How do Our New Graduates Prefer to Learn?

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ABSTRACT

Background: Learning preference refers to one's choice of specific learning situations or environments over the other. It is one of the factors needed to be considered in planning curriculum and in designing instructional units.

Objectives: The primary objectives of this study were to characterize the learning preference of recent medical graduates of the National University of Singapore (NUS) and to identify any possible gender differences. This study is likely to be first of its kind in this learner population.

Instrument: Rezler's Learning Preference Inventory.

Methods: Rezler's Learning Preference Inventory was administered among twenty-eight 1997 graduates (male 16, female 12) of NUS. The independent variable was the gender and the dependent variables were the scores in each of the learning categories: abstract, concrete, teacher-structured, student-structured, interpersonal, and independent.

Analysis: Frequency distribution of the learning preferences was counted manually. Independent samples t-test was used to compare two groups of dependent variables.

Results: Ninety-two percent female and sixty-nine percent male respondents preferred concrete learning. Only one male respondent and none of the female respondents preferred abstract learning. Among all the respondents, differences between concrete and abstract categories reached statistical, as well as meaningful, significance ($p < 0.0001$ and mean score difference of 19.9). Differences between student-structured and teacher-structured, and between interpersonal and independent categories did not reach statistical significance (p value of 0.51 and 0.78 respectively). Female respondents generally showed a trend towards greater preference for concrete and teacher-structured learning than their male counterparts.

Conclusion: The learning preferences of recent graduates of the NUS is characterized by high inclination towards concrete learning. The results can be utilized in designing instructional methods for this group of learners.

Keywords: Learning Preference, Rezler's Learning Preference Inventory, Curriculum Planning, and Instructional Unit Design.

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Learning preference refers to one's choice of a specific learning situation or environment over others[1]. It is one specific aspect of learning style. Learning style is generally described as an attribute or quality of an individual that interacts with instructional circumstances in such a manner as to acquire differential learning achievement[1]. Several important points of this definition need further clarification. The learning style is individualized and wide variations in learning styles are expected even in a relatively homogenous population like the students in medical schools. In other words, no two learners are alike in terms of what works best for their learning. A second important point is that learning style determines the interface of the learners and the instructors. Thus, a specific instructional method may work perfectly well for a given learner but may fail to produce desirable results in others.

Learning preference is the basic information needed for planning curriculum and for designing instructional units. It provides the curriculum planners and medical educators a systemic view of their learners' educational needs. Methodical inquiry into the learning preference helps the educators decide important issues like what types of learning objectives the learners desire, what should be the teaching environment, and how to motivate them to become lifelong learners. The learning preference is also useful in determining the nature of influences that medical schools exert on the students. Thus it is imperative to ascertain the learning preferences of the learners to optimize the educational outcome.

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Learning is as important for the medical students as it is for the medical graduates. Because of the advent of information technology and the rapidity at which new information emerges, medical schools are unable to provide the medical students with all the information necessary for their practice. To keep pace with the generation of new information, one of the key attributes young practitioners must have is the commitment to continue acquiring knowledge throughout life. This is a key reason for the current focus of medical education on lifelong learning. Thus, identifying the learning preferences of medical graduates is vitally important in building up a solid foundation for planning continuing medical education and developing instructional units.

The learning preferences of the individual is prone to both internal and external influences. Among the different factors that are important determinants of the learning preference include: ethnicity, culture, and possibly family atmosphere and upbringing. Thus the learning preferences of the local medical students and medical graduates should not be extrapolated from the studies conducted in other countries. Unfortunately, there is little published literature on the learning preferences of medical students and medical graduates outside the Western world. This was confirmed by a literature search using Medline from 1966 onwards and also by reviewing reference sections of pertinent articles. Specifically none was noted from Singapore.

There are possibilities of a gender difference in the learning preferences as well. Paul et al (1994) studied a group of medical students from a single university in the United Arab Emirates. According to this study, the female students in this specific medical school did not prefer learning in a group situation whereas the male students significantly preferred group learning. The authors attributed this finding to the cultural orientation of the Arab women[2]. This issue needs further exploration to identify whether a difference in learning preference exists among our medical students and graduates as well.

We conducted a study among the recent medical graduates of the National University of Singapore with the primary objectives at characterizing their learning preference and identifying any possible gender differences. We used Rezler's Learning Preference Inventory (LPI) in an attempt to create a comprehensive and quantifiable learning profile of the respondents. This study is likely to be first of its kind from local perspectives.

Description of Rezler's Learning Preference Inventory: Rezler's Learning Preference Inventory is one of the most commonly used instruments to identify and to categorize a range of learning preferences among medical students and practitioners[3]. This LPI consists of three axes and each axis consists of two categories of learning preferences. The two categories within the first axis are abstract and concrete learning preferences. For the second axis, the categories are teacher-structured and student-structured learning preferences and for the third axis these are interpersonal and independent learning preferences.

The descriptions of these categories are:

- *Abstract (AB)* Preference for learning theories, and generating hypotheses with focus on general principles and concept.
- *Concrete (CO)* Preference for tangible, specific, practical task with a focus on skills.
- *Teacher Structured (TS)* Preference for well organized, teacher-directed learning, with clear expectations, assignment, and goals defined by the teachers.
- *Student Structured (SS)* Preference for learner generated tasks, with emphasis on autonomy and self- direction.
- *Interpersonal (IP)* Preference for learning with others, with emphasis on a harmonious relationship between students and teachers and among students.
- *Individuals (IN)* Preference for learning and working alone, with emphasis on self-reliance and tasks which are solitary, such as reading.

The instrument is divided into two parts. Part I contains six groups where each group consists of six representative phrases or words describing each of the six categories of learning preferences. Part II contains nine groups, where each group consists of six representative statements or sentences describing each category of the learning preferences. The respondents are asked to rank the phrases or the statements in each group in descending order from the one 'that promotes learning *most* for you' to one 'that promotes learning *least* for you'. The highest score of six is assigned to the phrases and the statements representing 'that promotes learning *most* for you' and the lowest score of one is assigned to the phrases and the statements representing 'that promotes learning *least* for you.' The scores are then transferred to a specifically designed nomogram. Aggregate scores derived from this nomogram provide a graphic representation of the respondents' learning preferences. A high score in one specific category represents preference for that category, and conversely a lower score represents dislike for that category. In this instrument, the highest score for each category is 90 and lowest possible score is 15. A score between 15 to 29 represents 'least preferred', 30 to 44 represents 'less preferred', 45 to 59 represents 'neutral', 60 to 74 'preferred', and 75 to 90 represents

'most preferred'. Generally an individual respondent exhibits preferences (a score of 60 or above) in one to three of the six categories.

The validity and reliability of Rezler's LPI is well established. This instrument has been widely tested among medical students, graduates, nursing students and professionals, and also in allied health fields like pharmacy and occupational therapy. The content validity of the LPI was supported by the emergence of well-defined factors. The internal consistency and reliability for each of the six categories varied from 0.72 to 0.88. The construct validity of the instrument was tested and proven by two methods. The first method used correlation of the sub-scores of the LPI to demonstrate that the categories are either independent or related, in keeping with their defined meaning. The second method was to correlate the scores of the LPI with Myers-Briggs Type Indicator, which measures related concepts. Thus the use of LPI permits identification of individual learning preference with a fair degree of accuracy and reliability[3].

Rezler's LPI has been used in various contexts to answer valuable research questions. This has been used for academic as well as for need-based research. Paul et al (1994) used this instrument to create a learning profile among the medical students in the United Arab Emirates[2]. Lineras (1989) used LPI as one of the instruments to conduct a comparative study of the learning characteristics of nursing students and non-nursing students. The author demonstrated a difference in interpersonal mode of learning and also concluded that ethnicity and age were important determinants of learning characteristics[4]. Barris et al (1985) utilized this instrument to explore learning preferences and their relationship to students' satisfaction among the physical therapy and occupational therapy students[5]. This study suggested that educational satisfaction correlated with different sets of learning preferences. They also noted that the postgraduate students tended to prefer more abstract learning, whereas undergraduate students preferred concrete learning. Montecinos et al (1993) administered the LPI longitudinally among Chilean medical students to identify any effects of exposure to traditional teaching methodologies on the learning preferences. They demonstrated that this group of students preferred interpersonal learning at the start of medical school, which later changed to more independent learning[6]. In conclusion, Rezler's LPI has been used as a valid research tool to answer a wide range of research questions across diverse cultural and geographical groups.

Although Rezler's LPI is one of the more widely used inventories for this purpose, there are other instruments of similar nature. For example, Kolb's model of experimental learning proposes four phases: concrete experience (feeling), reflective observation (watching), abstract conceptualization (thinking), and active learning (doing). Plovonik (1975) used this instrument among the medical students to describe two dichotomies of learning style: abstract-concrete and active-reflective[7]. Baker et al (1985) used the same instrument among surgical trainees to individualize the instructional process[8]. Another similar instrument is Lancaster Approaches to Studying Inventory. Arnold and Feighny (1995) used this instrument to examine the relationship of students' general learning approaches and performances in medical schools. The data from this study suggests that the initial level of students' learning approaches is an important qualifier of predictive capability of the dimensions of students' performance[9]. We choose Rezler's Learning Preference Inventory as it allows delineating medical students and graduates into more categories than the others, and also for its relative ease of administration.

The important point to realize is that the LPI characterizes the learning situations and environment that a learner believes suits him or her most at the time of application of the instrument. It is not intended to reflect what we, as medical educators, tend to believe the ideal learning preference should be in a learner. Neither does it identify what medical schools' current learning environments are. It can be used longitudinally over a period of time to determine how the learning preferences of the learners change following their exposure to a specific learning environment.

METHODS

We administered the Rezler's LPI among 28 recent medical graduates of the National University of Singapore. These doctors graduated in 1997 and at the time of research were working as Medical Officers in different departments. The number of male graduates was 16 (57%) and the number of female graduates was 12 (43%). Proportionately larger number of female graduates was included in the study for statistical comparison. All the graduates that the researcher approached agreed to participate in the study and all the responses were available for analysis. This was an anonymous study and it was approved by the Ethics Committee of K K Women's and Children's Hospital.

The administration of each instrument took about 20 minutes and was administered one respondent at a time. Care was taken to avoid any distraction during the administration. The researcher explained the nature and purpose of the study with specific instructions. The introductory statement was as follows: "This is a study to determine the way *you prefer to learn*. This is known as Rezler's Learning Preference Inventory and it was

specifically designed for medical students and graduates. It is important that you try to sort these phrases and statements according to *the way you prefer to learn* rather than what other people believe it should be, or what has been done in the medical school." The complete instrument is available from the researcher and it can be used with permission from the developer. A pilot test was done with six respondents. The pilot test showed that the respondents did not encounter any significant difficulty in interpreting the phrases or the statements, or in following the instructions. Thus in the actual study the LPI was administered without any modification.

Each of the responses was checked by the researcher for consistency and accuracy. Independent variable was gender and six dependent variables were the scores in each category of the LPI: abstract (AB), concrete (CO), teacher-structured (TS), student-structured (SS), interpersonal (IP), and independent (IN). The frequency distribution of respondents' preferences was determined. Independent samples t-test was used to compare two groups of dependent variables e.g. abstract and concrete categories. Subsequently, responses were separated by gender and comparison between two groups of dependent variables was measured by independent samples t-test as well. P value of 0.05 was taken as statistically significant. Where applicable, a ninety-five percent confidence interval (C.I.) was chosen to extrapolate the study results beyond the sample. A difference of 15 in the mean scores of two categories was taken as meaningfully significant. This value of 15 represents the interval scale within each LPI category, such as that between 'most preferred' and 'preferred' and between 'preferred' and 'neutral.'

Table I. The frequency distribution of learning preferences of the respondents. Due to the fact that an individual respondent usually shows preferences for more than one category, the aggregate total exceeds the number of respondents.

	Total n = 28	Male n = 16 (57%)	Female N = 12 (43%)
Abstract	1 (3%)	1 (6%)	0 (0%)
Concrete	22 (79%)	11 (69%)	11 (92%)
Teacher-structured	11 (39%)	6 (37%)	5 (42%)
Student-structured	10 (36%)	7 (44%)	3 (25%)
Interpersonal	5 (18%)	3 (19%)	2 (17%)
Independent	3 (11%)	2 (12%)	1 (8%)

RESULTS

A. All Respondents

All the responses were eligible for inclusion. No aberrant score was noted. The respondents showed an overwhelming preference for the concrete category. Seventy-nine percent of all the respondents preferred the concrete method of learning. This was followed by teacher-structured, student-structured, interpersonal, and independent categories respectively. The least preferred method of learning was abstract. Only one respondent chose abstract method as the preferred learning category. The results are shown in the Table I.

The best mean score was in the concrete category. The mean score in this category was 67.1 (C.I. 62.8 - 71.3) which corresponded to 'preferred' scale in the LPI. The second highest score was noted in the teacher-structured category (mean 54.7, C.I. 48.4 - 61.0) followed by student structured (mean 51.4, C.I. 46.1 - 56.7). The mean scores of abstract, interpersonal, and independent categories were almost same. The results are shown in Table II. Note that only the mean score of the concrete category was higher than 60, the differentiating mark between the 'neutral' and 'preferred' in the instrument. This was the only category where the mean score exceeded the 60 mark.

The results of the independent samples t-test to evaluate the statistical differences of the mean scores in each category within the three axes are presented in Table II. This shows that only the differences between concrete vs. abstract reached a statistical significance (p = 0.0001), whereas, the differences between the categories in other two axes, teacher-structured and student-structured and interpersonal and independent failed to reach a statistical significance (p value of 0.51 and 0.78 respectively). The difference between the mean

Table II. The mean, standard deviations, and the significant differences between the learning categories in each axis (mean ± 2 SD).

	AB	CO	p	TS	SS	P	IN	ID	p
All N=28	47.70 ± 9.24	67.11 ± 10.99	0.0001*	54.71 ± 16.24	51.39 ± 13.66	0.511	47.75 ± 15.66	46.50 ± 11.79	0.784
Male N=16	48.81 ± 9.62	64.06 ± 11.97	0.002*	54.37 ± 15.18	54.06 ± 12.94	0.962	49.37 ± 16.70	45.00 ± 12.87	0.502
Female N=12	46.41 ± 8.90	71.17 ± 8.34	0.0001	55.16 ± 18.22	47.83 ± 14.31	0.384	45.58 ± 14.56	48.50 ± 10.36	0.655

** denotes statistical significance*

AB abstract *TS teacher-structured* *IN interpersonal*

CO concrete *SS student-structured* *ID independent*

scores of concrete and abstract categories was 20; thus far exceeding the meaningful difference set up *a priori*.

B. Gender Difference

Analyzing the results separately among the male and female respondents generally reflected the results of the overall sample. A higher proportion of female respondents preferred the concrete (92% vs. 69%), and teacher-structured (42% vs. 37%) categories than their male counterpart (Table l). On the other hand, the male respondents showed a higher preference for the student-structured (44% vs. 25%) and independent (12% vs. 8%) categories than their female counterparts (Table I). The only respondent who chose abstract category as the preferred learning was a male graduate. None of the female respondents chose abstract as the preferred learning category.

The results of the independent samples t-test comparing the mean scores of male and female respondents in learning categories within each of the axis is presented in Table II. These results also reflected the overall pattern of all respondents. Both the male and female respondents preferred the concrete over abstract learning category (p value of 0.002 and 0.0001 respectively). These differences were considered meaningful for both male and female respondents as well. Apart from these two categories, the differences between the teacher-structured and student- structured, and interpersonal and independent categories, were not statistically significant for either male or female respondents (Table II).

Comparison between the mean scores for each of the six learning categories in the two gender groups showed that the female respondents scored higher in concrete, teacher-structured, and independent categories than their male counterparts. Conversely, male respondents showed slightly higher preferences for student-structured and interpersonal categories. None of these differences reached statistical significance or meaningful significance. The results of these scores are shown in Table III.

C. Summary of Findings

An overwhelming number of the respondents in this study showed extremely high preferences for the concrete mode of learning, and high aversion for the abstract category. This pattern was almost uniformly consistent among all the respondents and among the male and female respondents as well. Apart from this, the group showed a high degree of variability in their preferences for other categories and almost equally preferred components of the other two axes: teacher-structured and student-structured, and independent and interpersonal. In general, the female respondents had a higher preference for concrete and teacher-structured learning than their male counterparts.

Table III. Comparison between the male and female respondents in their preferences for each learning category (mean ± 2 SD).

	Male N= 16	Female N=12	Significance
Abstract	48.81 ± 9.62	46.41 ± 8.90	0.922
Concrete	64.06 ± 11.97	71.17 ± 8.34	0.503
Teacher Structured	54.37 ± 15.18	55.16 ± 18.22	0.438
Student Structured	54.06 ± 12.94	47.83 ± 14.31	0.812
Interpersonal	49.37 ± 16.70	45.58 ± 14.56	0.679
Independent	45.00 ± 12.87	48.50 ± 10.36	0.829

** denotes statistical significance*

DISCUSSION

A. Significance of Findings

One of the most important findings of this study is that as a group and as individuals, the young medical graduates from the National University of Singapore displayed stunning preference for the concrete mode of learning over the abstract mode. From the piloting stage and from the findings of other studies, the researcher somewhat expected preference for concrete learning. But the magnitude at which both the male and female respondents preferred concrete learning and indicated aversion for abstract learning was not documented in other studies.

One significance of this homogeneity among the young graduates from this University is that it can be an important factor in curriculum planning and in designing instructional units. It would be quite advantageous for the medical educators to deal with a group demonstrating remarkable similarity in at least one aspect of learning preferences. Although it is usual practice to provide the learners with clear objectives in each course or teaching session, the findings from this study suggest that this practice should be more diligently followed and universally adopted. If we revisit the authors' description of concrete learning (preference for tangible, specific, practical tasks with a focus on skills), it is clear that course planners and instructors have to state the objectives as clearly as possible and set clear expectations.

This research indicates that although the vast majority of respondents preferred concrete learning, they also demonstrated wide variations in the other learning categories. It is not practical to create an individualized learning environment catering to the learning preference of each learner. Nonetheless, it is quite possible to modify the instructional methods to

address some of the learning needs of the individuals. This can be done without disrupting the existing teaching atmosphere. This notion of more freedom in creating individualized learning environment within the context of classroom settings was supported by other authors as well. For example, Cavanagh and Coffin (1994) conducted a literature review on matching instructional preferences and teaching style and concluded that in creating the optimum learning environment, individual rather than group characteristics must be addressed[10].

Can active learning and problem-based learning be promoted in a group which revealed high preferences for concrete over abstract learning? The short answer to this question is yes. Will it be more difficult to implement a problem-based curriculum or foster active learning in this group? Probably not. Arguably if the aim is to promote self-directed learning or problem-based learning, it would be easier and advantageous for curriculum planners to have a homogenous learner group with strong preferences for the abstract, student-structured, and independent learning categories. Studies have shown that this type of perfect learning combinations is rare. Still, medical schools around the world have implemented problem-based curriculum and inspired the students to be active learners. The real issue is whether institutions and medical educators can commit to the extra effort needed to implement such a curriculum, and be willing to modify the teaching strategies after taking into consideration these learning preferences. It is challenging when the learner group is diverse but encouragingly this group of learners is uniform in at least one aspect of the learning preferences.

Although this study was conducted among the new medical graduates and the results were not intended for extrapolation to the medical students in Singapore, the findings might be useful to some degree in understanding the medical students' learning preferences as well. Before examining the issue two important points should be considered. First, do the learning preferences tend to change over time and if they do, how much time must elapse before such changes take place? Secondly, do the learning preferences of the young graduates differ from the medical students? Rakoczy and Money (1995) conducted a longitudinal study over three years among female nursing students in Canada using the Kolb Learning Style Inventory[11]. They demonstrated that learning style tends to change over time. Two separate studies by Barris et al (1985) and Montecinos et al (1993) using the Rezler's LPI also demonstrated changes in learning preference over time[5,6]. In all the above studies the periods of time before such changes took place were more than three years. Although no specific study addressed the issue whether the learning preferences changed significantly between the medical school years and in the immediate postgraduate year, one can speculate there is little chance that the learning preferences will show dramatic changes in one year. In short, the learning preference of the medical students in Singapore is likely to be parallel, at least in some aspects, to those in this study.

Can curriculum planning be implemented based on learning preferences alone? No, it is not recommended that a complex issue like curriculum planning be carried out based on the learning preference alone. Other major factors to consider are the goals and objectives of medical schools, the founding vision, available resources, content, curriculum approach, and teaching preferences of the faculty. Learning preference is only one component and should not be considered as the sole factor.

B. Direction for Future Research

Medical education research is a continuous process. The current study only scratches the surface of the complex and vital issues related to curriculum planning and instructional unit development. The next logical step would be to create a learning profile of our medical students. A longitudinal study among the entry level medical students, and comparing their learning preferences at graduation will help to understand whether the learning preference changes over time and in which direction it tends to change. The issue is not of mere academic interest. It will help us to identify the beneficial or detrimental influences that medical schools exert on students. If the learning preferences of the medical students change in undesirable directions, we should try to identify any modifiable factors predisposing to such changes and try to amend them. Similarly, any positive factors in the medical school's environment deserve greater attention and incorporation. Another important research area is the cross cultural comparison of learning profiles between our students and other countries to help understand what cultural and environmental factors influence learning preference.

C. Limitations of the Study

Several limitations of this study have to be kept in mind in interpreting the results. This study captured the learning preference at a given time as opposed to longitudinally over a period. This study was carried out with one single, relatively new batch of graduates from the National University of Singapore and the generalization of the results to older batches has to be done cautiously. Although the instrument is well validated, no data is available in the literature on administration of the Rezler's Learning Preference Inventory in our local context. Some of the words might

be subject to varied interpretation. Finally, learning preference is only one component of curriculum planning and instructional unit development.

CONCLUSIONS

Medical education should be evidence based. As our understanding of the science of learning and teaching has grown substantially, we should not formulate our medical education system merely on precedence. Also, the time is demanding a paradigm shift in our approach to medical education: from *how we want to teach* to *how our students prefer to learn*. The time and effort spent on teaching and learning should be planned properly and structured on well-documented scientific studies. This study is just one step towards a long journey that we all ought to be taking for the betterment of our learners and for the joy of teaching.

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