# Learning Styles of Pharmacy Students in the University of the Philippines – Manila (UP Manila)

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## Research Article

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## Abstract

**Objectives**: To assess the learning styles of the students at the University of the Philippines – Manila (UP Manila) College of Pharmacy and to determine their association to teaching method preferences and academic performance.

**Methods:** A survey was conducted among 198 pharmacy students from UP Manila, using a validated, online, electronic questionnaire based on the 100-item version of Vermunt's Inventory of Learning Styles (ILS).

**Results:** The most prevalent learning style among Pharmacy students across all year levels is reproduction-directed (36.4%) followed by application-directed (26.8%). In general, students favored lecture as teaching method and selected reading assignments and reporting as the least preferred. Students with application-directed learning styles preferred laboratory exercises while students with meaning-directed learning styles and reproduction-directed learning styles preferred lectures. No significant relationship was found between learning style and academic performance (p = 0.687).

**Conclusions:** Reproduction-directed is the most prevalent learning style among Pharmacy students in the University of the Philippines Manila. Each learning style favors a certaim teaching method, but there was no relationship found between learning style and academic performance. The learning style profile of the students may be built upon on, to develop meaning-directed approaches by focusing on interventions that will promote deep, critical processing and self-regulation.

*Keywords: learning, pharmacy, teaching method, Vermunt's Inventory of Learning Styles*

## Introduction

Learning is affected by factors such as the learning environment, interest in material under study, and learning style preferences[1]. The ideal learning environment is one that promotes students' motivation to master and acquire a deep understanding of the course material, and that develops self-directed and independent study skills. This mastery approach in learning is essential for the acquisition of critical-thinking and problem-solving skills and for fostering a desire for the lifelong learning attributes that are preferred in students of the health care profession. These approaches to learning are also believed to lead to enhanced academic performance[2].

On the other hand, students' learning style refers to the way they respond to stimuli in a learning context, and to their characteristic way of acquiring and using information[1]. This definition implies that students have varied learning styles and favor a specific method of teaching[3]. However, students' learning style preferences may change over time due to exposure to certain teaching styles intended to promote a different type of learning[4] and may also be affected by the curriculum and other interventions[5].

In response to the changing scope of pharmacy practice, pharmacy education worldwide has been evolving both in terms of content and modes of delivery (e.g. online learning, problem-based learning)[2]. With these changes, instructors also try to employ innovative and appropriate teaching methods. Traditional ways of teaching such as the simple transmission of knowledge are no longer adequate for pharmacy students[2].

Students' knowledge of the different learning styles may help improve their academic performance as they learn more about themselves and how to acquire knowledge in the most effective manner[6] especially in situations where the instructor's teaching style does not match the students' preferred learning style[4]. In addition, certain learning styles have been associated with better academic performance. As mentioned previously, the mastery approach that molds critical-thinking and problem-solving skills and the desire for lifelong

learning is believed to lead to enhanced academic performance.

This study aimed to (1) describe the learning styles of Pharmacy students in UP Manila using the Vermunt's Inventory of Learning Styles, (2) determine their relationship with certain demographic factors, namely, sex, course, and year level, (3) and describe their association with academic performance, and teaching method preference.

## Material and Method

### Research Design

This study employed a descriptive, correlational design to describe the learning style profiles of Pharmacy students in UP Manila according to sex, course and year level using a cross-sectional data collection and correlated them with teaching method preferences and academic performance.

### Population of the Study and Sampling Procedure

The population of this study was the undergraduate students of the UP Manila College of Pharmacy enrolled in the 2nd semester of the academic year 2012-2013. Students who were not willing to reveal their academic records (GWA) or participate and students enrolled for a second degree were not included in the study.

A stratified random sampling was employed where there were 5 strata according to year level – $1^{st}$ year to $5^{th}$ year. The following formulae were used in computing the sample size:

$$n = \frac{z^2 P(1-P)}{d^2}$$

where n = sample size, z = normal deviate (i.e. 1.96) corresponding to α of 0.05, P = population proportion (set at 0.5 for maximum sample size due to lack of existing data), d = maximum acceptable error (i.e. 0.05);

$$n' = \frac{n}{1 + \frac{n-1}{N}}$$

where n' = corrected sample size for finite population, N = population size (total number of enrolled students in the UP Manila College of Pharmacy for the $2^{nd}$ semester – 450).

The corrected sample size was computed to be 210. This was then divided by 5 strata which yielded a sample size of 42 students per year level from $1^{st}$ to $5^{th}$ year. The sampling frame was obtained from the UP Manila College of Pharmacy Student Council which is a listing of all students per year level. Each student in the list was assigned a number, starting from 1, in ascending order. Microsoft® Excel 2007 was then used to generate random numbers as a basis for selecting participants in accordance to the required sample size.

### Data Collection Procedure

Participants were contacted via text messaging, social media and personal invitation. An online electronic questionnaire was used to gather th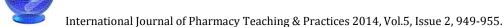e data. The questionnaire was hosted using Google® Forms at https://docs.google.com/spreadsheet/viewform?formkey=dFJNOXp3QTA4VnZodTNxbzRaLVlLckE6MQ. Participants were asked to answer the questionnaire at the UP Manila College of Pharmacy library using an internet-enabled laptop computer at a time convenient to them. The time needed to complete the survey ranged from 10 to 20 minutes. The researcher/s accompanied the participants throughout the process to answer any questions that will be raised. Participants were asked to sign an informed consent form and were given an overview of the study and its objectives prior to answering the questionnaire. They were also assured of the confidentiality of all disclosed information. In addition, participants were given the option of knowing their learning style via individual emails that would be sent by the researchers to interested participants after the study is published. The entire data collection was done from November 26 to December 6, 2012.

### Instrumentation

The instrument used in the study was adapted from the 100-item version of Vermunt's Inventory of Learning Styles (ILS)[7]. As mentioned previously, it was converted to an online electronic version through Google® Forms (accessible at https://docs.google.com/spreadsheet/viewform?formkey=dFJNOXp3QTA4VnZodTNxbzRaLVlLckE6MQ) . The questionnaire was developed to gain a clearer insight on how students perceive their own learning. The questionnaire was modified to include demographic data, such as the year level, course, sex, and GWA (general weighted average), and the teaching method preferences. The ILS is composed of two parts: A and B. Part A consisted of statements concerning the students' study activities while Part B consisted of statements regarding study motives and views on studying.

The 100-item short form version of the ILS is a self-rating instrument using 5-point Likert scales. The 100 items are distributed equally among the learning components: 25 items each for statements regarding processing strategies, regulation strategies, mental learning models, and learning orientations. For the processing and regulation strategies, students were asked to evaluate the degree to which the given statements correspond to their learning activities from (1) I seldom or never do this to (5) I (almost) always do this. For the items on the mental learning models and learning orientations, students were asked to indicate the degree to which the statements coincide with their views and motives ranging from (1) completely disagree to (5) completely agree.

The questionnaire was pre-tested to a group of 10 undergraduate Pharmacy students of UP Manila on November 15-19, 2012. The questionnaire was

revised based on the comments of the pre-test participants.

### Analysis of Data

Data collected from the electronic version of the questionnaire through Google® Forms were transferred to a database using Microsoft® Excel 2007. To determine which learning style is predominant, scores for items corresponding to the different learning subscales were added. The prevalence of each learning style among pharmacy students of UP Manila were then presented through descriptive statistics (frequency and proportion). The relationship between learning style and sex, course and year level was determined using chi-square test for independence. This is to determine whether or not the students as classified based on sex (male or female), course (BS Industrial Pharmacy or BS Pharmacy) and year level ($1^{st}$, $2^{nd}$, $3^{rd}$, $4^{th}$, $5^{th}$) have the same proportions for each learning style.

One-way Analysis of Variance (ANOVA) was used to determine if there is a significant difference in the learning styles with respect to the students' academic performance, measured using their general weighted average (GWA). Two sample t-tests were done to determine if there is a significant difference in the academic performance based on sex and course. On the other hand, chi-square test for independence was done to determine whether or not the learning styles are associated with teaching method preferences. All tests were done using IBM® SPSS® 20.0 © 2011 at a 95% confidence interval with the alpha set at 0.05 ($\alpha = 0.05$).

## Results

### A. Demographic Characteristics

Twelve students among the 210 study sample did not respond to the invitation to participate in the study, corresponding to a response rate of 94.3%. Majority (70.7%) of the respondents were female, consistent with the general trend of the UP Manila College of Pharmacy population (Table 1). The mean GWA of the respondents was 2.22 and ranged from 1.30 to 3.33. Majority of the respondents had GWA at the range of 2.00 to 2.50.

**Table 1. *Demographics of the Study Participants (N=198)***

| Year | Course | | |
| --- | --- | --- | --- |
| | BS Industrial Pharmacy | BS Pharmacy | Total |
| $1^{st}$ | 18 (9.1%) | 20 (10.1%) | 38 (19.2%) |
| $2^{nd}$ | 17 (8.6%) | 23 (11.6%) | 40 (20.2%) |
| $3^{rd}$ | 23 (11.6%) | 19 (9.6%) | 42 (21.2%) |
| $4^{th}$ | 17 (8.6%) | 21 (10.6%) | 38 (19.2%) |
| $5^{th}$ | 22 (11.1%) | 18 (9.1%) | 40 (20.2%) |
| Total | 97 (49.0%) | 101 (51.0%) | 198 (100.0%) |

### B. Learning Styles of Pharmacy Students

The most prevalent learning style among the respondents was reproduction-directed (R) followed by application-directed (A) for both BS Industrial Pharmacy and BS Pharmacy students (Table 2). Some of the students (26.8%) had multiple learning styles – the most common of which is the combination of reproduction and application-directed (5.56%). No student was found to be purely undirected (U).

### C. Individual Attributes Affecting Learning Styles: Sex, Year Level and Course

When the study sample was divided based on year level, sex, or course, (Table 3) the prevailing learning style was still consistent with the general findings. Based on Chi-square test for independence, there was no significant association between the learning styles of the students and their course (p = .096), year level (p = .239) or sex (p = .344).

### D. Relationship of Learning Style, Sex, Course, Year Level with Teaching Method Preference

Students who have application-directed learning styles preferred laboratory exercises while students with meaning-directed learning styles and reproduction-directed learning styles preferred lecture (p = 0.898). Majority of the students who have combination learning styles likewise favored lecture as the most preferred teaching method. On the other hand, reporting was the least preferred teaching method for the majority of learning styles method (p = 0.975). In students with application-directed learning styles, both reporting and reading assignments were deemed to be the least favored.

Majority of students from all year levels preferred lecture as teaching method (p = 0.145). Students belonging to the first, third and fifth year levels selected reporting as their least preferred method while fourth year students selected reading assignments as their least preferred method (p = 0.074). Second year students deemed both reporting and reading assignments as the teaching methods least preferred.

Students in both degree programs chose lectures as the most preferred teaching method, followed by laboratory exercises (p = 0.901) and reporting as the least preferred, followed by reading assignments. Chi-square analysis showed that there was a significant association between least preferred teaching method preference and course (p = 0.046).

Lecture was preferred by both males and females followed by laboratory exercises (p = 0.130) and reporting was the least preferred method, followed by reading assignments (p = 0.808).

**Table 2. Distribution of the Students' Learning Styles According to Course and Year Level**

| Learning Style | BS Industrial Pharmacy | | | | | | BS Pharmacy | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Total | 1 | 2 | 3 | 4 | 5 | Total | |
| Meaning-directed (M) | 4 | 2 | 2 | - | 5 | 13 (6.6%) | 1 | 3 | 1 | - | 2 | 7 (3.5%) | 20 (10.1%) |
| Application-directed (A) | 2 | 3 | 7 | 3 | 5 | 20 (10.1%) | 6 | 9 | 5 | 7 | 6 | 33 (16.7%) | 53 (26.8%) |
| Reproduction-directed (R) | 5 | 8 | 7 | 7 | 5 | 32 (16.2%) | 9 | 9 | 9 | 5 | 8 | 40 (20.2%) | 72 (36.4%) |
| Combination | 7 | 4 | 7 | 7 | 7 | 32 (16.2%) | 4 | 2 | 4 | 9 | 2 | 21 (10.6%) | 53 (26.8%) |

**E. Academic Performance as Affected by Learning Style, Sex, Year Level and Course**

There was no significant difference in the GWA between groups when the study sample is subdivided based on learning styles (p = 0.687), sex (p = 0.140) or course (p = 0.102). There was however a significant difference when the study sample was divided based on year level (p < 0.001) where the first year students had significantly different (better) GWA as compared to all other year levels.

**Table 3. Distribution of the Students' Learning Styles According to Year Level and Sex**

| Learning Style | Year Level | | | | | Sex | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Male | Female |
| Meaning-directed (M) | 5 (3.9%) | 5 (3.9%) | 3 (2.3%) | - | 7 (5.5%) | 9 (7.0%) | 11 (8.6%) |
| Application-directed (A) | 8 (6.3%) | 12 (9.4%) | 12 (9.4%) | 10 (7.8%) | 11 (8.6%) | 15 (11.7%) | 38 (29.7%) |
| Reproduction-directed (R) | 14 (10.9%) | 17 (13.3%) | 16 (12.5%) | 12 (9.4%) | 13 (10.2%) | 16 (12.5%) | 56 (43.8%) |
| Combination | 11 (8.6%) | 6 (4.7%) | 11 (8.6%) | 16 (12.5%) | 9 (7.0%) | 18 (14.1%) | 35 (27.3%) |

## Discussion

### A. Learning Styles of Pharmacy Students

Majority of the students (36.4%) showed a reproduction-directed learning style, followed by application-directed (26.8%). The reproduction-directed learning style indicates high preferences for surface learning or stepwise processing – memorizing and rehearsing, analyzing; external regulation; a mental model of learning defined by intake of knowledge; certificate-oriented and self-test oriented. Learning is viewed as taking in knowledge provided by education through memorizing and reproducing. These students strive for high study achievements; study to pass examinations, to obtain a degree and to prove to oneself and others that one is able to cope with the demands of higher education[9, 10]. According to Nhan[11], Asian countries in general are more lectured-based, have strong external regulation and put greater value on memorization, as compared to Western countries. This could be the case in the UP Manila College of Pharmacy where the prevalence of a reproduction-directed learning style may be driven by the tedious academic requirements in the College including difficult examinations and the high attrition rate. More studies may however be done to confirm this assumption.

The second most prevalent learning style in the College is application-directed. The application-directed style has high preferences of concrete processing as processing strategy, use of knowledge as mental model of learning, and vocation-oriented learning orientation – simply put, learning to acquire knowledge and skills that can be applied[9, 10]. This learning style is viewed relevant for the health care sciences because the purpose of a health care science (i.e. Pharmacy) education is to produce competent health care professionals by equipping students with the necessary knowledge and skills. Nonetheless, it is also beneficial to equip students with a desire for lifelong learning, problem solving, critical thinking, reflection, and constructing qualities which are characteristic of the meaning-directed learning style[10]. This meaning-directed learning style, however, is low in prevalence (10.1%) among UP Manila Pharmacy students.

Combination learning styles are possible since the ILS was conceived as a flexible learning style framework with learning styles that are not mutually exclusive[13]. The most prevalent combination in the UP Manila College of Pharmacy was the mix of application- and reproduction-directed, consistent with the findings for the most prevalent individual learning styles. This signifies that the students were interested in both practical applications and subject mastery[13].

### B. Individual Attributes Affecting Learning Styles: Sex, Year Level and Course

There is no significant association between the learning styles of the students and their sex, year

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level or course. However, BS Industrial Pharmacy students were found to utilize self-regulation of learning process and results (meaning-directed) as opposed to the external regulation of learning results employed by BS Pharmacy students (and the College in general). A probable reason is the difference in subjects taken during the last year of the curriculum. Subjects taken up by the 5th year Pharmacy students require more memorization – examples include Pharmacotherapeutics, Counseling, and Clinical Pharmacy.

## C. Relationship of Learning Style, Sex, Course, Year Level, with Teaching Method Preference

It was found in the study that students with application-directed learning style preferred laboratory exercises as their most preferred teaching method, followed closely by lectures. People with this kind of learning style tend to relate topics learned in school to everyday experience, which may explain their preference for laboratory exercises. Furthermore, they view learning as a source of knowledge, which they can use in the real world[9]. Laboratory exercises may be an effective method in learning scientific principles because it allows students to reach higher levels of learning such as application, analysis, synthesis, and evaluation[14]. Meaning- and reproduction-directed learning styles favor lecture as teaching method. This is consistent with meaning-directed's preference for experts' view to stimulate thinking and with reproduction-directed's desire for objectivity[9]. Reporting as the least preferred teaching method of students is consistent with the study by Kirschner et al.[15] that unguided learning, or minimally guided learning is less effective and may even produce negative results due to possible misconceptions and incomplete knowledge.

It has also been shown in the study that majority of students in various year levels, and in both sexes favored lectures as a teaching method and viewed reporting as the least preferred teaching method. The preference for lectures is consistent with literature and can be attributed to the students' desire for objective and structured learning, properly and sufficiently guided by those who are deemed knowledgeable about a certain topic. With this, it may be easier for students to understand key concepts and ideas to facilitate learning[15]. However, results on teaching method preferences may reflect choices made based on familiarity rather than actual preference. It is possible that since lecture is considered as the most familiar teaching method, students intuitively chose it as their preferred method resulting to a possible overestimation of the actual preference. Nonetheless, this is already outside the scope of the study. Follow-up studies on reasons behind the teaching method preferences may be done. Likewise, a more comprehensive list and description of the teaching method preferences may also be employed.

## D. Academic Performance as Affected by Learning Style, Sex, Year Level and Course

Statistical results concerning the students' academic performance (measured as GWA) mostly resulted in insignificant differences using ANOVA and t-test. This may be due to the relatively small sample size and the possibility of

the GWA being equalized when averaged due to diverse values. Smith et al.[12] also found no significant relationship between learning style and academic performance. Furthermore, it has not been confirmed by research if the ILS is a good predictor of academic performance.
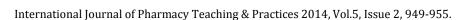
In this study, first year students have been found to have significantly better GWA as compared to all other year levels. The 1st year students are mostly taking-up General Education subjects which usually offer better grades as compared to Pharmacy subjects, hence explaining the better GWA. General Education (GE) refers to a set of courses that precede specialization and which aim to foster holistic education among students. The GE curriculum includes 60 units of courses in languages, logic, humanities and sciences[16]. Specifically, this curriculum covers three domains: arts and humanities; math, science, and technology; and social sciences and philosophy. The curriculum of the Bachelor of Science in Pharmacy and Bachelor of Science in Industrial Pharmacy were designed as to prioritize GE subjects in the first two years of study.

Other factors that may affect academic performance of Pharmacy students are stress[17], academic competence, test competence, test anxiety and time management skills. Students with better academic and test competence are more likely to show better academic performance[18]. Strategic studying techniques may also help students acquire better academic performance.

## Conclusion

The most prevalent learning style among Pharmacy students across all year levels is reproduction-directed followed by application-directed. In general, students favored lecture as teaching method and selected reading assignments and reporting as the least preferred. Students with application-directed learning styles preferred laboratory exercises while students with meaning-directed learning styles and reproduction-directed learning styles preferred lectures. No significant relationship was found between learning style and course, year level, sex, or academic performance. Results of this study may be used in developing the learning style profile of the students to meaning-directed approaches by focusing on interventions that will promote deep, critical processing and self-regulation (rather than stepwise, surface processing and external regulation).

### LIMITATIONS

Since only students from the UP Manila College of Pharmacy are included, the results of the study may be highly specific for the teaching curriculum of the College and may not be generalizable for Pharmacy

education in the Philippines. Second, given that the Vermunt's Inventory of Learning Styles is quite lengthy (100 items), test fatigue may have an influence on the reliability of students' response. Results on teaching method preferences may reflect choices made based on familiarity rather than actual preference. Lastly, student-reported GWA may limit the results to a certain extent.

## Acknowledgement

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## AUTHORS' CONTRIBUTIONS

Authors contributed equally to all aspects of the study.

## PEER REVIEW

Not commissioned; externally peer reviewed.

## CONFLICTS OF INTEREST

The authors declare that they have no competing interests.