

Learning Style Preference and Its Correlation Toward Academic Performance Among First Year Medical Students

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ABSTRACT

Background: Learning styles are various ways of acquiring knowledge and important due to its contribution to the learning process' outcome and students' academic performances. This study aims to find out the correlation between learning style preference and cognitive academic performance of medical students.

Methods: A cohort study using The Honey and Mumford's Learning Style Questionnaire was conducted to first-year medical students during their first semester at Udayana University, Bali. Mean of four academic blocks' final assessments (multiple choice questions) represented the cognitive academic performance. Data were analysed using univariate and bivariate analysis (Spearman correlation).

Results: There were 219 students who fulfilled the inclusion criteria. Each student can have more than one learning style preferences. There were 33.3% students with a very strong preference for theorist learning style, followed by activist (30.6%), reflector (27.9%), and pragmatist (14.2%). Mean of final academic blocks' assessments had positive correlation with reflector ($r=0.227$, $p<0.001$) and theorist ($r=0.135$, $p=0.045$) learning style. However, a negative correlation was found with the activist learning style ($r=-0.267$, $p<0.001$). No correlation was found between the academic blocks' assessments and pragmatist learning style.

Conclusion: Medical students with reflector and theorist learning style tend to have better

cognitive academic performances compared to other learning styles. This study should be taken into consideration in providing the most suitable teaching methods for medical students based on their various learning style, especially for the ones with activist learning style which in this study had lower cognitive academic performances.

Keywords: learning style, medical student, academic performance, cognitive outcome

INTRODUCTION

The system of medical education has developed through the years, from didactic learning into a more student-centered, discussion and problem-based learning.¹

Medical students are expected to understand theoretically and apply their knowledge and skills in limited times during medical school. This would be a challenge since students arrived from different educational backgrounds and learning experiences which shaped them into having different kinds of learning style to acquire and processing information.²

Learning style is a various approach or way of acquiring knowledge, skills, attitude through study and experience.³ Learning style is referred as individual's preferred way of gathering, organizing, and thinking about information.² The most accepted and adopted theory stated that learning styles are defined as cognitive, emotional, and

physiological traits that serve as relatively stable indicators of how learners perceive, interact and respond to their learning environments. The learning style of each individual could be different, depending on the task requirements, the previous experiences, and personality.^{4,5} There were some models created to classify learning style preferences. Peter Honey and Alan Mumford classify learning style into four distinct preferences, which are activist (sensation seeking, impulsive, extrovert), reflector (introvert, cautious, methodological), theorist (intellectual, rational, objective) and pragmatist (expedient, realistic, practical). The tool used to classify the learning style is called as the Honey and Mumford Learning Style Questionnaire (LSQ).⁶ The preference of learning style could be useful in improving and maximizing medical students' learning process. Teacher's awareness regarding the students' learning style could also help in facilitating better teaching strategies and variety of teaching approaches for the most effective learning outcome.^{2,7} Research has shown that by becoming aware of their own learning style, it would help students judge the kind of activities which is likely to help in their studies, hence a more efficient and effective learning process can be achieved.⁵ Learning style preferences and academic achievements were said to be related, however there were no conclusive founding due to different results from previous studies.^{1,2} A study among preclinical medical students in Thailand found that a reflective learning style correlated with better achievements due to its suitability with the curriculum.⁸ Different study result was shown in Canada by Wilkinson *et al.*⁹ where overall there were no significant correlations between learning style and academic performance among dental and medical students. However, there were tendencies that specific learning styles could result in better marks in some of the assessments.⁹

Learning outcome can be classified in different ways, those are cognitive, psychomotor, affective, and intuitive.¹⁰ Each of those domains has its own points and characteristics, however the domains are connected from each other. Learning dimensions are co-existent and perhaps even synergistically interactive. Cognitive domain perceptions including knowledge, comprehension, application, analysis, and synthesis. Specifically, the cognitive dimension is used to include activities such as remembering and recalling knowledge, thinking, and problem-solving, and creating. Affective domain perceptions including receiving, responding, valuing, organization, and characterization. It provides the bridge between the stimulus and both the cognitive and psychomotor aspects of an individual's personality. Psychomotor domain perceptions including excitement, making manual control, skill, fitting situation, and creating. Psychomotor skills are important in implementation, and hence the importance of "behavioural immersion". Meanwhile, intuitive domain consists of recognizing, discrimination, inside born, retention under control, and future-past relationship building.^{10,11} Teaching method and assessments usually focus on one of the domains. In medical education, learning outcome was usually assessed through theoretic examinations and practical examinations. Cognitive is the easiest learning outcome to be measured.¹¹ Therefore the aim of this study was to explore the learning styles preferences of medical students and its correlation to cognitive academic performance in one semester.

METHODS

Design and setting

This cohort study was conducted in the Faculty of Medicine, Udayana University, Bali, Indonesia for one semester (September 2017 – February 2018). The total of first-year medical students in batch 2017 was 243 students. The assessment of learning style was done in the beginning of the

semester, and the results of the blocks' examinations were followed throughout the semester. Participation in this study was on a voluntary basis with written informed consent. The exclusion criteria were those who didn't take all the final block's assessments completely and didn't attend to fill out the questionnaire, with the total of 21 students. Three students were categorized as drop-out criteria who didn't fill the identity and the questionnaire completely. Therefore, only 219 first-year medical students were included in this study as subjects. The final blocks' examinations were theoretical computer-based test (CBT) covering various aspects of basic sciences in the form of Biomedical I (anatomy, histology, physiology, biochemistry), Biomedical II (parasitology, microbiology, pharmacology), and Cell as Biochemical Machinery blocks. The CBT also covered Studium Generale block as introduction lectures for new medical students. All these examinations were conducted in bilingual (Bahasa and English). These assessments were used to represent the cognitive academic performance in medical students.

Study instruments

Participants completed a self-report questionnaire, which was divided into two sections. The first section collected demographic data, including name, age, and gender. The second section of the questionnaire consists of the Honey and Mumford's Learning Styles Questionnaire (LSQ)⁶, to assess the learning style preferences. The LSQ contains 80 statements which have two options for the answer (agree, disagree) for each statement. One point was awarded for each "agreed" answer, and no point was given for the other response. Each of the 80 statements were grouped into four learning styles subscales namely activist, reflector, theorist, and pragmatist. The maximum score for each subgroup would be 20 points. Each learning styles' level of preferences were interpreted accordingly. The final blocks' examination results were taken from the database of

Medical Education Coordinator Department in Faculty of Medicine, Udayana University.

Data analysis

The data collected were tabulated and analysed using the Statistical Package for Social Sciences (SPSS) version 20. Mean scores and standard deviation (SD) were calculated for the four learning style subscales. Spearman correlation test was performed as bivariate analysis to examine the correlation of each learning styles and the students' final blocks' assessment results. In this study, p -value <0.05 was considered as statistically significant.

RESULTS AND DISCUSSION

Knowledge of the learning style preference is beneficial for medical students to get better educational and clinical outcomes. Medical students would be able to adjust their learning environment according to their newfound learning style preference based on the theory. The teachers or instructors' knowledge regarding their students' learning style was beneficial as well in providing the best learning experience for the students.^{12,13}

From 219 respondents, the median age of the respondents was 18 years old where the ages range from 16-22 years old. Most of the respondents were female (64%), and the rest were males (36%). The learning style preferences were divided into five categories, which are very strong, strong, moderate, low, and very low. Since the total of percentage was not 100% in each category, it is indicated that a student could have more than one strong or very strong preferences for learning style.

Table 1. Students' Learning Styles Preferences

| Learning Style | Level of Preferences | | | | |
|----------------|----------------------|--------|----------|-------|----------|
| | Very Strong | Strong | Moderate | Low | Very Low |
| Activist | 30.6% | 23.3% | 37.9% | 8.2% | 0% |
| Reflector | 27.9% | 46.6% | 17.4% | 6.8% | 1.4% |
| Theorist | 33.3% | 25.6% | 28.8% | 9.1% | 3.2% |
| Pragmatist | 14.2% | 27.9% | 36.5% | 19.6% | 1.8% |

Theorist was the most strongly adopted learning style preferences among the medical students where 73 students (33.3%) showed very strong preference. Many students also adopted activist and reflector learning styles. Pragmatist was the least preferred learning style among first-year medical students. Hence fewer students preferred the kind of learning activities which involved practical sessions. Pragmatist students prefer learning few important theoretical details and skipping other theories which didn't have direct practical benefits.⁵

Medical School in Udayana University provide learning environment through lectures, problem-based learning in Small Group Discussion (SGD), plenary session, and practical session for OSCE preparations. Lectures would be suitable for theorist medical students, while activist students would do well in SGD and practical sessions. Reflector students would reflect their learning process during lectures and plenary, while the pragmatists would prefer practical sessions. However, first semester curriculum was lacking practical and clinical sessions. These conditions could contribute to the poorer academic performance among activist students, and not many students adapted the pragmatist learning style.

Other studies among medical students showed different results where the preferences were dominated by reflectors. The study conducted by Wilkinson *et al.*⁹ found that reflectors were the dominant

learning style, followed by theorists then pragmatists and activists. This difference possibly caused by different categorizations where each student only had one learning style and the dominant learning style was defined through the mean and standard deviation analysis.⁹ Meanwhile, Bhalli *et al.* found that reflector learning style was the most dominant were followed by pragmatist, theorist, and activist among the fourth year medical students in Pakistan. These differences may be caused by the different types of participants in the studies which was affected by academic environment and the seniority of the medical students.¹⁴ Focusing on strong points on each style could be beneficial for medical students. Those who prefer to observe and think before reaching conclusion would perform well in making important decisions when handling tough clinical cases. On the other hand, those who prefer immediate action and trying out new experiences could be trained in handling cases which required critical thinking and urgent decisions.¹³

A significant positive correlation was shown between the mean of all four final academic blocks' assessments with reflector and theorist learning styles. Activist learning style had a significant negative correlation with the mean of the assessments. However, no significant correlation was found between the pragmatist learning style and the mean of final academic blocks' assessments (Table 2).

Table 2. Correlation between Learning Style Preferences and the Mean of Final Academic Blocks' Assessments

| Learning Style Preferences | Mean of Final Academic Blocks' Assessments | |
|----------------------------|--|----------|
| Activist | <i>r</i> | -0.267** |
| | Sig. (<i>p</i>) | 0.000 |
| Reflector | <i>r</i> | 0.227** |
| | Sig. (<i>p</i>) | 0.001 |
| Theorist | <i>r</i> | 0.135* |
| | Sig. (<i>p</i>) | 0.045 |
| Pragmatist | <i>r</i> | 0.102 |
| | Sig. (<i>p</i>) | 0.134 |

Note:

* Correlation is significant at the 0.05 level ($p < 0.05$), 2-tailed

** Correlation is significant at the 0.01 level ($p < 0.01$), 2-tailed

From each of the first-semester final blocks' assessments, some significant correlations were also found. Activist and reflector learning styles had a significant correlation with all the blocks, while theorist learning style only correlated with Biomedical II block (Table 3).

Table 3. Correlation between Learning Style Preferences and First Semester Final Academic Blocks' Assessments

| Learning Style Preferences | | First Semester Final Academic Blocks' Assessments | | | |
|----------------------------|-------------------|---|--------------|-----------------------------------|---------------|
| | | Studium Generale | Biomedical I | The Cell as Biochemical Machinery | Biomedical II |
| Activist | <i>r</i> | -0.306** | -0.253** | -0.247** | -0.219** |
| | Sig. (<i>p</i>) | 0.000 | 0.000 | 0.000 | 0.001 |
| Reflector | <i>r</i> | 0.224** | 0.179** | 0.225** | 0.190** |
| | Sig. (<i>p</i>) | 0.001 | 0.008 | 0.001 | 0.005 |
| Theorist | <i>r</i> | 0.098 | 0.121 | 0.108 | 0.161* |
| | Sig. (<i>p</i>) | 0.149 | 0.073 | 0.112 | 0.017 |
| Pragmatist | <i>r</i> | 0.095 | 0.072 | 0.099 | 0.107 |
| | Sig. (<i>p</i>) | 0.162 | 0.288 | 0.143 | 0.116 |

Note:

* Correlation is significant at the 0.05 level ($p < 0.05$), 2-tailed

** Correlation is significant at the 0.01 level ($p < 0.01$), 2-tailed

Based on the results, medical students with reflector or theorist learning style preferences tend to have better cognitive academic performance that could be seen from their mean of final academic blocks' assessments. Same significant correlations could also be seen when analysed from each blocks' assessments where reflector learning style significantly related to all first semester blocks, while theorist only correlated with Biomedical II block which consists of parasitology, microbiology, and pharmacology basic sciences. Reflectors are good observer and tend to be passive participants in meetings and discussions. Reflectors learn best from structured learning experience where they can listen and observe what they must study. They tend to explore, investigate, and assemble information or reviewing to produce analysis and conclusion. Therefore, the medical curriculum at Udayana University is suitable for reflectors because they are allowed to maximize their knowledge by listening passively to lectures and reading background data.¹² The same thing applied to theorists who tend to learn best by exploring ideas and questioning the basic methodology, assumptions, or logic behind the theories. Small Group Discussion (SGD) and plenary session, which were included in the curriculum in Udayana University, were suitable for the theorists because they were able to understand by participating in complex and interesting questions and ideas

to solve the questions logically. On the contrary, in this study, activists tend to have lower scores on all final blocks' assessments. Activists learn least in activities where they were being involved in a passive role, such as listening to lectures, reading, and watching. They performed poorly in solitary work and repeated same activities, which were likely to be happening in the medical curriculum.^{5,15}

A study by Wilkinson *et al.* among first year medical and dental students shared the same result where reflector and theorist learning styles had significant positive correlation toward the multiple-choice examinations. In this study, theorist was the learning style with the greatest number of positive correlations with the students' assessments. Theorist learning style may be beneficial in first-year medical examinations because theorists tend to think thoroughly and carefully and enjoying the process of material analysis and synthesis which is suitable for the assessments. This study also found that high activist score related to lower examination marks. However, it was stated that more evidence is needed because most of the correlations were not significant. A similarity was also showed where there was no correlation between pragmatist learning style and the examination results.⁹

Jirapornchareon *et al.* also found that reflective learning style was commonly found and associated with high academic

achievement among preclinical students in Thailand. The preclinical curriculum in Thailand focuses on basic knowledge of medical sciences which included lectures, problem-based learning, self-directed learning, and written reports. This curriculum was very similar with the preclinical curriculum in Udayana University.^{8,16} Students may have preferred to observe and thinking theoretically, hence spending more time working alone to understand the content. This led to the reason for activist undergraduate students who tend to have lower academic performance in preclinical years. Activists learn least when they were faced with solitary working and passive roles activities in learnings.⁵ Jirapornchareon's study stated that active learning style was more suitable for the clinical year medical students to improve their learning process in clinical practice and community-based learning. Clinical years required the students to be actively involved in the real situations and able to learn new skills.⁸

Different results were found in the correlation between learning style preferences and academic performance in other studies. Bhalli *et al.*¹⁴ reported there were no correlation between learning styles and academic success grades among fourth-year medical students at Khawaja Muhammad Safdar Medical College, Pakistan. This study highlighted that a complex relationship existed between the two variables.¹⁴ Among pharmacy students, no significant influence was found between the learning style scores and the academic level.³ Another study in Brazil among undergraduate nursing students also showed there was no statistically significant correlation between learning style preferences and knowledge acquisition, but had a significant influence on intervention confidence when learning about substance use education. It was stated that intervening variables, such as educational background and personality or emotional intelligence, might have affected the results of that study.¹⁷

This cohort study is an initial study, hence it is limited due to small size of sample which couldn't exactly represent all medical students in different medical schools. This study did not control the confounding variables such as intelligence or personality type which could also contribute to the learning process and outcome. Future studies are needed to explore more regarding the correlation of learning style preference and different kinds of learning outcome. The future study should also be conducted with a longer study period to gain better insight of the students' development.

CONCLUSION

Learning style preference significantly correlated with the learning outcomes. Assessments of students' learning style preference are important to understand the best way of learning and achieve the optimum learning outcomes. This study showed that theorist was the strongest adopted learning style among first-year medical students in Udayana University, subsequently followed by activists, reflectors, and pragmatists. Reflector and theorist students tend to achieve a higher score in final academic blocks' assessments which represented cognitive academic performance. On the contrary, activist students tend to score lower in final academic blocks' assessments.

RECOMMENDATION

Based on this research, by knowing about the correlation between learning style preferences and cognitive academic performance, the faculty should be able to provide teaching methods which are appropriate for various learning styles. However, students should also be encouraged to adapt to different learning styles which are the most suitable to achieve the best learning outcome.

Future research which correlates future cognitive assessments and learning style preferences among medical students should be done to find out whether the result will be different from this study. It is needed to

explore other factors that affect learning outcome of the students to improve teaching and learning process in medical school.

Authors' Contribution

I Gusti Agung Ayu Andra Yusari – developing research proposal, data analysis, and publication of manuscript.

I Putu Hendri Aryadi – developing research proposal and collecting data.

Ida Ayu Dewi Dhyani – developing research proposal and collecting data.

Putu Gede Sudira – developing research idea and proposal, and publication of manuscript.

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