and 16-item survey instrument was stored in a locked cabinet and deidentified by a researcher who had no influence over course grades. These data were not combined with academic performance data for analysis until final grades were submitted for the fall 2009 semester.

Descriptive statistics were used for population demographics. The student's *t* test was used to compare SDLRS score and mean quiz and final examination scores. Categorical survey data were analyzed with the Fisher's exact test. *P* values < 0.05 were considered significant. All statistical analyses were performed using SAS software, version 9.2 (Cary, NC).

RESULTS

One hundred sixty-one (95.8%) of 168 survey instruments were returned. Of these, 8 (4.8%) lacked participant identification, resulting in an evaluable response of 153 (91%). The mean SDLRS score was 148.6 ± 13.8 (range 74 - 174; *n* = 153), and the median score was 149. Sixty-eight students (44%) scored > 150 on the SDLRS, indicating a high readiness for self-directed learning. The baseline characteristics of the evaluable respondents are summarized in Table 1. Students with a readiness for self-directed learning > 150 were more likely to have a previous academic degree (*p* = 0.03) and less likely to pursue a career in community pharmacy following graduation (*p* = 0.03). The mean quiz scores did not differ significantly between the high and low readiness groups (84.9 ± 8.0 for high readiness and 84.0 ± 7.14 for low readiness, *p* = 0.475). In addition, the mean final examination score (91.4 ± 5.63 and 90.1 ± 6.01 , *p* = 0.564) did not differ between the high and low readiness for self-directed learning groups. Of those evaluated, 140 students (91%) received an A for their final course grade, and readiness for self-directed learning did not differ by final course grade. Results of resources used to prepare for the laboratory are summarized in Table 2. Students with a high SDLRS score were more likely to complete pre-laboratory

Table 1. Demographics of Survey Respondents

Category	High Readiness for Self-directed Learning ^a <i>n</i> ^b (%)	Low Readiness for Self-directed Learning ^c <i>n</i> ^d (%)
Age, y		
18-24	39 (40)	58 (60)
25-29	13 (46)	15 (54)
≥ 30	6 (50)	6 (50)
Unknown ^e	10 (63)	6 (37)
Gender		
Male	20 (41)	29 (59)
Female	38 (44)	49 (66)
Unknown ^e	10 (59)	7 (41)
Race		
Asian	27 (47)	30 (53)
Black	9 (75)	3 (25)
Caucasian	16 (30)	38 (70)
Other	5 (42)	7 (58)
Unknown ^e	11 (61)	7 (39)
Previous academic degree		
Associate	3 (38)	8 (62)
Bachelor's	38 (39)	59 (61)
Master's	4 (50)	4 (50)
Doctorate	4 (100)	0
Other	6 (75)	2 (25)
Unknown ^e	18 (72)	7 (28)
Postgraduation plans		
Community/independent	7 (29)	17 (71)
Hospital/Health System	21 (58)	15 (42)
Residency/Additional	20 (54)	17 (46)
Academic degree		
Pharmaceutical Industry	5 (50)	5 (50)
Undecided	7 (23)	23 (77)
Unknown ^e	9 (56)	7 (44)

^a High readiness for self-directed learning = SDLRS score > 150

^b *n* = 68

^c Low readiness for self-directed learning = SDLRS score ≤ 150

^d *n* = 85

^e Unknown = students who did not submit a response for this item

assignments (*p* = 0.001), meet in study groups more often (*p* = 0.0496), spend more time each week preparing for quizzes (*p* = 0.017), and use general Internet searches (*p* = 0.04) compared with students in the low self-directed learning group. No other study habit reached significance (*p* > 0.05 for all comparisons).

DISCUSSION

This study did not demonstrate an association between readiness for self-directed learning and academic performance on quizzes designed to measure fundamental

Table 2. Resources Used by Students to Prepare for the Laboratory Course (in last 30 days)

	High Readiness for Self-directed Learning ^a (n = 68), No. (%)	Low Readiness for Self-directed Learning ^a (n=85), No. (%)	<i>p</i>
Number of times individuals sought outside tutoring			
0	40 (40)	60 (60)	NS
1-2	23 (55)	19 (45)	
3-4	1 (20)	4 (80)	
Unknown ^b	4 (75)	2 (25)	
Preferred method of studying ^d			
Alone	55 (45)	67 (55)	NS
With a study partner	22 (49)	23 (51)	
In small groups (< 6 students)	22 (67)	11 (23)	
In larger groups (> 6 students)	0	0	
Times per week met in study group (if used) ^d			
0	18 (42)	25 (52)	0.0496
1	17 (36)	30 (64)	
≥ 2	4 (100)	0	
How often complete pre-laboratory assignments prior to laboratory session			
Never/rarely	0	12 (100)	0.001
Sometimes	9 (45)	11 (55)	
Frequently	25 (41)	36 (59)	
Always	32 (58)	23 (42)	
Unknown ^b	2 (40)	3 (60)	
Utilization of recommended textbooks ^c			NS
Pharmaceutical calculations	62 (44)	78 (56)	
Medical terminology	62 (45)	77 (55)	
Sigler's Drug Cards	21 (41)	30 (59)	
Drug Information Handbook	32 (46)	37 (54)	
Hours per week spent preparing for quizzes			0.017
0-1	6 (29)	15 (71)	
2-5	48 (44)	62 (56)	
6-9	12 (75)	4 (25)	
≥ 10	0	0	
Unknown ^b	2 (33)	4 (67)	
Completion of pharmaceutical calculation review problems			NS
Never	4 (44)	5 (56)	
Rarely	8 (32)	17 (68)	
Sometimes	15 (37)	26 (63)	
Frequently	18 (51)	17 (49)	
Always	20 (53)	18 (47)	
Unknown ^b	3 (60)	2 (40)	
Use of additional drug information resources (times per week) ^d			NS
0	16 (43)	21 (57)	
1	25 (39)	39 (61)	
2	11 (46)	13 (54)	
≥ 3	8 (50)	8 (50)	
Use of general Internet searches to prepare for laboratory session (times per week) ^d			0.0401
0	20 (52)	28 (58)	
1	18 (33)	36 (67)	
2	7 (41)	10 (59)	
≥ 3	13 (72)	5 (28)	

Abbreviations: CD = compact disc; NS = not significant ($p > 0.05$).

^a High readiness for self-directed learning = SDLRS score > 150; low readiness for self-directed learning = SDLRS score ≤ 150.

^b Unknown = students who did not submit a response for this item.

^c More than 1 response was acceptable; thus, $n > 153$.

^d Blank response was acceptable, thus, $n < 153$.

pharmacy knowledge, final examination scores, or final course grade. Previous research in this area is conflicting. Other studies have shown positive correlations between higher SDLRS scores and academic performance in engineering, business, distance learning, and nursing education, although the readiness scales that were used differed.⁷ Similar to our findings, a study of third-year medical students failed to show a positive correlation between the SDLRS score and examination scores using the Guglielmino SDLRS.¹⁵

Several factors may have affected the association between readiness for self-directed learning and academic performance in our study. Students performed well in the course overall, which suggests that students are capable of learning foundational knowledge regardless of their readiness for self-directed learning. In addition, the point distribution concentrated heavily on non-self-directed learning activities, professionalism, and participation. These components were heavily weighted because skill demonstration was a primary course objective. However, the course provided an opportunity to assess the association between self-directed learning and academic performance because self-directed learning was incorporated throughout the course. Students performed well and grades were similar between groups, thus a ceiling effect for performance in the course may have occurred. For this reason, we could not detect an appreciative difference in academic performance among students who scored high and low using Fisher's SDLRS. We attempted to account for factors that tend to bolster overall grades by evaluating mean quiz scores, which relied solely on the student's self-directed learning habits. Further, quizzes and final examinations consisted primarily of multiple-choice, matching, fill-in-the-blank, and pharmaceutical calculations problems, which limited conclusions drawn from recall and application-type assessments to evaluate higher-level problem-solving skills. Although students were expected to learn material independent of lecture-based instruction, they were given direction on what to cover when studying. Therefore, readiness for self-directed learning and learning habits may not be important predictors of academic success when students are given exact expectations and told the knowledge and skills to be learned.

Another factor accounting for the failure to find an association between readiness for self-directed learning and academic performance could be that the Fisher SDLRS may not be the best instrument to use to predict this association. The factor structure of the subscales were recently reexamined by Fisher in response to the work of Hendry and Ginns in identifying a 4-factor model using Fisher's scale with medical students instead of the 3-factor model.^{12,13} The confirmatory factor analysis also revealed

11 redundant items from the original 2001 scale; however, Fisher maintains a recommendation for the 40-item scale until further research examines the scales factor structure.¹³ Whether these potential limitations would influence the scale's ability to show an association between a high readiness for self-directed learning and academic performance is unclear. Most of the research that has tested the association between self-directed learning and academic performance has used Guglielmino's SDLRS.^{7,15} Further research is needed to determine the best SDLRS to use for this academic research.

The findings of specific learning behaviors in students with a high readiness for self-directed learning validate the construct of the Fisher scale. Readiness for self-directed learning in our population was higher in those with a previous degree, which is consistent with other studies that found a difference in SDLRS scores based on premedical school education. This research found that those with master's and doctorate degrees had higher SDLRS scores.¹⁷ Even though only a small percentage of students failed to answer the survey instruments completely, this may have impacted our results. Further, when associate's/bachelor's and master's/doctorate degree groups were combined to increase group size, statistical significance was lost, highlighting this potential limitation. The SDLRS score also varied by postgraduation plans. When groups were combined to compare those planning to enter a job in community practice with those planning to enter noncommunity practice (hospital/health system, industry, residency/additional academic degree), readiness was significantly different. Moreover, a significantly greater number of respondents with low readiness scores reported they were undecided about their career plans.

Results from SDLRS also varied by resources used to prepare for the laboratory, including completion of prelaboratory assignments prior to laboratory sessions, meeting more frequently with study groups, spending more hours per week preparing for quizzes, and using general Internet searches more often. These findings were expected because students who are more self-directed learners may be more likely to complete assignments and spend a greater amount of time studying. However, quiz scores, examination scores, and final grades were similar between groups. Our findings for demographic data and resources used to prepare for the laboratory should be interpreted with caution due to a small number of students responding in some categories, leading to statistical instability and a lack of supplemental survey validation.

Interestingly, the mean SDLRS score was 148.6 ± 13.8 (< 150), and 55% of respondents had a SDLRS score < 150 , indicating a low readiness for self-directed learning. When the same survey instrument was administered

at our institution to P4 PharmD candidates, only 26% of respondents had scores < 150.¹³ Reasons for the difference may include differences in populations, prepharmacy experiences, unfamiliarity with the professional program for P1 students, or that P4 APPEs require a significant amount of self-directed learning. Previous research of medical students using an alternative SDLRS failed to show a difference in SDLRS scores between first-through fourth-year students.¹⁷ Further research in our population is warranted to evaluate changes in SDLRS score as this cohort moves through the curriculum.

The Guidelines and Standards set forth by ACPE in 2007 expresses the importance of schools integrating teaching and learning methods and outcome statements that help students transition from dependent to active, self-directed lifelong learners.⁴ The amount of medical information is increasing exponentially, and numerous new drug entities are approved each year. With more information available, self-directed learning skills are essential to the growth and success of the pharmacy profession. As the amount of information grows, covering all material using a pedagogical approach almost becomes impossible. Students are expected to explore material outside the formal classroom setting, and the educator assumes the role as facilitator. As curricula change, concerns may arise that students will be unable to master material with less guidance. These data are helpful to faculty members when designing similar courses for students at this level of education, and for facilitators of other self-directed adult learning activities.

CONCLUSION

The Fisher SDLRS is valid for predicting an association between readiness for self-directed learning and self-directed learning habits, but the tool may not be useful for predicting the association between readiness and academic performance. Whether the lack of association is due to our course methodology, the tool itself, or both is unknown. The study demonstrates that pharmacy students are capable of self-learning foundational knowledge regardless of their level of readiness for self-directed learning when given specific instructions on what material to learn. Whether high readiness for self-directed learning is necessary for more complex learning or for self-identification of learning needs is unknown; however, self-directed learning

activities likely can be integrated into courses, curriculum, and self-directed adult education activities without all learners having a high readiness for self-directed learning.

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