

# Exploring the LS of Masters in Medical Education (MME) Students in KSAU-HS, Riyadh, Saudi Arabia

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**Abstract :** *The Learning Style (LS) concept has gained considerable popularity and interest among professional educators at all levels of the educational system in recent decades. Optimized educational experiences are very important for learning but are also subject to the stress of limited resources in time and personnel. The present study was designed to assess LS in Batches 5 and 6 Masters in Medical Education (MME) students and also to ascertain the changes in LS of MME Batch 5 students over a period of one year.*

*The study was conducted at King Saud bin Abdulaziz University for Health Sciences (KSAU-HS). The subjects consisted of 44 MME students in these Batches studying at KSAU-HS. They are a mix of males and females, with a wide range of ages, from 26 to 58 years, and belonging to different health professions, e.g., internists, surgeons, dentists, nurses, and allied health professionals.*

*The data was collected using Kolb's LS Inventory (Questionnaire). It uses four LS: Accommodator, Assimilator, Converger, and Diverger. Descriptive analysis for this history is presented as frequencies and percentages for categorical variables (e.g. gender, age group, LS, and discipline). The association between LS and the grouping variables was determined using Chi-square/ Fischer's Exact Test (with a p-value of < 0.05 considered as statistically significant for all the statistical tests).*

*Study results showed no significant difference in LS between the two Batches. But when assessing change in LS of MME Batch 5, change was found from being more Diverger in the First Year to having more predominately Converger styles and some increase in Accommodator style. LS difference by gender was mixed but not significant. Similarly no significant difference was found in LS distribution according to age. LS differences were found to be significant between physicians and non-physicians ( $p=0.02$ ).*

*Physicians were more Convergers and non-physicians mostly Divergers in both Batches at first year. No significant difference between graduates and postgraduates was found.*

*It is concluded that LS of students may well change as they progress in time. It is recommended that learning should be designed in accordance with the LS preferences of students.*

**Keywords:** *Learning style, Masters, accommodator, Assimilator, Diverger, Converger*

## INTRODUCTION

Every person has his/her own individual and unique way of learning and solving problems encountered in different situations, which ultimately influences his/her individual decisions and behavior. The study of how different people learn information in their different preferred ways is classified under Learning Styles (LS), which has been described as personal cognitive abilities acquired in the course of a long socializing process.<sup>1</sup>

The LS concept has gained considerable popularity and interest among professional educators at all levels of the educational system in recent decades. Optimized educational experiences are very important for learning but are also subject to the stress of limited resources in time and personnel. This also applies to the field of Medical Education. This problem can be overcome by identifying the LS of students and tailoring the educational program to optimal tailored learning<sup>2</sup> and, since students in medical education are all adults, the variety of preferences may well broaden.<sup>3</sup> In fact, whatever the field, proponents of LS believe that optimal instruction requires diagnosing individual LS and

tailoring instruction accordingly.<sup>4</sup> According to Sprenger<sup>5</sup>, LS assessment of students is helpful for modifying or redesigning the teaching methods in order to achieve the best outcomes. Their contention is based on the argument that an instructional method that is most effective for a student with one LS may not be the most effective method for another student with different LS. Moreover, researchers have suggested that alignment of LS with learning methodologies will in turn produce a positive synergy further leading to optimal student learning.<sup>6</sup>

Very few studies on the topic have been done to determine the LS of students at the university level or on the difference between LS of male and female students.<sup>7,8</sup> Similarly, in Saudi Arabia, which differs significantly from the Western countries, little is known about learning preferences generally or of medical students specifically.

A study performed on two hundred and seventy five undergraduate Saudi nursing students at Al-Jouf University, to determine their LS showed frequency distributions of Converger, Diverger, Assimilator and Accommodator LS as 35.6%, 25.8%, 25.55% and 13.1% respectively.<sup>9</sup> In another study, conducted at King Saud Bin Abdulaziz University for Health Sciences in Saudi Arabia, examining differences in LS of nursing students in conventional (Stream I) and accelerated tracts (Stream II) in the baccalaureate nursing education program showed that the predominant LS of Streams I was Diverger and that of Stream II was Converger.<sup>10</sup> In contrast, a similar study among ninety eight Saudi nursing students at King Saud Bin Abdulaziz University for Health Sciences in Saudi Arabia suggested that both conventional and accelerated programs favored a Diverger style of learning.<sup>11</sup> In another recent study using Kolb's LSI with Australian health science students enrolled in 10 different disciplines, consisting of dietetics and nutrition, midwifery, nursing, occupational therapy, paramedics, pharmacy, physiotherapy, radiation therapy, radiography, and social work, showed that the Converger LS was most preferred by health science students except in radiography, nursing/paramedic dual-degree, and midwifery students. In nursing/paramedic dual-degree and midwifery students Assimilator was the dominant LS and in radiography Divergent was the preferred LS.<sup>6</sup>

Presently, we do not have any studies available locally on LS of students at post graduate levels, such as in the Masters of Medical Education (MME) at

KSAU-HS. This present research is important because it may contribute to the theory of LS and, in addition to prior research findings, it may provide evidence about Saudi postgraduate level education. It tries to explore the LS dimension to add to the current body of related educational knowledge. The objectives of the study were to assess the demographics of LS in Batch 5 and 6 MME students and also to assess the change in LS of MME Batch 5 students over a period of one year (Longitudinal).

## **MATERIALS AND METHODS**

This study was conducted at King Saud bin Abdulaziz University for Health Sciences (KSAU-HS). KSAU-HS was established in 2004 by the directives of the Custodian of the Two Holy Mosques, under the umbrella of the Ministry of Higher Education. The MME itself first started in 2007. It is a two-year, four-academic semester program guided by regulations of the Ministry of Higher Education for postgraduate training. It focuses on utilization of advanced and innovative instructional methods, incorporating such strategies as problem-based learning (PBL), contact learning, group planning and students as teachers' strategies. It provides leadership opportunities, as well as improving the educational understanding, methods and programs of health professionals in the fields of medicine, dentistry, pharmacy, nursing, and other health professions. At the time of this study four MME Batches had graduated.

The objective of this study is to assess LS in Batch 5 and 6 MME students and to compare the different LS of MME students collectively.

The study population consisted of 44 MME students in these Batches studying at KSAU-HS. MME students are a mix of males and females, with a wide range of ages, from approximately 26 to 58 years, belonging to different health professions, e.g., internists, surgeons, dentists, nurses, and allied health professionals.

This study had two parts: *Pre Experimental Design Study and Campbell & Stanley Design 2: One-Group Pretest-Posttest Design*<sup>12</sup>

To assess the effect of MME on LS of Batch 5 students, pre and posttests were administered in the first and second year respectively, with MME experience as the independent variable. Subgroup comparisons were also conducted to ascertain comparability between the two Batches (5 and 6), and to investigate differences in age, gender, specialties and qualifications.

The data was collected using Kolb's LS Inventory (Questionnaire). It is an assessment method which helps in determining the LS of an individual. The LS are Accommodator, Assimilator, Converger, and Diverger. Kolb's LS Inventory is a validated<sup>13</sup> and reliable instrument with a strong theoretical framework<sup>14-15</sup> and has been widely used by researchers in the fields of medicine, education, business, etc.

To collect the data several steps were taken. First, a proposal for the study was written. Second, ethical approval was sought from the ethical review committee (Internal Review Board) IRB, of KSAU-HS. Then written consent was taken from students of Batches 5 and 6. Students had the right to withdraw from the study at any time. The questionnaire was distributed to these students during the lecture on LS as an activity which is a part of the MME curriculum (Cognition and Learning, Block 2). The follow-up questionnaire was distributed to the Batch 5 MME students during their session in their last block of the Masters Project. Students were asked to complete the Kolb questionnaire. The time spent to complete the questionnaire was also noted: participants took 20-30 minutes to complete it. The questionnaires were given serial numbers to assure anonymity to the subjects, and none of the participants' identities could be inferred in the study directly. Participants were assured that all the information would be kept confidential and only be used for research purposes.

Students filled out the inventory in class and analyzed their LS. The completed questionnaires were collected and further analyzed by the investigators. The LS of the students were categorized according to the four groups mentioned above. Subgroup variables included age, gender, specialties, and professional qualification. Afterwards results were discussed with interested students.

The data were entered and analyzed using SPSS. Descriptive analysis is presented as frequencies and percentages for categorical variables (gender and LS) and as mean and standard deviation for numerical variables (age and years since graduation). The association between LS and the grouping variables is determined using Chi-square/Fischer's Exact Test for categorical variables, with a p-value of < 0.05 considered as statistically significant for all the statistical tests.

## RESULTS

As previously stated, Kolb's LS Inventory was used to obtain the LS orientation and distribution of Saudi MME students at KSAU-HS. There were a total of 44 students in the two Batches of MME students: 25 from Batch 5 and 19 from Batch 6.

The survey was completed by a total of 34 students (response rate of 77%). Data were collected from Batch 5 twice, first in Block 2 of their first year and then at their second year. Data from Batch 6 were collected once, at Block 2 of their first year. The maximum response rate by Batch 5 was 18 students (72%) at the second year and 16 students (84%) from Batch 6 at first year. The first year survey for the LS was available for 15 students from Batch 5 (the responses of students of Batch 5 from Jeddah were not available for first year survey, which accounts for the lower rate).

The data were available for 31 respondents at first year for Batches 5 and 6 combined. For those who indicated gender, 12 (39%) were female and 19 (61%) male. The MME students had a wide range of age, from 26 to 58 years, with a mean age of  $37.3 \pm 6.8$ . According to age distribution 18 (58%) respondents were less than 40 years old while 13 (42%) were 40 years or more. Subjects were 14 (45%) physicians and 17 (55%) non-physicians. Regarding academic level, 13 (42%) were graduates and 18 (58%) were postgraduates. Students who held a bachelors or a first professional degree were classified as graduates, and students who had any further degree after graduation were classified as postgraduates.

The comparison of LS at first year was done for Batch 5 from Riyadh (n=15) and for Batch 6 from both Riyadh and Jeddah (n=16), as shown in Table 2, data from Batch 5 Jeddah students at first year were not available. The demographic variables included were age, gender, qualification and specialty, as shown in Table 1. The LS in Batch 5 (n=13) at second year was also compared with the first year (two students' data were not available at the second year from Batch 5). Among these, seven (53.8%) were below the age of 40 and six (46.5%) above 40 years. There were six (46.5%) females and seven (53.8%) males; seven (53.8%) physicians and six (46.5%) non-physician; and three (23%) graduates and ten (77%) postgraduates.

**Table 1: Demographics of Batch 5 and Batch 6 at First Year**

ITEM	BATCH 5	BATCH 6	N	%
Response Rate	15	16	31	70%
Gender				
Male	7	12	19	61%
Female	8	4	12	39%
Age				
< 40 years	9	9	18	58%
> 40 years	6	7	13	42%
Specialty				
Physician	7	7	14	45%
Non-Physician	8	9	17	55%
Qualification				
Graduate	5	8	13	42%
Postgraduate	10	8	18	58%

In the following pages results for the subgroups are discussed.

**LS in MME Batch 5 and Batch 6 Students at First Year**

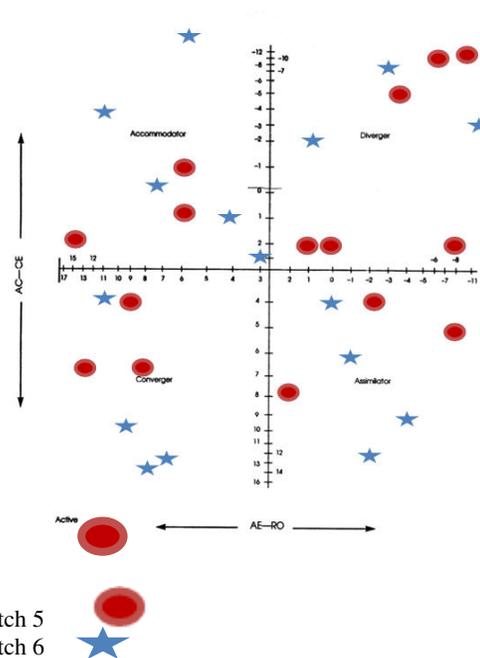
LS results for First Year majors are shown below in Table 2. MME students in Batch 6 were distributed fairly evenly across the four styles. A small plurality of Batch 6 was Accommodators (31%, 5 out of 16) and in Batch 5 Divergers (40%, 6 out of 15). Batch 5 respondents distributed evenly across three styles while Divergers had double the number (40%, 6 out of 15). There was no significant difference in LS between the two Batches,  $p=0.71$ .

**Table 2: LS in MME Batch 5 and Batch 6 Students at First Year**

LS	Batch 6 First Year	Batch 5 First Year	Total
Accommodator	5	3	8
Assimilator	4	3	7
Converger	4	3	7
Diverger	3	6	9
<b>Total</b>	<b>16</b>	<b>15</b>	<b>31</b>

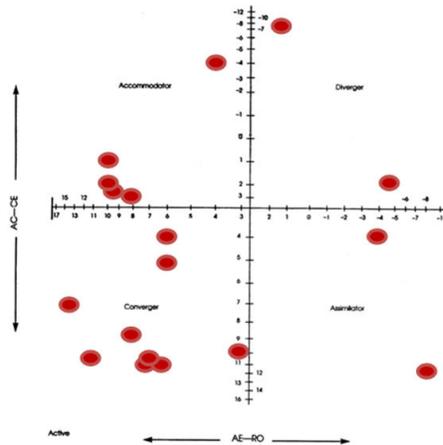
Looking at figure 1, distribution of Batch 6 students in first semester, they were dispersed among all four quadrants with four Assimilators, three Divergers, five Accommodators and four Convergers.

**Figure 1 presents the actual scores within the four quadrants.**



**Figure2: LS in MME Batch 5 Students at Second Year**

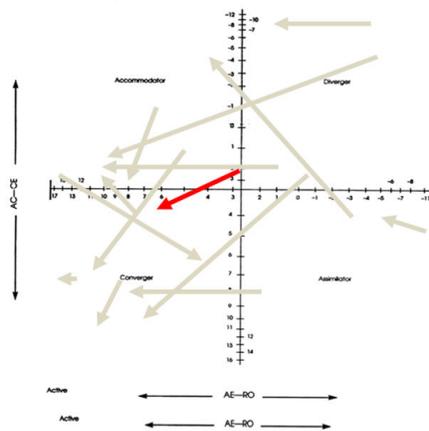
As seen in figure 2, five more people from Jeddah were included in the Second Year, out of these one was a male physician above 40 who was Assimilator and another male physician above 40 was a Diverger. One male and one female under age of 40 were Convergers as well as one female non-physician under 40 was a Converger.



Batch 5 

**Figure 3 LS Changes in Batch 5 at First Year and Second Year Bat 5 Over Time**

Figure 3 shows the average vector for the population (red arrow). The vector moves to the left and slightly down. We have taken the average of axis i.e. the x axis is AE-RO and the y axis is AC-CE to determine the beginning and ending points for the 13 MME Batch 5 students from Riyadh (at the First Year and Second Year). The average of beginning was 2.9, 1.9 and ending point was 6.8 and 4.0. This showed the downward and left shift in LS.



Individual Change 

Group Vector 

**Comparing LS and gender, Age, profession and educational level at First Year of Both Batches**

Among females the most common LS was Diverger 42% (5 of 12) as compared to 21% (4 out of 19) in males. The most common LS in males were Accommodator 32% (6 out of 19) and Converger 32% (6 out of 19) as compared to 17% (2 out of 12) and 8% (1 out of 12) respectively in females, as shown in Table 5. However the differences were not found to be statistically significant  $p=0.24$ .

When we compare the LS with age, the most common LS in the age group < 40 were Diverger 33% (6 out of 18) and Accommodator 28% (5 out of 18), as compared to 23% (3 out of 13) in the 40 and above group. The latter showed roughly equal distribution across styles, but the difference were not significant  $p = 0.86$ . While comparing the physicians and non-physicians at first year these data were gotten for 14 physicians and 17 non-physicians. Physicians were found to be more Convergers (43%, 6 out of 14) or Accomodators (36%, 5 out of 14) as compared to 6% (1 out of 17) and 18% (3 out of 17) of non-physicians, respectively. The non-physicians were found to be mostly Divergers (41%, 7 out of 17) or Assimilators (35%, 6 out of 17) compared with physicians (14%, 2 out of 14) and (7%, 1 out of 14) respectively. The distribution of LS, was found to be significantly different between physicians and non-physicians ( $p=0.02$ )

Furthermore, LS with the distribution for those at graduate and post graduate levels, common style found in graduates was Diverger 46 % (6 out of 13) as compared to 17% (3 out of 18) of postgraduates, and the most common LS in postgraduates was Converger 33% (6 out of 18), compared to 8% (1 out of 13) in graduates. Post graduates were also divided more evenly across styles than postgraduates. However there was no significant difference in the distribution of LS between the two groups,  $p= 0.24$ .

**Table 3: Comparison of LS Distribution by Gender, Age, Profession and Educational Level at First Year in Both Batches**

Variable	Accommodator	Assimilator	Converger	Diverger	Total
<b>Gender</b>					
Male	6	3	6	4	19
Female	2	4	1	5	12

p-value = 0.24					
<b>Age</b>					
<40 years	5	4	3	6	18
40 and above	3	3	4	3	13
p-value= 0.86					
<b>Profession</b>					
Physician	5	1	6	2	14
Non-Physician	3	6	1	7	17
p-value = 0.02					
<b>Educational Level</b>					
Graduate	3	3	1	6	13
Postgraduate	5	4	6	3	18
p-value = 0.24					

## DISCUSSION

The strength of this study was that the whole population of Batch 5 and Batch 6 was included and it is the first study of its kind of MME students in the region. This is because we are the only MME program in Saudi Arabia. In the present study, which was aimed at identifying the different LS of MME students by use of Kolb's LS Inventory the plurality of MME students from Batch 5 were Divergers (40%) and students in Batch 6 were roughly equally distributed across the four styles at first year. The results of this study are consistent with other studies done on medical students when the Kolb's LS Inventory was the study instrument.<sup>16-19</sup>

With regard to the difference between the LS of the two Batches, the present study found no significant difference in their initial phase, i.e., the first year in their program. This is similar to the Gurpinar, Bati, and Tetik<sup>20</sup> study done in Turkey in which they also found no significant differences comparing LS of students from the three participant schools in the initial phase of their study. However their study was conducted on undergraduate medical students, while participants in the present study were graduates and post-graduates.

The present study did find some change in the LS between first year and second year for Batch 5 students. As mentioned earlier, Batch 5 data was

available for 15 students at first year and 18 students for second year. Change over the time was noted from being more Diverger (40%) at the first year to having more of Converger 50% and Accommodator 28% LS at second year. This is similar to a study by Mammen et. al.<sup>2</sup> (2007) at the University of Cincinnati where LS change was noted in 91 general surgery residents during the course of their training. Seventy three percent of the residents who changed their LS during the period became Convergents. In contrast, the study done by Gurpinar, Bati, and Tetik<sup>20</sup> was 525 participants, as compared to 31 in the present study, and this could be one of the reasons for having contrasting findings with the present study. Previous literature has shown that Convergents prefer professional fields like medicine, computer sciences, and economics, whereas Accommodators show preference for the fine arts, literature, political science, history, psychology, and foreign language.<sup>21,22</sup> This could explain the Converger preference in the present study, with physicians and non-physicians health professionals. The change in LS could be also explained due to selection bias or maturation, as explained by Campbell and Stanley<sup>12</sup>. Regarding selection in the present study, there was a difference in Batch 5 respondents' composition at first and second year, since in first year Jeddah data was not available and at second year, two of the first-year subjects dropped from the MME and five Jeddah subjects were newly included. The difference may be due to addition of different subjects in the second year administration. There was also a period of one year between the pre and post tests and maturation may be considered a possible issue, except that all were adults of at least graduate status.

LS in Medical Education have been studied from many different perspectives. Some researchers have discussed the meaning and classification of LS, but fewer have addressed the ways to assess and measure these LS, Others have looked into the relationship between LS and factors like age, culture, and gender.<sup>23</sup> In the past years, much research has been done on gender and LS. Gender differences in LS have been small on average, though with a few studies observing different results. For example, Severiens and Dam<sup>24</sup> (1997), using the Vermunt Inventory of LS, found that women more often use the reproduction-directed LS compared to men. The reproduction-directed LS is characterized by step-wise processing strategies, external regulation, an "intake of knowledge" mental model, and vocation learning orientations.<sup>24</sup> Although no significant association with particular LS was found among

males or females in the present study, females were more of Divergers (42%) style, whereas Accommodator (32%) and Converger (32%) styles were more common in males. These results were consistent with Adesunloye et al.,<sup>16</sup> who found no significant association between gender and LS in a study on 42 internal medicine residents and faculty members at Morehouse School of Medicine, USA, using the Kolbs' LSI. On other hand a survey by Maammen et al.<sup>2</sup> on general surgery residents at the University of Cincinnati from 1994 to 2006 found that male and female residents differed in LS at Postgraduate Year 1 and 2 levels, with the Accommodating LS being frequent in women and the Assimilating LS more common in men ( $p < 0.001$ ). Similarly Wehrwein<sup>25</sup> at Michigan State University found differences in LS between genders in 48 undergraduate physiology students, even though they were using Visual, Auditory and Kinesthetic (VAK) Learning Inventory, a different LS inventory. Those authors concluded that it is the responsibility of instructors to design learning strategies that take into account learner's diverse LS.

While accessible research findings on factors associated with LS of medical students are still unclear, varied factors commonly discussed are gender<sup>26,26</sup>, age<sup>27,28</sup>, discipline, and level of program, e.g. undergraduate vs. postgraduate.<sup>27</sup> Moreover, Kolb (1984) suggests that personality type, educational specialization, career choice, and current job role and its tasks are associated factors of LS preference. With regard to age and LS in the present study, participants younger than 40 at first year were more Diverger (33%) and participants 40 and above were equally distributed in all four LS, though particularly given small n, statistically insignificant. Similarly, the Adesunloye study<sup>16</sup> found no significant association between age and LS.

For the factor of career choice, studies examining relationships of doctors' Kolb LS have yielding conflicting findings. Robinson<sup>19</sup> studied links between GPs' LS, risk-taking propensities, and CME preferences on 274 GP principals within the Portsmouth and South East Hampshire Health Authority and found that most GPs were Assimilators (43.8%), followed by Divergers (21.1%), Convergers (18.3%), and Accommodators (16.8%). Risk-seeking GPs were found to be more likely to be Accommodators or Convergers than Divergers or Assimilators ( $p = 0.006$ ).

Other researchers have found that professionals tend to have different dominant LS.<sup>29,30</sup> The present study found a difference in LS of individuals based on their career. Physicians in this study were found to be more Convergers (43%) or Accommodators (36%) as compared to non-physicians, where the Diverger (41%) LS was predominant. This is similar to Mammen<sup>2</sup> and Contessa<sup>31</sup> studies done with 91 general surgery residents in the 1st to 5th clinical years at the University of Cincinnati, and 16 general surgery residents in the Hospital of Saint Raphael in Connecticut, respectively. Both studies found physicians to be more Convergers. Zoghi<sup>6</sup>, in contrast, found Convergers to be the dominant LS with 752 Allied health professionals at Monash University.

Generalizability cannot be made from this study due to its limitation to one MME program and the small sample. On comparing LS in graduates and postgraduates at first year, graduates were found to be frequently Divergers (46%) and postgraduates were commonly Convergers (33%) though again not significant. This is similar to findings by Engels<sup>32</sup> among second year undergraduate medical students, general surgery residents, and general surgery faculty at the University of Alberta. The predominant LS among their students was Assimilator and among residents and faculty was Converger.

### **Conclusion**

Based on the data analysis in the present study a good beginning has been made towards its objectives and learning methodologies can be explored for the MME program. This is also indication reiterating the findings from previous literature that student populations usually produce LS from all four Kolbian quadrants, suggesting curricula should employ a mix of methodologies.

In today's complex society Medical and Allied Health professionals are undergoing a substantial amount of personal and professional training that could benefit from understanding of their LS. The findings of the present study, though preliminary at this stage, suggest that LS of students may change as they progress in time. Also Kolb's Inventory, even with its brief, structured format, has the potential to assess and understand the LS of graduate students. A greater understanding of these individual LS may allow for more refinement and tailoring of instructional activities in a program such as the KSAU-HS MME at graduate level.

### Limitations and Recommendations

Though encouraging, these results have their limitations. The study was conducted in only one university in Saudi Arabia with a small number of participants. Batch 5 results were available for only the Riyadh group at first year. The number of participants in the study overall was low due to small class size. Experimental designs with larger numbers and longer follow-ups are indicated. It is recommended that future work be planned jointly with other institutions offering Masters in Medical Education or related graduate programs to increase sample size and potential generalizability. It is similarly recommended that in learning methodologies are designed in accordance with the LS of students, their effectiveness should be carefully evaluated. Finally, as this is the first study done on LS among graduate students in this part of world, there is much room for further study.

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