

# Learning Preferences to Physiology of Undergraduate Students in a Chinese Medical School

Yuemin Ding<sup>a</sup>, Jianxiang Liu<sup>a</sup>, Hong Ruan<sup>a</sup>, Xiong Zhang<sup>b</sup>

<sup>a</sup>*Department of Biotechnology, School of Medicine and Life Science, Zhejiang University City College, Hangzhou, China*

<sup>b</sup>*Department of Physiology, School of Medicine, Zhejiang University, Hangzhou, China*

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## Abstract

Students learning may be classified according to the sensory modalities using VARK instrument, which categorizes learning modes as visual (V), auditory (A), reading-writing (R), or kinesthetic (K). We administered the VARK questionnaire to our second-year medical students, and 98 of 133 students (74%) returned the completed questionnaire. Only 14.3% of the students preferred a single mode of information presentation. In contrast, most students (85.7%) preferred multiple modes of information presentation. Knowing the students preferred modes and using web-based learning system may help the instructors to tailor to the student's individual preference in the teaching of medical science.

**Index Terms:** learning modes; medical education; physiology

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## 1. Introduction

Today's undergraduate students represent a broad spectrum in terms of learning modes. This diversity presents a challenge for teachers to meet the educational needs of all students. It is reported that when instruction is adapted to student learning styles, student motivation and performance improves[1]. Thus, because students have significantly different learning modes, it is the responsibility of the teachers to address this diversity of learning modes among students and develop appropriate learning approaches[2].

A learning mode is the complex ways that students most efficiently and most effectively perceive, remember, and recall what they are attempting to learn[3]. Specifically, the students' preferred mode of learning in terms of the sensory modality is the characterization of learning styles. There are four major sensory modes of learning: visual (V), aural (A), reading-writing (R), and kinesthetic (K), which is called the VARK instrument. Although students can use all of these sensory modes of learning, one mode is often dominant and preferred. Briefly, visual students learn through seeing pictures, animations and other image-rich teaching tools. Auditory students

learn by listening to lectures. Reading-writing students learn through interaction with textual materials, whereas kinesthetic students learn through touching and experiences.

Physiology is the discipline focusing on the biological manifestations of the normal body. How organisms function and respond to and deal with changes in their environment is particularly difficult to master by students as it implies complex integrative regulatory mechanisms involving different organs. Traditionally, the learning of physiology at medical schools has relied heavily on classroom lectures. More recently, with changes to the medical curricula globally, it is increasingly being taught in a number of different ways, ranging from web-based distance learning, problem based learning, experiment based learning and a combination of many processes. A current trend on physiology education is to highlight ways in which the teaching of physiology can be successfully integrated into both traditional and web-based learning orientated curricula.

The advantage of web-based support of instruction by making all teaching materials, including visual, aural and reading-writing materials, available 24 hours per day, 7 days per week, may meet the needs of different students with various learning styles and help teacher to develop appropriate teaching approaches.

Since we introduced the Blackboard learning system as the web-based support platform in the course of physiology, we were interested in learning the preferred learning styles of our medical students in the course of physiology so that we could develop appropriate teaching approaches. To achieve this goal, we designed a descriptive study. The rationale for this descriptive study was to help us design a lesson plan that addressed all students and to identify areas for further research.

## **2. Methods**

### *2.1 Design*

The VARK questionnaire was designed to investigate the preferences of students for particular modes of information presentation and was administered to our second-year medical students to determine their preferred modes. The questionnaire was included with the class packet for the physiology course, and 98 of the 133 students (74%) returned the completed questionnaire. The questionnaire was administered on the Blackboard platform so that it can be completed online. The analysis of the questionnaire was completely managed on this virtual learning environment.

### *2.2 Procedures*

The questionnaire was administered at the end of our medical physiology class at Zhejiang University City College, School of Medicine and Life Science. The class consisted of 133 second-year medical students.

### *2.3 Analysis*

The number of students who preferred each mode of learning was divided by the total number of responses to determine the percentage of students in each category.

## **3. Results**

The data shown in table 1 indicate that more than 80% of the total 98 students preferred visual modes (video and/or animation) and traditional reading-writing modes of teaching information presentation (blackboard and/or handouts). The kinesthetic mode (learning from experiments) was preferred by 76.5% of the students. Only 64.3% preferred auditory mode (sound record). In the present study, 14.3% of the students preferred a single

mode (either unimodal V, unimodal A, unimodal R or unimodal K) of information presentation, while the majority of students (85.7%) preferred multiple modes (multimodal) of information presentation.

Taking unimodal and multimodal together for consideration as 100%, 16 students preferred two modes (bimodal, 16.3%), 19 students preferred three modes (trimodal, 19.4%), and 49 students preferred four modes (quadmodal, 50.0%). The percentage distribution of single mode preference was as follows: unimodal V (4.1%), unimodal A (1.0%), unimodal R (5.1%) and unimodal K (4.1%). Fig. 1 presents the percentages of students who preferred single, two, three, or four modes of information presentation.

Of the 84 students (85.7% of respondents) who preferred multiple modes of information presentation, 49 students preferred four modes (VARK 58.3%). The percentage of students preferring other modes in descending order were VAR (9.5%), VRK (9.5%), RK (7.1%), VK (6.0%), ARK (2.4%), VAK (1.2%), AR (1.2%), VA (1.2%) and AK (0%) (Fig. 2).

Table 1. Overall learning preferences to physiology of 98 medical students

Learning preferences		No. of students	Percentage
Visual (V)	Video And/or Animation	79	80.6
Aural (A)		63	64.3
Reading- Writing (R)	Blackboard and/or Handouts	82	83.7
Kinesthetic (K)		75	76.5

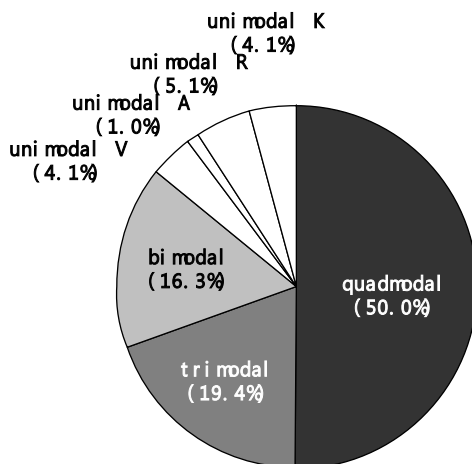


Fig 1. Overall learning mode preferences of medical students

Be consistent with the above results, when asked about the traditional classroom lectures, 96.6% of the students preferred Powerpoint (PPT) slides show, which may include amount of teaching approaches related to different sensory modes, such as pictures, animations, flashes, videos, etc. Of the students who preferred PPT presentation, some students preferred the combination of PPT and blackboard drawing (48.2%), some students preferred the combination of PPT and discussion (29%), and some students preferred PPT alone (19.4%), only 3.4% of them preferred blackboard drawing or discussion alone

#### 4. Discussion

In the present study, we administered the designed questionnaire to our second-year medical students to determine their preferred modes of information presentation. Ninety eight of the 133 students (74%) returned the completed questionnaire. Only 14.3% of the students preferred a single mode of information presentation (either visual, auditory, Reading- writing, or kinesthetic). Most students (85.7%) preferred multiple modes of information presentation. These students may be inclined to receive information containing all four sensory modes. Besides, they are more easily to adapt to different teaching styles. For example, it could be visual in cardiovascular physiology and reading-writing in respiratory physiology. Thus most students may benefit from active learning strategies over the traditional lecture format. Active learning strategies reach all types of students in the visual, auditory, reading-writing, and kinesthetic schemes. While the traditional classroom lecture format assumes that all students are auditory students. Furthermore, all students were assumed to acquire the same information presented orally at the same pace without communication with the teacher in the traditional classroom.

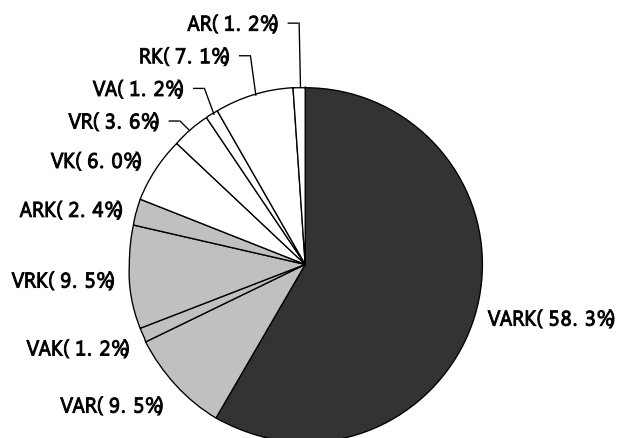


Fig 2. Students with multimodal learning style preferences

Knowledge of the students' learning modes may provide a focus for developing strategies that are tailored for individual students[4]. It may help the teachers overcome the predisposition to treat all students in a similar way, thus helping them to identify and solve learning problems among the students. The VARK questionnaire was selected for its simplicity and for its relevance in the determination of learning modes in undergraduate curriculum. The questionnaire can motivate teachers to reach more students because of the better match between teacher and learner styles, by moving from their preferred modes to using others[5].

When analyzing the learning modes, 80.6% of the medical students preferred visual modes of teaching information presentation. These students preferred information to arrive in the form of graphs, charts, videos and animations. They were sensitive to changing spatial arrangements[6]. Similarly, 83.7% of the students preferred reading-writing modes of teaching information presentation. They preferred receiving information by printed or written words. The kinesthetic mode was preferred by 76.5% of the students. These students were satisfied by manipulating models, role playing[7] and experiments. Only 64.3% preferred auditory mode. Auditory students are reached through discussion during peer instruction [8], collaborative testing[9], debate, games[10], and answering questions[11]. Most students are able to learn effectively when the teacher provides a blend of visual, auditory, reading-writing, and kinesthetic activities. However, some students prefer one of the modalities over the other three. To meet the need of each individual student, teaching should be multisensory and filled with variety. To achieve this goal, it becomes extremely important to use active teaching strategies.

The blackboard learning system has been introduced in the teaching of physiology from the spring of 2009. It enable us to load a vast array of learning materials to make sure each student can find the kind of materials that best suit his/her learning style. This feature helps students to become strategic learners by stressing the relations between educational contents and curriculum objectives. The use of such varied multimedia materials also facilitates the learning of abstract concepts, which are particularly prominent in Physiology course.

In conclusion, the VARK questionnaire identifies student's preferences for particular modes of information presentation. Students have significantly different learning styles; it is the responsibility of the teacher to address this diversity of learning styles among the students and develop appropriate learning approaches. Knowing the students' preferred modes can enrich the learning experience. The use of web-based multimedia materials facilitates both teachers and students in teaching and learning process in Chinese medical schools.

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