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Learning Styles of Vietnamese Medical Students

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Abstract

Background: The purpose of this study was to assess the learning styles of Vietnamese medical students at the Ho Chi Minh City University of Medicine and Pharmacy.

Method: Participants were 856 (147 first-year, 144 second-year, 144 third-year, 136 fourth-year, 148 fifth-year, and 137 sixth-year students) medical students who completed the 100-item Vermunt's Inventory of Learning Styles.

Results: Factor analysis resulted in four factors with adequate reliability (α range: 0.71 - 0.86): Meaning-directed learning style (factor 1), passive, undirected learning style (factor 2), application-directed learning style (factor 3), and reproduction-directed learning style (factor 4). Final-year students employed more deep processing, concrete processing, self regulation, use of knowledge, but more stepwise processing, certification orientation, intake of knowledge than did the freshmen. Students with higher achievement classifications had higher mean score of deep processing, concrete processing, self-regulation, construction of knowledge, and use of knowledge, lower certificate and ambivalent orientation.

Discussion: Four theoretically meaningful and cohesive factors underlying learning patterns emerged from the factor analysis. The learning styles of Vietnamese medical students were relatively similar to Asian students, but there were some differences from European students.

Conclusion: The assessment of learning styles of medical students may help curriculum renewal, the application of teaching and assessment methods, and improve student learning.

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Introduction

A knowledge of students' learning style in higher education may be useful for curriculum renewal, implementing varying teaching methods, and student assessment[1]. A sound understanding of medical students' learning styles is especially important since, subsequently as physicians, their behaviours will be directly related to patients' welfare. While medical schools pay considerable attention to the analysis of curriculum content, to the organization of teaching and assessment of students, little attention is given to the impact of these activities on the various ways that students learn. Student learning styles may have considerable impact on their achievement.[1,2] Accordingly, a thorough understanding of the way students learn is important to develop appropriate curriculum content, teaching styles and assessment to activate and sustain students' motivation, and to maximize learning and achievement.

Learning style refers to a coherent set of learning activities that students usually employ, their learning orientations, and their learning conceptions at a particular developmental period. It is the result of the temporal interplay between personal and contextual influences and environmental stimuli.[3] There are many definitions of learning styles and researchers have focused on varying aspects of learning. In the 1980s, several researchers including Entwistle and Ramsden, Marton and Säljö, and Biggs focused on motivation and cognitive processes as major domains for students' learning.[4] At about the same time, Schmeck analyzed connections of learning strategies and learning styles in different educational aspects, while Van Rossum and Schenk studied the relationship between learning conceptions and learning strategies, and Vanzile-Tamsen and Livingston were interested in the impact of self-regulation of learning and motivation.[5] James and Gardner categorized learning styles according to perceptual, cognitive, and affective domains,[6] while more recently, Tullos focused on distinguishing cognitive, affective, and physiological aspects of learning styles.[7]

Short and Weisberg-Benchell, and Vermunt focused on three types of learning activities: cognitive, affective, and metacognitive or regulative.[3] The affective domain of learning was re-emphasized in learning and teaching for both students and teachers.[7,8] More recent researchers considered self-directed, self-regulated learning as significant determiners of effective learning.[9]

Based on constructivist views of learning, Vermunt explored interrelations and integration of four learning aspects including cognitive processing strategies, regulation strategies, learning orientations and learning conceptions to reduce the overlap among learning component. *Cognitive processing strategies* are thinking activities students use to process learning content and lead directly to learning outcomes. *Regulation strategies* are activities students use to decide on learning contents, to plan, to monitor their learning processes and affective activities. *Learning orientations* are personal goals, intentions, motives, expectations, attitudes, concerns of students in relations to their studies. *Learning conception*s are students' views on what learning is and on the task division between oneself and others in learning processes.[3,10]

From this approach, four different learning styles have been identified by Vermunt.[3,10] The *undirected learning style* is characterized by a lack of regulation, an ambivalent orientation, and a learning conception needs support of fellow students and teachers. Students with this learning style often experience difficulties with the amount of learning materials, and with distinguishing what is important and what is not. The *reproduction-directed learning style* is defined by the uses of a stepwise processing and an external regulation, a learning conception in which learning is viewed as the intake of knowledge provided by teachers, and a learning orientation towards testing one's capabilities and gaining credentials or certificates. The use of deep processing, self-regulation, a learning conception in which learning is seen as constructing one's own knowledge, and a personally interested orientation together define the *meaning-directed learning style*. Students with this learning style wish to find out what is meant exactly in their learning materials and interrelate what they already know. The *application-directed learning style* combines concrete processing, a learning conception in which the use of knowledge is stressed, and a vocation orientation. Students with this learning style try to apply what to learn to actual, real-world settings.[3,10]

There are several studies on the learning styles of medical students. According to Olmstead, medical students had two styles – independent and dependent.

Freshmen were science-oriented, people-oriented or extrinsically oriented.[11] In the Johns and Smith study, medical students were either internally directed or externally directed, while Plovnick used the Kolb instrument to describe two types of medical students: abstract-concrete and active-reflective.[11] Newble and Gordon using Entwistle's *Lancaster Approaches to Learning Inventory* indicated that the first-year, third-year, sixth-year medical students had high scores on reproducing orientation. The first-year students had low scores on meaning orientation, but the score from students in later years showed a progressive rise.[12] Chessell[13] using Entwistle's *Short Inventory of Approaches to Learning* reported that first-year medical students had high scores on achieving, meaning scales and prediction for success.

Paul, Bojanczyk and Lanphear[11] conducted a study on learning preferences of first-year, second-year, and fourth-year Arabian medical students. They found that students preferred teacher-structured learning experiences dealing with concrete and applied tasks, rather than abstract tasks.[11] Recently, Kalaca[5] used the Vermunt's inventory of learning styles for identifying four learning styles of Turkish medical students.

Medical education in Vietnam is confronted with urgent requirements to update and renovate its medical school pedagogy and thus more effectively meet the needs of society. A pressing problem (among several) is to improve upon teaching and learning methods.[14] Many improvements have been recently made in Ho Chi Minh City University of Medicine and Pharmacy such as training lecturers on curriculum design and evaluation, active teaching-learning methods, student assessment, and developing learning materials. Some evaluations have been conducted on teaching methods and student assessment, but there has been no previous research on learning styles of Vietnamese medical students. The main aim of the present study, therefore, was to assess the learning styles of medical students at Ho Chi Minh City University of Medicine and Pharmacy and to study any cross-sectional differences (by year of enrolment) that there may be. Accordingly, the aim was to administer *Vermunt's Inventory of Learning Styles* (ILS) to medical students from the first to sixth year.

Methods

Participants

The sample was composed of 856 medical students (147 first-year, 144 second-year, 144 third-year, 136 fourth-year, 148 fifth-year, and 137 sixth-year students) from the Faculty of Medicine, Ho Chi Minh City University of Medicine and Pharmacy. The mean age of students was 22. There were approximately an equal number of male (55%) and female students (45%). The students were invited to respond voluntarily to the questionnaire at the end of lectures or after skills training sessions. The response rate was 91%.

The inventory of learning styles

The instrument was the 100-item Vermunt's ILS tested successfully by cross-sectional and longitudinal studies across different higher education environments.[4,5,9,10,15] The ILS had two main parts. Part A refers to study activities including *processing strategies* and *regulation strategies*. Part B refers to *learning orientations* and *learning conceptions*. Each of these four components comprised five subscales. Each subscale was determined by four to six items (Table 1). Each item was a statement in which participants were required to indicate on a 5-point scale to what extent the statement was appropriate for them: 1 = "disagree entirely" to 5 = "agree entirely" (in Part A) or "I do this seldom or never" to "I do this almost always" (in Part B). The ILS was translated into Vietnamese, corrected and reviewed by language experts and pilot tested before used in the main study.

Achievement classification

Students were required to indicate their achievement classification of the previous school year or the previous semester (for the first-year students).

Analyses

Descriptive analyses were used to calculate means, standard deviations of items and subscales. Cronbach's alpha coefficients were computed to determine the internal reliability of the Vietnamese inventory of learning styles (VILS). Principal components factor analysis with Varimax rotation was performed to investigate the structure of Vietnamese medical students learning styles. Multiple regression analyses were carried out to explore interrelationships of learning components. One-way ANOVA procedures

with Tukey tests were performed to explore differences in learning styles among school years. In this analysis, scores of subscales of the VILS were dependent variables, and the school year (year 1 to year 6) was the independent variable. Finally, one-way ANOVA procedures were performed with scores of subscales as dependent variables and the achievement classification as the independent variable to investigate differences in learning styles among achievement classifications. For this analysis, the achievement classifications were divided into three groups. Group 1 included "Excellent", "Good" and "Fair"; group 2 included "Fairly Average"; and group 3 had "Average" and "Unsatisfactory".

Results

The reliability alphas for four components and subscales are presented in Table 1. The Cronbach's alphas were good for processing strategies (0.86), regulation strategies (0.71), learning orientations (0.72), and

Table 1. Number of items in each subscales (*k*), item means (*M*), standard deviations (*SD*) and Cronbach's alpha coefficients of scales.

	k	M	SD	alpha
Processing strategies				**.86**
Deep processing		2.70	.71	.84
Relating and structuring	6	2.98	.76	.77
Critical processing	4	2.43	.82	.73
Stepwise processing		2.82	.51	.58
Memorizing and rehearsing	5	2.94	.67	.50
Analyzing	5	2.70	.57	.35
Concrete processing	5	3.12	.74	.72
Regulation strategies				**.71**
Self-regulation		2.78	.70	.82
Learning process and results	6	2.80	.75	.73
Learning content	4	2.75	.82	.75
External regulation		2.94	.55	.63
Learning process	5	2.97	.63	.43
Learning results	5	2.92	.66	.52
Lack of regulation	5	2.56	.72	.60
Learning orientations				**.72**
Personally interested	5	3.58	.52	.34
Certificate directed	5	2.84	.78	.65
Self-test directed	5	3.72	.83	.72
Vocation directed	5	4.20	.60	.56
Ambivalent	5	2.95	.74	.55
Learning conceptions				**.83**
Construction of knowledge	5	3.98	.59	.68
Intake of knowledge	5	3.65	.67	.54
Use of knowledge	5	4.36	.56	.70
Stimulating education	5	3.92	.78	.81
Co-operative learning	5	3.78	.79	.75

learning conceptions (0.83). The alpha coefficients for domain subscales were good. The subscales personally interested (0.34), external regulation of learning process (0.43) and analyzing (0.35) had low values. These also found in previous studies such as personally interested (0.57) and external regulation of learning process (0.48) in Vermunt's study and in the Turkish study, personally interested (0.22) and vocation-oriented (0.46) in the Indonesian study, personally interested (0.54), external regulation of learning process (0.46) and certificate-oriented (0.49) in the British study.[3-5,9,10] The factor analysis resulted in four factors with loadings of subscales (Table 2). Factor 1 (meaning-directed learning style) contained relating and structuring, critical processing, concreting processing, self-regulation of learning processes and learning contents, construction of knowledge, and personally interested. However, it also contained reproductive elements such as analyzing, memorizing and rehearsing, and external regulation of learning results. Factor 2 (passive, undirected learning style) was stimulating education, co-operative learning, use of knowledge, intake of knowledge, construction of knowledge, vocation directed and lack of regulation; no loading from processing and regulation strategies. Factor 3 (application-directed learning style) consisted of self- test directed, vocation directed, personally interested, construction of knowledge, use of

Table 2. Principal components analysis with rotation to the normalized varimax criterion.

	F1	F2	F3	F4
Processing strategies				
Deep processing				
Relating and structuring	**.83**			
Critical processing	**.82**			
Stepwise processing				
Memorizing and rehearsing	.43			**.53**
Analyzing	**.57**			.38
Concrete processing	**.74**			
Regulation strategies				
Self-regulation				
Learning process and results	**.83**			
Learning content	**.75**			
External regulation				
Learning process				**.77**
Learning results	.27			**.72**
Lack of regulation		.28		
Learning orientations				
Personally interested	.23		**.64**	
Certificate directed	-.30		.28	**.41**
Self-test directed			**.74**	
Vocation directed		.39	**.65**	
Ambivalent				
Learning conceptions				
Construction of knowledge	.43	.41	**.45**	
Intake of knowledge		**.49**		.32
Use of knowledge		**.56**	.42	
Stimulating education		**.77**		
Co-operative learning		.64		
Eigen value	4.8	2.9	1.7	1.3
% explained variance	24.0	14.4	8.5	6.4
Cumulative %	24.0	38.4	46.9	53.3

knowledge, and certificate directed; no loading from processing and regulation strategies. Factor 4 (reproduction-directed learning style) was composed of external regulation of learning processes and learning results, memorizing and rehearsing, analyzing, certificate directed and intake of knowledge.

Regression analyses of interrelations among learning components indicated that self-regulation was positively related to deep processing and concrete processing, construction of knowledge and use of knowledge ($p < 0.01$). External regulation was positively linked to stepwise processing ($p < 0.01$). Lack of regulation was not related to any processing strategies. Use of knowledge was positively related to deep processing and concrete processing ($p < 0.01$). Certificate orientation was positively linked to stepwise processing, external regulation and negatively linked to deep processing and concrete processing ($p < 0.01$). Intake of knowledge and stimulating education were positively related to external regulation and lack of regulation ($p < 0.01$). Vocation orientation was positively linked to external regulation ($p < 0.05$). Significant differences in learning styles were found chiefly between first-year and second-year students (freshmen) and fifth-year

Table 3. Subscales means of VILS for the first-year to six-year students and *F* ratio

	Year 1 (*n*=135)	Year 2 (*n*=136)	Year 3 (*n*=129)	Year 4 (*n*=125)	Year 5 (*n*=133)	Year 6 (*n*=124)	*F* ratio
Processing strategies							
Deep processing	28.29	26.12	27.27	26.43	28.68	28.24	2.96**
Stepwise processing	28.97	26.47	27.76	28.22	28.66	28.11	3.99**
Concrete processing	15.70	14.65	15.44	15.51	16.20	15.94	2.86*
Regulation strategies							
Self-regulation	28.91	26.03	28	26.58	28.47	28.88	4.02**
External regulation	28.64	29.04	29.30	29.78	29.20	30.50	NS
Lack of regulation	11.97	12.74	12.68	13.22	12.38	13.19	2.33*
Learning orientations							
Personally interested	17.79	17.63	18.06	17.63	17.89	18.10	NS
Certificate directed	13.40	14.38	14.15	14.26	13.94	14.96	2.3*
Self-test directed	19.05	18.43	18.67	18.10	18.46	18.50	NS
Vocation directed	21.06	20.69	20.05	20.80	21.36	20.90	NS
Ambivalent	13.94	14.93	14.76	15.20	14.20	15.35	0.1*
Learning conceptions							
Construction of knowledge	20.04	19.65	20.01	19.45	20.11	19.81	NS
Intake of knowledge	17.61	17.67	18.28	18.42	18.53	18.96	3.17**
Use of knowledge	21.36	21.24	21.85	21.69	22.55	21.82	3.40**
Stimulating education	18.93	19.51	19.81	19.28	19.92	20.05	NS
Co-operative learning	18.54	18.62	18.83	19.02	19.17	18.65	NS

* $p < 0.05$, ** $p < 0.01$

and sixth-year students (final-years students) (Table 3). Results showed that final-years students employed more deep processing, concrete processing, self regulation, use of knowledge, but more stepwise processing, certification orientation, intake of knowledge than freshmen. Table 4 depicts differences in learning styles among achievement classifications. The results demonstrated that there were significant differences among achievement classifications on deep processing ($p < 0.01$), concrete processing ($p < 0.05$), self regulation, lack of regulation, certificate orientation, ambivalent orientation, construction of knowledge, and use of knowledge ($p < 0.01$).

Moreover, students with higher achievement classifications had higher mean scores of deep processing, concrete processing, self-regulation, construction of knowledge, and use of knowledge but lower certificate and ambivalent orientation.

Discussion

The main findings of the present study are: (1) Learning styles of medical students can be assessed by the 100-item *Vermunt's Inventory of Learning Styles*; (2) Factor analysis resulted in four, theoretically meaningful and cohesive factors with adequate reliability; (3) Final-years students employed more deep processing, concrete processing, self regulation, use of knowledge, but more stepwise processing, certification orientation, intake of knowledge than did the freshmen; and (4) Students with high achievement classifications trended towards high quality learning activities.

The alpha reliabilities of most subscales of VILS were adequate to good. The subscales *personally interested*, *external regulation of learning process* and *analyzing* showed low values. The main reason might be translation. First, some items of these subscales were difficult to find equivalent words in Vietnamese (e.g. "I do these studies out of sheer interest in the topics that are dealt with, I analyze the successive steps in an argumentation one by one", etc). Second, characteristics of items reflected differences of learning cultures between Vietnam and Western countries.[4,16] For instance, if a Vietnamese student likes to study, he will be hard-working and not view his study as relaxation.

Table 4: Subscales means of VILS for achievement classification and *F* ratio.

	Good & Fair (*n*=277)	**Fairly Average** (*n*=325)	**Average & Unsatisfactory** (*n*=116)	***F* ratio**
Processing strategies				
Deep processing	28.31	27.33	25.45	6.84**
Stepwise processing	28.23	28.31	27.02	NS
Concrete processing	15.60	15.70	14.73	3.24*
Regulation strategies				
Self-regulation	28.64	27.67	25.71	7.63**
External regulation	29.17	29.47	29.22	NS
Lack of regulation	12.42	12.47	13.97	8.69**
Learning orientations				
Personally interested	17.88	17.88	17.45	NS
Certificate directed	13.46	14.00	15.53	12.60**
Self-test directed	18.45	18.71	18.45	NS
Vocation directed	21.18	21.01	20.61	NS
Ambivalent	14.21	14.71	15.67	6.64**
Learning conceptions				
Construction of knowledge	20.00	19.99	19.00	5.61**
Intake of knowledge	18.08	18.17	18.45	NS
Use of knowledge	21.96	21.81	20.85	6.12**
Stimulating education	19.77	19.42	19.22	NS
Co-operative learning	18.70	18.93	18.84	NS

* $p < 0.05$, ** $p < 0.01$

Third, learning habits of students might influence their answers. For the *analyzing* subscale, there were three statements mentioning directly analyzing activities in students' learning process. In Vietnam, lecturers usually provide students all necessary information, and students are passive receivers. Students mainly memorize knowledge to temporarily deal with examinations.[14] They might not do many analyzing activities in their real learning. Moreover, there may be differences between Western and Eastern analytic and synthetic thinking processes.[17] So students might be confused when indicating their answers with those statements. Further study should be done to improve the Vietnamese internal consistency of the VILS.

Factor analysis identified four learning styles of Vietnamese medical students. These factor structures were generally similar with Vermunt's original study. There were differences with those Vermunt found in Dutch students, however. First, in Vermunt's study all factors were defined by at least three learning components. In the present study, the meaning-directed learning style and the reproduction-directed learning style were defined by four learning components. These results were found in Dutch regular university students and in British students. Two these learning styles were equivalent with the deep and surface learning approaches that have been widely reported.[9,10] However, Vermunt's model of learning provides a fuller characterization of these learning styles and complements metacognitive aspects of learning.[9] The passive undirected learning style was determined by three learning components, but mainly by learning conceptions. This learning style was similar with the passive idealistic learning style obtained with Indonesian students.[4] The application-directed learning style was not typical as Vermunt described. A mixture of the application-directed and reproduction-directed learning style was determined by learning orientations and learning conceptions. This result was quite similar with studies in Indonesian students, British students and Turkish students.[4,5,9]

From the structures of the third and fourth factor, it was concluded that learning orientations and learning conceptions showed less integration with processing strategies and regulation strategies in Vietnamese medical students. A similar result was reported with Indonesian students.[4] The reason might be that students had not well developed learning methods during their learning process.

The next difference in factor structures was that subscales of a learning component concentrated on the same factor, while in Vermunt's study, these subscales spread over different factors. For instance, factor 1 (meaning-directed learning style) consisted of all five subscales of processing strategies. This means that Vietnamese medical students employed deep processing, concrete processing and stepwise processing together. A similar result found in Indonesian and Turkish students and Chinese students might reflect some common characteristics of learning and teaching in Asian countries.[4,5] Those were the general structure of the conventional educational system (lecture-based, strong external control, mostly toward examination, requiring memorization)[18] and relationship between teachers and students (teacher-centered and passive receivers).[4] Furthermore, Western educators view memorization and understanding as opposites, and repetitive learning is rote-learning, while in Eastern opinions, memorizing and understanding are closely related, one being able to enhance the other.[19] For Asian students, memorizing as well as repetitive learning have the intention to understand the meaning, are not rote-memorizing.[20,21] Besides, there was empirical evidence that repetition played a major role among Vietnamese learners, but this was not accompanied by deficits in deep learning strategies or in less critical thinking.[22]

Results of interrelations among learning components were fairly similar with the previous studies,[5,9,10] thus providing validity evidence of the VILS. Findings indicated that external regulations were linked to both deep processing and concrete processing. Similar results were reported with British students and Turkish students.[5,9] This implied that Vietnamese students expected a shared responsibility for performing the learning function between teachers and students.[23] Therefore, students needed assignments, exercises, instructions of teachers to help them use deep and concrete processing.

External regulations were also positively linked to construction of knowledge, stimulation education, and vocation orientation which Vermunt did not find

in Dutch students. This confirmed again teachers' roles in providing more support for Vietnamese students to help them to build up their knowledge, use learning strategies, and orient their career.

Regarding learning styles among school years, final-years medical students employed more high quality learning activities such as deep processing, concrete processing, self regulation, use of knowledge. A similar result was found in Dutch students.[24] However, a unexpected trend was that stepwise processing, certification orientation, intake of knowledge were higher at clinical stages, while these subscales of Dutch students and Turkish students were decreasing.[5,24] The reason might be that heavy workloads and high stakes assessments at final years were the unconcerning factors that influenced students towards using reproduction learning approaches in order to keep up the coming exams.[25] In our cross-sectional study, we cannot measure which students' learning styles change over time, and how they change. Therefore, further longitudinal studies are needed to follow changes in learning approaches of medical students when they progress from the beginners to the graduates.

For learning styles among achievement classifications, results of the present study showed that students with high achievement classifications tended towards high quality learning activities. The finding was very similar to Vermunt's with Dutch students. However, this study could not analyze relationships between learning styles and academic success. Further study of correlations between learning styles and academic success is needed.

Implications

To form active learning is a long process. The present study indicates that the university needs to review objectives, workload and administration of the curriculum, teaching methods, assessments and to create a facilitative learning environment to encourage students to develop effective learning styles.[24,26] In Ho Chi Minh City University of Medicine and Pharmacy, we consider that teaching-learning methods renovation must begin first with teachers. Improving teachers' capacity in teaching methods will influence directly students' learning process. Therefore, teachers must be trained more on professional competence as well as medical education to become skilful teachers.[14] For teachers, it is important to apply various teaching and assessment methods to motivate students towards active learning and transfer gradually the responsibility for performing learning function to students.[23] Finally, it is essential to equip students with active learning methods: Vietnamese learners need to be more active, self regulated, self-directed to follow up and equal development of advanced world.

Conclusion

Learning styles of Vietnamese medical students were relatively similar to Asian students, but there were some differences from European students. While the psychometric characteristics of the VILS were similar in the present study to other results, there were also interesting differences in the factor structures. More study should be undertaken to investigate this further with Vietnamese medical students. Moreover, further research should be undertaken to investigate the extent that purposeful teacher behaviours can influence Vietnamese medical students to develop deep processing, self-directed learning styles.

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