

# How do Medical Students Learn?

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## Abstract

**Background & Objectives:** In this paper, we try to define learning, to describe how retention of memorized material can be improved and to describe how to help students improve clinical reasoning and problem solving skills. The goal of teaching is to improve learning, but how do we know that students are learning in the proper way? **Methods:** We depend on our experience in medical and clinical teaching of our undergraduate and postgraduate students during implementation of the curriculum. We interview 1<sup>st</sup> year (preclinical) and 6<sup>th</sup> year medical students by certain questionnaires (VARK) in order to know their learning methods and their knowledge about the styles of learning and the techniques of learning. Learning is viewed here as developing a way of thinking and acting that is a characteristic of an expert physician. Such a way of thinking consists of three important elements: We utilize Working Memory in 3 main approaches: First, attention in a way through questions, focus attention and uses of first letter of statement of the word; Second, rule of 7 (Teach < 7 steps); Third, concentration on important relevant materials. We have to keep in our mind that even if we remember something, it doesn't mean we understand it. In addition, the case learning approach & problem solving learning approach are the methods used and we try to be cooperative, active, and experimental and the student must be self directed and the students should be competent in his learning methods, most are confident of their ability. **Results:** Most of the first year students have poor knowledge in regards to style & learning techniques. For final year students around 30% learn two styles and 20% trimodel, especially more in female students, 10% mention single model in their learning and the remaining learn by Quad modals. In conclusion, learning how to learn must be a standard part of the curriculum in medical school, and student must be aware of that.

## Keywords

Learning Style, Learning Methods, Questionnaires, Medical Students

## 1. Introduction

Learning is viewed here as developing a way of thinking and acting through 3 elements: Knowledge, Thinking activities through the use of knowledge to interpret situation, Thirdly to be active in utilizing them. Elements of any educational programme depend on 3 pillars: The students, the teachers and the curriculum. The key task for a teacher is to decide what the student should learn, and this can be specified as learning outcomes, competencies and entrustable professional activities. The decision about the curriculum, teaching and learning methods and assessment is informed by the expected learning outcomes and competencies [1]. Medical students during the process of their learning must have 3 characters to establish good learning behavior: works in ethics, dedication & self confidence. Thus Learning Style is the process by which a person understands and retains information, thereby gaining knowledge or skills [2]. In the process of teaching and learning, the student's memory can be improved through increasing attention of the students by creating question and sometime we use the first letter of the statements or we can use rule of 7 (Teach < 7 steps), at the same time we have to concentrate on important relevant materials [3]. The learning revolution in higher education all over the world has resulted in a shift of paradigms from teacher-centered to learner-centered pedagogical approaches. Thus, different methods have been incorporated into classrooms to enhance student learning and replace teacher-led lectures as the predominant means of students in processing and analyzing information and making better decisions rather than merely transmit knowledge [4].

According to Pashler, Mc Daniel, Rohrer, and Bjork (2009), the term learning skill refers to the view that different people learn information in different ways, and also refers to the concept that individuals differ in regard to what mode of instruction or study is the most effective for them [5] [6]. Medical teacher should understand the style of learning that is utilized by medical students in acquiring the knowledge, and there are three learning theories:

- 1) Adult Learning Theory (Mal Colm) [4],
- 2) VARK by Neil Fleming [7],
- 3) Experimental Theory (Learning Style Kolb's model) [8]

This Experimental learning theory, developed by David Kolb, demonstrates the importance of individual learning styles in improving learning. This study helps elucidate the way in which medical students, surgical residents, and surgical faculty learn. The Kolb Learning Style Inventory, which divides individual learning styles into Accommodating, Diverging, Converging, and Assimilating categories [4] [5] [6] [7].

- 4) Inventory and Gardner's Multiple Intelligence Theory [9].

We concentrate in this study on VARK questionnaire in understanding how medical students learn depending on the preference of the students in learning by seeing, hearing, or reading/writing and by practice and interactions and performing activities. In VARK, we also assess and teach, the need of students including their knowledge, skill and attitude. Every clinical student should know and how can apply 5 important learning techniques [10]:

1) Testing & enhanced testing: Testing has been shown to more effectively improve knowledge retention compared with less active forms of studying, such as rereading information or rewatching lectures

2) Spaced-Repetition: The key concept is that spacing your studying and self-testing over time as opposed to massing, also known as “cramming”, will flatten your forgetting curve and help you retain information longer.

3) Interleaved Technique: Traditional methods of learning are through massed practice, and only have short term effectiveness, as in spaced repetition, interleaving may not be as effective in the short term but is more effective in the long term. All these 3 techniques will add improvements in long-term performance and you learn more efficiently.

4) Memory associations: during my lectures to medical students I can't recall the name of all students, but I can remember their names if the group is small during role play and during bedside teaching in hospital and also I can remember all the time the name of the medical student, who helps me during the presentation of my lectures and also the name of brilliant students and the name of students with poor clinical performance. The more associations you can form to something you're trying to learn, the more likely you are to remember it in the future because there are more paths you can take to retrieve it.

5) Fogg Behavior Technique [11]: Stanford behavioral scientist B. J. Fogg reduces behavior change to three variables: motivation, ability, and trigger. If you think about any behavior, e.g. learning and studying, you need a certain level of motivation and ability, followed by a trigger, to implement the behavior. Finally in medical schools students should experience that long-term retention of factual knowledge is important and this particularly, if it is associated with procedural knowledge and learning and forgetting is the unpleasant side of learning [12]. Scientific knowledge of how to learn and acquire factual knowledge should be a standard part of the curriculum in medical school. In this paper, we present our review of how to successfully learn and retain knowledge and let medical students to know the type of learning techniques.

## 2. Subjects & Methods

This study performed at the department of medicine and at the college of medicine during the year 2016. An established evaluative tool, the VARK Learning Style methods was administered by questionnaire protocol paper to 2 groups of medical students: One first year pre-clinical undergraduate medical class (N = 50); and the second is 6<sup>th</sup> year clinical undergraduate medical class (N = 50). The survey and explanatory materials were distributed to the groups personally. Each participant was offered to receive the result of their survey as well as an explanatory sheet on learning styles. Two third of the students are female medical students & the other are male. In addition to the questionnaire, we ask the students about their knowledge of the study techniques. We use P value to measure the difference between students.

Results: No single student from the first year class has, ever any knowledge regarding

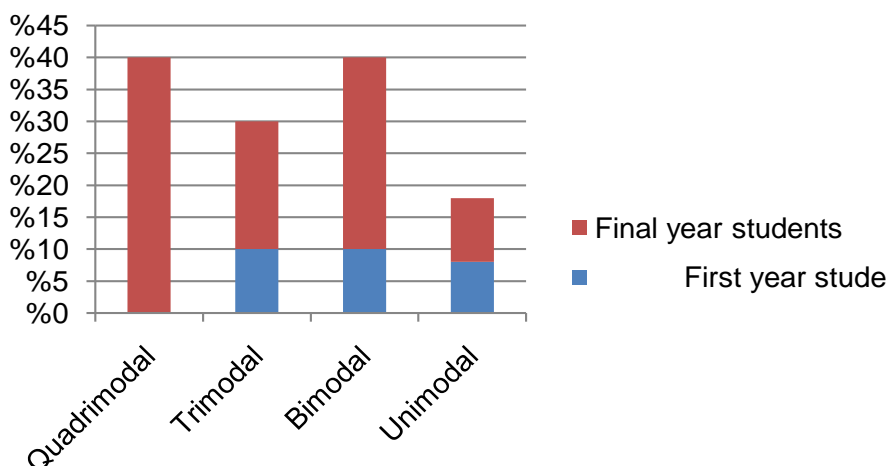
the learning style, learning theories and the proper study techniques and they mentioned that, their main methods of learning are either visual and reading and writing and in addition around 10% they mention the auditory method as one of their learning style and in general, students are largely unaware of how to learn successfully and improve memory, meanwhile and after we explain the methods of learning to them, we get some of the following results: 10% three models of learning, 10% two modals and 80% single modal of learning mainly visual **Table 1**, **Figure 1**, and **Figure 2**. There is no significant difference in regards to the gender of these students, **Table 2**. The 6<sup>th</sup> year undergraduate Students have poor knowledge in regards to style & learning techniques and Around 30% two style including visual & kinaesthetic and 20% trimodal more seen with female students (statistically significant) and about 5% mention single model.

**Table 1.** Showing the representation of the VARK inventory results for learning styles among (First-year students), & (Final year students) (\*VARK = V visual, A Audition, R Reading Writing and K Kinesthetic).

*VARK modals	Final year students	First year students
Quadrimodal	40%, 20 students	Nil
Trimodal	20% (V, A, K), 10 students	10% (5 students)
Bimodal	30% (V, R, K), 15 students	10% (5 students)
Unimodal	10% (V), 5 students	80% (40 Students)

**Table 2.** Sociodemographic features of the studied students.

Sociodemographic features	First year		Final year	
Age	19 - 20 years		24 - 25 years	
Gender	10 males	40 female	20 males	30 female
Total students	50		50	



**Figure 1.** The representation of the VARK inventory results for learning styles among first-year students & final-year students.

## First year VARK

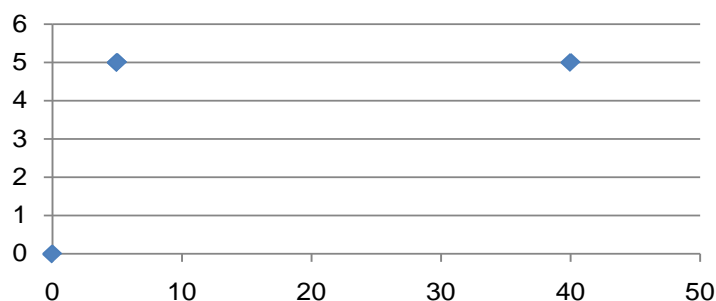


Figure 2. Scattered Diagram of First year students.

### 3. Discussion

The comprehension of how people learn is important in order to improve the teaching and learning methods and circumstances and will improve the student's learning [13]. Our study shows that the predominate learning styles of the students of college of medicine University of Babylon is VARK style. Many models and measures of learning styles have been described in the literature, including Kolb's Learning Inventory and Gardner's Multiple Intelligence Theory Adult Learning Theory (Colm) [4] [5] [6] [7]. In present study in medical school; learning medical sciences involves two parts: one is the theoretical aspects of medical education and the second is the practical and procedural parts, which might include laboratory teaching, simulation and practice, hospital clinical medicine and bedside teaching [14]. We can say it is similar to the traditional way of medical education in medical school which include the stage of basic science, and the the stage of clinical science. In our questionnaires on how medical students learn, we noticed that most of the first year and final year medical students have no knowledge in regards to the style of learning and the techniques used in learning of medical students and we ask them any previous knowledge or experience about the following techniques: Testing effects, Active recall and spaced repetition, and this leads us to consider that these styles and techniques must be part of the curriculum in medical colleges and in previous study on medical education learning how to learn is not a standard part of the curriculum in medical school [15].

We try during the process of learning and teaching of medical students to utilize student's Working Memory in 3 main approaches.

First Attention in a way through questions, focus attention and uses of first letter of statement e.g. a patient presents with jaundice, how you are going to reach a clinical diagnosis? We ask the students to remember the words that begin with the letters from A to J: e.g.

A for appetite, acuteness, abdominal pain etc.

B for history of blood transfusion etc.

Second Rule of 7 (Teach <7 steps, & Numbers aide memory, particularly during powerpoint slide presentation of knowledge).

Third we try to concentrate on important relevant materials and especially through

bedside teaching by data interpretation and problem case discussion and we might use the brain storming techniques. The students should understand the concept that tells before students start to learn, they should be taught how to learn. This idea should become an essential part of the medical curriculum [16] [17].

Learning Style is the process by which a person understands and retains information, thereby gaining knowledge and/or skills [18]. In the present study it is clear, that the predominate learning style for undergraduate medical students is VARK, this goes with idea that A significant improvement in learning style, as evidenced by an increase in mean VARK score and percentage increase of multimodal learners in pre and post tests, and was seen especially, after introduction of PBLs (problem based learning) [19] [20].

In this study on first year medical students, they mentioned that, their main methods of learning are either visual, reading and writing and in addition around 10% they mention the auditory method as one of their learning style and in general, students are largely unaware of how to learn successfully and improve memory, meanwhile and after we explain the methods of learning to them, the students can get some knowledge of learning style, but in one study on first year medical students, they prefer Multiple learning style [21], and in this study 63.9% of the students were found to be multimodal, which means that active learning strategies have to be applied to a greater extent in the first 3 years of our educational curriculum to reach all types of learners. The lack of knowledge of the students on learning style and learning techniques is due to pre- university education system in the country, where students traditionally follow didactic lectures in primary & secondary schools and the Pre-university education is often supplemented with private tuition classes; these could be either small group classes or larger lecture based classes [22]. A similar study met the same latter criteria [23] [24] [25]. The expanding medical knowledge and the advances in the learning styles and learning techniques, raise the issue that, there is a need to review the priorities and preferences of the methods or to find out a different way to use the existing methods to increase their effectiveness, and Before students start to learn, they should be taught how to learn, this idea should become an essential part of the medical curriculum [26]. Finally, medical education needs the collaboration of several healthcare providers and improvement in education processes will be reflected on the improvement of the quality of patients and health care [27].

#### 4. Conclusion

Medical knowledge is expanding and medical learning is also an evolving process, and this will reinforce us to look for more efficient and effective ways of medical education and learning.

#### Recommendations

- 1) Prepare faculty for new learning behavior and change.
- 2) Establish a new curriculum committee and working group belonging to medical

education department.

- 3) Design new methods of learning, e.g. learning modules and defining educational outcomes.
- 4) Seek advice from experts in medical education and learning and even take the experience of other medical schools.
- 5) We have to plan an organized learning methods.
- 6) Train the facilitators of the learning and defining the objectives of a facilitator.
- 7) Introduce students to these new learning programs & curriculums.
- 8) Use 3-learning to support the delivery of these modules.
- 9) Change the assessment methods to suit the new curriculum.
- 10) Encourage feedback from students and teaching staff.
- 11) Manage learning resources and facilities that support self-directed learning of medical students.
- 12) Provide continuing evaluation and make new changes.

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