

RESEARCH ARTICLE

# Self-Directed Learning (SDL) vs. Lecture: Effectiveness of SDL strategy in dentistry

Criszel F. Buenaventura

College of Dentistry, University of the Philippines Manila, Manila, Philippines

## ABSTRACT

**Objective:** The objective of the study was to determine the effectiveness of self-directed learning (SDL) strategy in dentistry by comparing it with lecture. Specifically, the objectives were to describe the students' perception of their learning experience after each TL strategy, compare the students' cognitive performance, determine whether certain student characteristics influence these two variables, and identify whether these two variables are correlated.

**Methods:** Total enumeration was done in the selection of student-respondents. Using a two-treatment counterbalanced experimental research design, two kinds of data were collected after completion of each TL strategy – post-test scores that indicate the students' cognitive performance (lowest score is zero; highest score is 20) and Assessment of University Teaching Activities Questionnaire (A.U.T.A.Q.) results, indicating students' perceptions on their learning experience (5-point scale from strongly disagree to strongly agree).

**Results:** Results showed that there is a statistically significant difference between the total mean of A.U.T.A.Q. after SDL ( $M=3.94$ ,  $SD=.480$ ) and lecture ( $M=3.74$ ,  $SD=.658$ );  $p=.024$ . Statistically significant difference ( $p<.05$ ) can also be observed in three learning dimensions – clarification, instructor scaffolding, and evaluation. No statistically significant difference in the means of A.U.T.A.Q. after SDL [ $F(3, 61) = .340$ ,  $p = .796$ ] and lecture [ $F(3, 61) = 1.152$ ,  $p = .335$ ] was noted in all four year levels of dentistry proper. In terms of cognitive performance, there is no statistically significant difference between the scores after SDL and lecture in all year levels ( $p>.05$ ). Nationality and sex did not significantly affect the students' perceptions and cognitive performance except in the third year level. Finally, there is no correlation between these two factors.

**Conclusion:** It can be concluded that SDL is as equally effective as lectures, but it must be used cautiously at lower year levels where lecture is still more beneficial. Lower year levels exhibited higher cognitive performance after lecture while the higher year levels displayed higher cognitive performance after SDL.

## Introduction

The health sciences curricula have truly evolved through time. From Flexner's science-based curriculum in 1910, health sciences programs are pursuing outcome-based education (OBE), with problem-based learning (PBL) and competency-based curricula in between. This evolution is brought about by the need to improve the quality of health care and is accompanied by several innovations of teaching-learning (TL) strategies to improve the learning experience of the students [1].

In Flexner's science-based curriculum, the primary pedagogical approach is didactic lecture. In PBL, learning is facilitated in small groups led by the students. In competency-based and outcome-based curricula, various TL strategies are being used to achieve the competencies and learning outcomes, including large and small group strategies, as well as individualized learning strategies [1].

The roots of an individualized learning strategy may be traced back to the Greek philosophers like Socrates, Plato, and Aristotle [2]. Gibbons defined individualized instruction as a general term in education that describes different programs and TL strategies, which are based on various interpretations of individualization [3]. One of the strategies that is widely known as a form of individualized instruction is self-directed learning (SDL).

The first effort in formal study to understand self-directed learners was made by Alan Tough in 1971 who utilized the research of Houle (1961) on motivations of learners [2,4]. His study showed that an individual plans and prepares 70% of the overall learning process, which is one of the major characteristics of SDL [4]. Another popular researcher in the field of SDL is Knowles who used the term *andragogy* to refer to the "art and science of helping adults learn" [4,5]. Knowles identified several characteristics of andragogy, including the concepts that the "learner is self-directed" and the learners have an active participation in each stage of the learning process [4].

Hiemstra also offered the following descriptions of SDL: (1) With SDL, students can be motivated to accept more responsibility for different decisions in their learning process; (2) SDL does not necessarily involve learning in separation from others; (3) Learners who undergo SDL seem to be able to impart learning, both knowledge and skills, from one setting to

another; (4) SDL may include different activities and resources; and (5) Teachers may assume different roles in SDL [2].

Since the 1970s, individualized learning strategy has been quite popular in health professions education, especially in medical and nursing education [6,7]. The primary advantage of SDL is that it deals with individual learning differences. This is because SDL is designed in a manner that considers variation in the learning styles of every individual, especially in terms of students being allowed to learn at their own rate [16].

In a study by Al-Nasserli involving nursing students, he stated that students who underwent SDL displayed better academic performance than those taught using the traditional method. He enumerated other benefits of SDL, including: (1) more profound and better learning that is retained longer; (2) prepares lifetime learners who can work effectively and independently in a transforming and demanding health care milieu; (3) helps develop critical thinking in the students; (4) enrichment of many skills of the students, including decision making and critical judgment that enables the transmission of skills from one setting to another; and (5) fostering of motivation to learn because the students are given the opportunity to seek and evaluate information on their own, enhancing their sense of completion and contentment [6].

Pai *et al.* stated that SDL is widely used in medical education because several studies have shown that it is effective in learning different medical subjects like anatomy and physiology. After the experiment that they conducted to determine the effectiveness of SDL in teaching physiology to medical students by comparing it to didactic lectures, they concluded that in

### Corresponding author's email address:

cfbuenaventura@up.edu.ph

**Keywords:** Dental Education, Teaching Method, Pedagogy, Self-Directed Learning, Dentistry, Individualized Learning

Date submitted: August 26, 2024

Date accepted: February 18, 2025

Presented in International Summer Program in Tokyo Medical and Dental University held last August 2, 2023 and in South East Asia Association for Dental Education held last November 26, 2024.



terms of knowledge acquisition, SDL is just as effective as lectures and may therefore be considered as an alternative TL strategy. They, however, claimed that the effectiveness of SDL may be limited to certain topics [7].

In dentistry, the traditional method remains the most frequently utilized TL strategy. SLD and other strategies are used on a very limited basis. Dentistry is a complex and highly dynamic profession that requires intensive training in all the three learning domains – cognitive, psychomotor, and affective. It is difficult, if not impossible, to totally separate the development of these three, because knowledge is considered paramount to learning the skills and behavior necessary in delivering quality oral health care.

Dentistry students used to take a passive role in the learning process because the primary teaching approach was through didactic lectures. In consideration of the advantages of SDL, an individualized type of learning strategy is believed to be beneficial for all students in dentistry proper, who are considered adult learners and can therefore assume a great deal of responsibility in their own learning process. Furthermore, it is important to explore various TL strategies that will help enrich the learning experience of the dentistry students to meet the intensive training demands in both cognitive and psychomotor domains and to improve the knowledge gained.

SDL has been present since the 1960s, but there is insufficient evidence that proves its effectiveness as a TL strategy in dentistry, particularly in the Philippines. Most research in dental education attempted to study motivation, perceptions of learning environment, and other factors that affect learning – concepts that may be related to SDL. However, studies that evaluated the use of SDL in learning remain limited. Since no research is available yet, the effectiveness of SDL must be established so that it can be utilized with confidence to enhance and maximize the learning experience of dentistry students in the Philippines.

To establish the effectiveness of any TL strategy, it must be evaluated. According to Lechner, the evaluation of a TL strategy is challenging but vital since educational strategies have been greatly revolutionized. He stated that examination and student perception regarding their experience are approaches in measuring the outcomes of a TL strategy [8].

In this study, the effectiveness of SDL as a TL strategy is evaluated by comparing it to lecture, which is believed to be the standard TL strategy considering its use since Flexner's time. This study further aimed to describe how dentistry students perceive their learning experience when exposed to these two strategies, compare their cognitive performance, determine whether student characteristics such as year level, nationality, and sex influence their perception and cognitive performance, and correlate their perception to cognitive performance.

## Methodology

This study was reviewed and approved by the University of the Philippines Manila Research Ethics Board (UPMREB) with the study protocol code UPMREB 2017-347-01. Informed consent was also obtained from all participants at the start of the study.

An experimental research design (two-treatment counterbalanced design) was conducted, in which two groups of students (Group A and B) were exposed to both SDL and lecture but in different order. This is the most appropriate design for this study because this exhibits strong control over different threats to internal validity, especially the subject characteristics. Another reason was to make sure that all students would experience the two TL strategies, eliminating any possible ethical issue especially that the students are currently enrolled and considered vulnerable subjects.

Total enumeration was done in the selection of the participants in a private dental school in Manila. There were 120 enrolled students in dentistry proper, divided into four-year levels. Students: (1) who are below 18 years old; (2) who took the subject in the past but needed to re-enrol because of a failing mark or were dropped/unofficially withdrawn from the class; and (3) whose first course is not dentistry (i.e., who shifted from another course or finished a different course before taking up dentistry) were excluded from the study. The participants were randomly assigned to either Group A or B.

In the selection of courses, only those without pre-requisites were included in the process since prior knowledge may be considered a confounding variable. The researcher randomly selected one subject per class for every year level of dentistry proper. Faculty members who were in charge of the selected courses were asked to be implementers of this study because they have ample knowledge and experience in teaching the selected subjects using lecture. SDL was discussed in detail during the orientation to ensure that there was no difference in how content was delivered.

The four faculty members were also asked to choose two related topics that were consecutively delivered according to the syllabi. Ideally, only one topic per subject was recommended to ensure that the differences observed in the experiment were due to the TL strategies that were used. However, due to the nature of the research design and to ensure that the topics would be more or less similar or equivalent, related topics that were purely cognitive in nature (no laboratory, simulation or demonstration exercise involved) and could be covered in a week with use of either strategy were suggested. The selected subjects, their description, and the topics selected per subject are presented in Table 1.

The instructional design (ID) for each topic was created by the researcher. Each ID describes the objectives and contents of the topic, the TL strategy that would be used (either SDL or lecture), time allotment (which depended on the TL strategy), recommended resources, and assessment method.

The implementation lasted for four weeks, in which the students in Group A were first exposed to SDL before being taught using lecture. During the first two weeks, they underwent the four phases of SDL to learn about the first topic. The four phases were: (1) planning phase, in which the teachers guided the students in setting their goals, provided references and other learning materials, and motivated them in accomplishing independent learning; (2) learning phase when actual learning of the subject matter occurred, which was dependent on the pacing of the students, their learning styles, and techniques; (3) assessment phase, which involved both internal (self-assessment) and external monitoring (formative feedback from the instructors); and (4) adjustment phase, which involved the students' reflection on their learning experience and feedback received.

**Table 1.** Description of selected courses and topics for SDL and lecture

Year Level	Course	Course Description	Topics
1	General Anatomy	Deals with the structures of the various body organs that make up the systems of the human body	Respiratory System Lymphatic System
2	Restorative Dentistry I	Deals with the basic principles of cavity preparation and manipulation of different restorative materials required for the restoration of teeth	Infection Control Control of the Operative Field
3	Periodontology	Deals with the understanding of the periodontal apparatus together with the different diseases that may affect the periodontium	Periodontal Risk Assessment Predisposing Factors
4	Hospital Dentistry I	Deals with the concepts and principles that are necessary in a hospital-based practice	Commonly Used Laboratory Procedures Management of Medically Compromised Patients

Lecture on the second topic was performed during the third and fourth week. The content was delivered in less than an hour by the faculty in charge using MS PowerPoint presentation. They were given half an hour to review and allow processing of information before data collection. Meanwhile, Group B was taught the first topic using lecture during the second week of implementation, and the students underwent the four phases of SDL for the second topic during the last two weeks.

Over the course of implementation, data collection was done twice. After each TL strategy, data was collected using post-test and a questionnaire during second and fourth weeks. A post-test-only design was employed because of two reasons – first, the groups were considered equivalent because random assignment of students to Group A and B was carried out, hence the use of pre-test to check whether the two groups were similar was unnecessary; and second, to eliminate testing as a threat to internal validity. A pre-test may pre-empt the kind of post-test that will be given to the students and it may significantly affect the results.

The post-tests, composed of 20 points each, were created and scored by the faculty in charge for each year level. The researcher provided the recommended blueprints for the post-tests, which was prepared based on the guidelines recommended by Patil, Hashilkar & Hungund, using the revised Bloom's taxonomy [9,10]. This was done to eliminate threats to validity like construct under-representation and construct irrelevant variance, to make sure that the assessment is unambiguous, precise, and transparent to both the instructor and the students, and to check if the learning objectives, the content of the course, and the method of assessment were matched [9]. The post-tests were in essay format and the questions targeted the apply, analyze, and evaluate levels of the cognitive domain. Both groups were given the same post-tests. Rating of the students in these tests was done by the faculty in charge, however, no formal rubrics in scoring the post-tests were utilized.

After the post-test, the students from both groups were handed out the Assessment for University Teaching Activities Questionnaire (A.U.T.A.Q.). This is a validated questionnaire (Cronbach's reliability,  $\alpha = .8635$ ) that was developed by Villar and Alegre in 2007. The instrument is composed of 25 items under ten learning dimensions that the students need to assess – clarification, student autonomy, instructor scaffolding, student prior knowledge, connections, interrogation or discussion, explorations based on new technology, collaboration and negotiation, motivation, and evaluation (Table 2) [11].

Response options refer to the 5-point scale where 1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, and 5: Strongly Agree. The interpretation of the instrument is: a score of 4 or better denotes a positive perception; a score of 2 or below suggests a negative perception; and a score of 3 implies a neutral perception (neither positive nor negative). Positive perception indicates that the learning experience is perceived by the students as favorable, helpful, and suitable for their learning while negative perception indicates otherwise. The instrument was administered twice by the faculty members among the student respondents – one after each TL strategy [11].

**Table 2.** Dimensions in A.U.T.A.Q

Learning Dimension	Description
Clarification	Extent to which the instructor explains and simplifies the difficult and challenging aspects of learning
Student autonomy	Extent to which the learning that takes place is student-centered
Instructor scaffolding	Extent to which the instructors assist the students in achieving their learning goals without directly giving away the answers
Student prior knowledge	Extent to which the learning activities result in new knowledge that they can relate to knowledge that was previously learnt
Connections	Extent to which the students are able to generate meaningful relationships between information, topics, and subjects
Interrogation/Discussion	Extent to which asking of relevant questions and discussion of different solution to a problem are encouraged
Explorations based on new technology	Extent to which technological advancements are utilized to facilitate the learning of students
Collaboration and negotiation	Extent to which social interaction or teamwork between students is given emphasis in the learning process
Motivation	Extent to which the students themselves are willing to become involved in the learning process
Evaluation	Students' assessment of the TL strategy in terms of increasing the teacher's interest in teaching and the quality of teaching

No makeup sessions were given to participants who missed a session of either SDL or lecture. Failure to attend both TL strategies, to take any of the post-tests, or to accomplish the questionnaires automatically terminated their participation in the study.

The data collected were processed and analyzed using descriptive and inferential statistics. Descriptive statistics were used to summarize the data obtained from post-tests and questionnaires. A measure of central tendency was computed, and since the data from post-tests and questionnaires were not influenced by extreme scores, the mean is preferred because it utilizes all the available information in a distribution. The measure that was used to describe the spread or variability that is present within a distribution is the standard deviation (SD), giving a more complete and accurate description of the collected data.

The data were further analyzed using inferential statistics to check two things – first is the significance of the difference between the means and second is to criticize the generalizability of results coming from random samples. Using the mean scores in post-tests and questionnaires, t-test for independent means was used to determine the effectiveness of SDL against lecture and to ascertain whether nationality and sex influence perception and cognitive performance. ANOVA was used to compare the scores per year level and Pearson product-moment correlation coefficient was performed to correlate perception and cognitive performance. All data gathered in this study were analyzed using SPSS for Windows version 14.0. An alpha level of .05 was used for all statistical tests.

## Results and Discussion

### Perceptions on the learning experiences of students:

The results in table 3 show a statistically significant difference between the total mean of A.U.T.A.Q. after SDL ( $M=3.94$ ,  $SD=.480$ ) and lecture ( $M=3.74$ ,  $SD=.658$ );  $p = .024$ . This suggests that the students have a more positive perception of their learning experience in SDL than in lecture. Further looking into the mean scores of each dimension of A.U.T.A.Q., only the mean differences in three dimensions were statistically significant – clarification, instructor scaffolding, and evaluation.

Clarification is supposedly more evident in lecture than in SDL because of the instructor's substantial role in lecture. However, the students perceived otherwise, which was probably because of the inherent disadvantages of lecture, especially those that were mentioned by Meyers and Jones regarding the students' lack of attention and interest in lectures [12]. In instructor scaffolding, the instructors failed to perform this because they just gave all the information that the students needed in a form of a "one way channel of communication" and they also failed to provide feedback, which is really difficult in this TL strategy [13,14]. In evaluation, the mean score of the students' perceptions in this dimension was significantly higher in SDL than in lecture which indicates that the students perceive SDL as a better TL



**Table 3.** Comparison of A.U.T.A.Q. results after SDL and lecture

Dimension	N	SDL		Lecture		Sig.
		Mean	SD	Mean	SD	
Clarification	65	4.11	.758	3.72	1.093	.013*
Student autonomy	65	3.87	.625	3.75	.757	.312
Instructor scaffolding	65	3.80	.574	3.54	.709	.022*
Student prior knowledge	65	4.07	.554	3.96	.741	.363
Connections	65	4.11	.628	3.88	.776	.061
Interrogation/Discussion	65	3.73	.724	3.54	.831	.105
Explorations based on new technology	65	4.01	.778	3.92	.863	.559
Collaborations and negotiation	65	3.65	.819	3.54	.849	.352
Motivation	65	3.92	.674	3.76	.961	.243
Evaluation	65	4.16	.697	3.73	.989	.001*
Total	65	3.94	.480	3.74	.658	.024*

\*statistically significant at  $p=0.05$ **Table 4.** One-way ANOVA results showing the variation between the means of A.U.T.A.Q. after SDL and lecture by year level

		Df	F	Sig.
AUTAQ after SDL	Between groups	3	.340	.796
	Within groups	61		
	Total	64		
AUTAQ after lecture	Between groups	3	1.152	.335
	Within groups	61		
	Total	64		

**Table 5.** Comparison of A.U.T.A.Q. results after SDL and lecture by nationality and sex

	Demographic factor		N	Mean	SD	t	Sig.
SDL	Nationality	Filipino	56	3.95	.498	.456	.656
		Foreigner	9	3.89	.37		
	Sex	Male	17	4.05	.61	.903	.377
		Female	48	3.91	.43		
Lecture	Nationality	Filipino	56	3.71	.699	-1.644	.109
		Foreigner	9	3.91	.24		
	Sex	Male	17	3.91	.63	1.315	.199
		Female	48	3.67	.66		

**Table 6.** Comparison of post-test scores of Group A and B per topic after SDL and lecture

Year level	Group	N	Topic 1	SD	t	Sig.	Group	Topic 2	SD	t	Sig.
1	SDL(A)	10	2.80	2.7	1.37	.194	LEC(A)	11.60	6.69	.317	.755
	LEC(B)	7	1.00	2.65			SDL(B)	10.71	4.82		
2	SDL(A)	5	16.00	2.24	1.75	.112	LEC(A)	15.20	.45	-1.83	.095
	LEC(B)	9	13.67	2.65			SDL(B)	16.11	1.36		
3	SDL(A)	9	10.11	7.66	.819	.425	LEC(A)	3.00	4.18	-1.7	.107
	LEC(B)	11	7.55	6.02			SDL(B)	6.45	4.93		
4	SDL(A)	9	11.11	4.29	.722	.483	LEC(A)	7.89	3.44	-.256	.802
	LEC(B)	8	9.25	6.07			SDL(B)	8.25	2.32		

strategy in terms of developing the teachers' interest in teaching and improving the overall quality of learning.

Even though the differences in all other dimensions were not statistically significant, the means in SDL were higher than in lecture, which was expected from SDL due to it being student-centered and giving responsibility to the students regarding their learning activity [2,15,16]. It was also difficult to develop higher order thinking skills (HOTS) during lectures unlike in SDL wherein the students can easily develop critical thinking skills and other HOTS [6]. Furthermore, the students did not actively participate in their learning process during lectures, thus there was no adequate opportunity for them to establish associations between ideas and concepts and to engage in meaningful interrogations, discussions, collaborations, and negotiation. SDL also allowed and encouraged the students to have first-hand experience in utilizing technology for their learning process unlike in lectures where they just had to depend on whichever technology the teachers used. Lastly, motivation is one of the many benefits of SDL, thus higher mean score is expected in SDL than in lecture [6].

In determining if the students' perception of their learning experience vary according to year level, nationality, and sex, the results of ANOVA and t-test are presented in tables 4 and 5, respectively. The results show that there is no statistically significant difference in the means of A.U.T.A.Q. after SDL [ $F(3, 61) = .340, p = .796$ ] and lecture [ $F(3, 61) = 1.152, p = .335$ ] in all four year levels of dentistry proper. There is also no statistically significant difference between the perceptions of the Filipino and foreign students, and between male and female students.

#### Cognitive performance of students:

The results in Table 6 show that there is no statistically significant difference between the scores after SDL and lecture in all topics in all year levels ( $p > .05$ ), suggesting that in terms of cognitive performance, both SDL and lecture are equally effective. This is consistent with the findings of Al-Nasseri. Most of the studies included in his systematic review of literature showed that in terms of knowledge acquisition, there was no significant difference between the students who learned through SDL and the students who were exposed to lecture [6].

**Table 7.** Comparison of post-test scores after SDL and lecture by nationality and sex per year level

FIRST YEAR							
	Demographic factor		N	Mean	SD	t	Sig.
SDL	Nationality	Filipino	14	6.29	5.09	.273	.807
		Foreigner	3	5.00	7.81		
	Sex	Male	4	8.50	6.35	.919	.407
		Female	13	5.31	5.09		
Lecture	Nationality	Filipino	14	6.36	6.99	-.801	.494
		Foreigner	3	11.33	10.26		
	Sex	Male	4	5.50	6.46	-.580	.583
		Female	13	7.77	7.99		
SECOND YEAR							
	Demographic factor		N	Mean	SD	t	Sig.
SDL	Nationality	Filipino	12	15.75	1.55	-5.046	0
		Foreigner	2	18	0		
	Sex	Male	6	15.50	1.23	-1.214	.248
		Female	8	16.50	1.85		
Lecture	Nationality	Filipino	12	14.08	2.02	-.3	.812
		Foreigner	2	15	4.24		
	Sex	Male	6	14.17	1.72	-.071	.945
		Female	8	14.25	2.66		
THIRD YEAR							
	Demographic factor		N	Mean	SD	t	Sig.
SDL	Nationality	Filipino	19	8	6.56	-	-
		Foreigner	1	10	-		
	Sex	Male	6	7.17	4.75	-.491	.631
		Female	14	8.50	7.11		
Lecture	Nationality	Filipino	19	4.95	5.21	-	-
		Foreigner	1	16	-		
	Sex	Male	6	1.17	2.40	-3.44	.003*
		Female	14	7.36	5.65		
FOURTH YEAR							
	Demographic factor		N	Mean	SD	t	Sig.
SDL	Nationality	Filipino	12	10.92	3.26	2.16	.067
		Foreigner	5	7	3.46		
	Sex	Male	1	13	-	-	-
		Female	16	9.56	3.72		
Lecture	Nationality	Filipino	12	8.17	5.29	-.57	.58
		Foreigner	5	9.4	3.44		
	Sex	Male	1	10	-	-	-
		Female	16	8.44	4.89		

Despite having no significant difference between SDL and lecture in terms of post-test results, the students achieved higher post-test scores after SDL than after lecture except in the second topic of the first year level, in which the post-test score after SDL was lower than after lecture. These results suggest that lecture was still probably more effective than SDL in first year students. This is consistent with the study of Pai et al. in which they determined that the use of SDL may be beneficial for higher year levels but may be limited for first year students especially when the topic requires integration of basic knowledge with clinical applications [7]. The post-tests focused on HOTS and involved mostly application and analysis of the topics. To be able to understand the topics better and obtain a good score in the post-tests, the topics require an instructor who can thoroughly explain the concepts and discuss clinical integration and correlation.

Table 7 shows the means and standard deviation of post-test scores after SDL and lecture by nationality and sex, indicating that there is no statistically

significant difference between the cognitive performance of Filipinos and foreigners, and between males and females ( $p > .05$ ), except in third year. The females ( $M=7.36$ ,  $SD=5.65$ ) exhibit significantly higher scores after lecture than males ( $M=1.17$ ,  $SD=2.40$ );  $p = .003$ .

### Correlation of perception and cognitive performance

The correlation coefficients between the means of perceptions and post-test scores after SDL and lecture in each year level are presented in Table 8. It can be noted that there is no correlation between the students' perceptions and their cognitive performance.

## Conclusion

It can be concluded that in terms of the students' perceptions of their learning experience, SDL is considered to be a more superior TL strategy than lecture.

**Table 8.** Pearson correlation coefficients between students' perceptions and post-test scores after SDL and lecture

Year Level	N	r (SDL)	Sig. (2-tailed)	r (lecture)	Sig. (2-tailed)
First	17	-.368	.146	.169	.516
Second	14	-.473	.088	-.087	.766
Third	19	.349	.143	-.093	.705
Fourth	15	-.060	.831	-.546	.065

However, in terms of cognitive performance, SDL is deemed as equally effective as lectures, except in the lower year levels in which lectures may still be considered more beneficial. It can be further concluded that the students' perceptions of their learning experience and cognitive performance do not significantly vary according to year level and nationality. Meanwhile, cognitive performance may significantly vary according to sex with females performing better than males in some year levels.

## References

1. Frenk J, Chen L, Bhutta Z. (2010) Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. *Lancet*. 376(9756):1923-1958. Doi: 10.1016/S0140-6736(10)61854-5
2. Hiemstra R. (1994) Self-Directed Learning. In: Husen T, Postlethwaite TN, eds. *The International Encyclopedia of Education*. 2nd ed. Oxford: Pergamon Press. <http://ccnmtl.columbia.edu/projects/pl3p/Self-Directed%20Learning.pdf>
3. Gibbons M. (1970) What is individualized instruction? *Interchange*. 1:28-52. Doi: 10.1007/BF02214857
4. Roberson D. (2005) Self-Directed Learning - Past and Present. *Education Resources Information Center*. <http://files.eric.ed.gov/fulltext/ED490435.pdf>
5. Knowles M. (1973) *The Adult Learner: A Neglected Species*. Education Resources Information Center. Available from: <http://files.eric.ed.gov/fulltext/ED084368.pdf>
6. Al-Nasser Y. (2014) The Effectiveness of Self-Directed Learning on the Professional Development of Pre-Registration Nursing Students: A Systematic Review of the Literature. *Kufa J Nurs Sci*. 4(1):16-29. Doi: 10.36321/2014kjns.v4i12460
7. Pai K, Rao K, Punja D, Kamath A. (2014) The effectiveness of self-directed learning (SDL) for teaching physiology to first-year medical students. *Australas Med J*. 7(11):448-453. Doi: 10.4066/AMJ.2014.2211
8. Lechner S. (2001) Evaluation of Teaching and Learning Strategies. *Med Educ Online*. 6(1). Doi: 10.3402/meo.v6i.4529
9. Patil S, Hashikar N, Hungund B. (2014) Blueprinting in Assessment: How much is imprinted in our practice? *J Educ Res*. 2(1):4-6. <http://jermt.org/wp-content/uploads/2014/06/2.pdf>
10. Anderson LW, Krathwohl DR. (2001) *A taxonomy for learning, teaching, and assessing*. Abridged Ed. Allyn and Bacon.
11. Villar L, Alegre O. (2007) Student Perceptions of Classroom Environment and Instructors' Reflections. *Education Resources Information Center*. <http://files.eric.ed.gov/fulltext/ED495249.pdf>
12. Meyers C, Jones T. (1993) *Promoting Active Learning: Strategies for the College Classroom*. Jossey-Bass.
13. Lecture method of teaching, definition, advantages and disadvantages. (2012) *Study Lecture Notes*. Available from: <http://www.studylecturenotes.com/social-sciences/education/382-lecture-method-of-teaching-definition-advantages-a-disadvantages->
14. The Lecture Method. (2014) The University of Queensland Australia. <http://www.uq.edu.au/teach/teachingpracticeinventory/documents/Lecture-Method-CIDDE.pdf>
15. Baker GL, Goldberg I. (1970) *The Individualized Learning System*. Association for Supervision and Curriculum Development. [http://www.ascd.org/ASCD/pdf/journals/ed\\_lead/el\\_197005\\_baker.pdf](http://www.ascd.org/ASCD/pdf/journals/ed_lead/el_197005_baker.pdf)
16. Piskurich GM. (1993) *Self-Directed Learning: A Practical Guide to Design, Development, and Implementation*. Jossey-Bass.