

Learning styles and their relationship with academic performance in students of the medical surgeon degree

Estilos de aprendizaje y su relación con rendimiento académico en los alumnos de la licenciatura de médico cirujano

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Abstract

Learning styles refer to students' individual preferences for acquiring and processing information, VAK (visual, auditory, and kinesthetic) theory is a way to categorize learning styles based on students' sensory preferences. According to this theory, some students have a preference for visual information, others for auditory information, and others for kinesthetic information. In the context of the surgeon degree, students may show different sensory preferences in their way of learning. Some may learn best through pictures and graphs (visual style), others may benefit more from listening and verbal explanation (auditory style), and others may need to actively engage in physical practices and activities (kinesthetic style). Academic performance is the result of various factors and it is important to offer students a variety of learning strategies that address different styles and promote active and meaningful participation in the learning process.

Keywords: learning styles; academic performance; medical students

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Resumen

Los estilos de aprendizaje se refieren a las preferencias individuales de los estudiantes para adquirir y procesar la información, la teoría VAK (visual, auditivo y kinestésico) es una forma de categorizar los estilos de aprendizaje según las preferencias sensoriales de los estudiantes. Según esta teoría, algunos estudiantes tienen una preferencia por la información visual, otros por la información auditiva y otros por la información kinestésica. En el contexto de la licenciatura de médico cirujano, los estudiantes pueden mostrar diferentes preferencias sensoriales en su forma de aprender. Algunos pueden aprender mejor a través de imágenes y gráficos (estilo visual), otros pueden beneficiarse más de la escucha y la explicación verbal (estilo auditivo), y otros pueden necesitar participar activamente en prácticas y actividades físicas (estilo kinestésico). El rendimiento académico es el resultado de diversos factores y es importante ofrecer a los estudiantes una variedad de estrategias de aprendizaje que aborden diferentes estilos y promuevan una participación activa y significativa en el proceso de aprendizaje.

Palabras clave: estilos de aprendizaje; rendimiento académico; estudiantes de medicina

INTRODUCTION

Throughout the entire life cycle, people are looking for ways to obtain knowledge in the easiest feasible way according to their abilities, with the goal of consolidating learning. Over time, these ways of acquiring knowledge may change, depending on the experiences of each individual and whether or not the methods used meet their expectations; however, the role that learning styles play in the teaching-learning process should not be overlooked (Acurio et al., 2019).

For over forty years, numerous attempts have been made to develop a comprehensive theory of learning. Despite extensive studies, the results so far have not been satisfactory due to the lack of a solid explanation of how learning occurs. Some experts argue that achieving a unified theory of learning is nearly impossible due to the various ways in which learning occurs, influenced by a wide range of elements, such as cognitive, affective and motivational aspects, which are involved in the process (López et al., 2020).

The concept of learning encompasses several dimensions, is complex due to the multiple existing interactions, and is characterized by having diverse connotations. Researchers have addressed several aspects of learning, with profiles, approaches and learning styles being one of the most prominent (Puga, 2020). According to Méndez et al. (2021), identifying or recognizing the learning style of a student represents their greatest academic achievement, as it puts them on the path to the

permanent goal: how to learn. In other words, students learn more effectively when provided with learning scenarios that fit their dominant or preferred learning style, although they sometimes use multiple styles in a complementary manner.

The personality and learning style of people determine how information is perceived and processed during the educational process; these factors are crucial to the student academic performance (González, Córdoba & Forero, 2020). Depending on the learning styles, students face educational challenges using the preferred cognitive channel and adopt different strategies to solve them according to their individual style (Colpas, 2022). Neurolinguistic Programming theory suggests that information that enters each person unconsciously through the senses, but consciously is perceived through a preferred representation system, which may be linked to the sight, the hearing, or the body (Rojas & Calle, 2019).

It is important to note that each person learns in a unique way, using different strategies and learning at different speeds, with distinct levels of effectiveness, even when they share similar motivations, the same age or are studying the same topic (Segura & Quiros, 2019). Knowing how learning styles manifest in undergraduate student groups can be a valuable teaching tool to generate suitable strategies and adapt the teaching style, with the goal of achieving a better academic performance (Arroyave, 2023). In this sense, learning concepts using hypothesis-contrast

processes specific to the clinical context is ideal for good knowledge development (García, 2020).

A crucial aspect of the learning process is how information enters the brain through perceptions, leading the subject to a particular perceptual preference. Humans have three main systems to perceive information: visual, auditory, and kinesthetic (VAK), and they often use one of them more frequently (Cornejo, Desiderio & Morillo, 2019). This model, developed by Rita and Kenneth Dunn (1978), describes visual representation as the process of thinking about images, making it easier to quickly absorb information; hearing representation as the process of internalizing information through listening, in a sequential and structured order; and kinesthetic representation as the process of acquiring information through sensations and movements (Chipana & Delgadillo, 2018).

Studying a degree involves developing expertise, acquiring knowledge, abilities, skills, and competencies, in itself shaping the learnings that will be used at some point to solve problems both in the academic field and in society. A level of quality in applying this knowledge is expected, and this level is reached if the students have specific characteristics or aspects, such as their learning style, the resources available for them, their personal characteristics, the way in which they take advantage of the study time and the unique characteristics of each student. Typically, all of these aspects are reflected in academic performance (Matas, 2019).

According to Villegas, Villegas & Villegas (2018), visual students tend to have organized, orderly, observant, and calm behavior; their learning is based on what they see and often think of images. For auditory students, they usually have ease of speaking, learn through what they hear, like dialogue, remember what they hear, and think of sounds. As for kinesthetic students, their channel of interaction with knowledge is through touch, action, sensations, and they often store information in muscle memory. In a study conducted by Bojorquez & Moroyoqui (2020) with 201 dental students from the Universidad Autónoma de Juárez, learning styles were determined based on how students selected the information. 45.8% of students were categorized as visual, 29.9% as kinesthetic, and 14.9% as auditory, while the rest showed combinations of these styles.

Another study conducted by Llontop (2022) with fourth grade students, aged from 8 to 11 years, examined the relationship between VAK-measured learning styles and academic performance. In this case, 66% of students showed a hearing style, 23% a visual style, and 3% a kinesthetic style, while the rest presented combinations of them. Regarding math performance, no significant differences were found between visual and auditory styles; however, in the area of language, the academic performance showed significant differences between auditory and visual students, with the latter achieving the best grades.

The integration of VAK learning styles into the Medical Surgeon Degree curriculum can provide a more holistic and effective approach to teaching.

Fernandez et al. (2020) suggest that a balanced approach, combining visual, auditory, and kinesthetic methods, can better serve the diverse learning needs of students: this combination allows for a deeper understanding and longer-lasting retention of information.

As a result of the above, there is an increasing educational and didactic interest in learning style preferences in any group of students, using this information to adapt teaching activities, design programs and apply techniques that fit the individual characteristics of the students, in order to achieve a more efficient learning and obtain better results. In this way, it aims to optimize the educational process for the benefit of students.

METHODS, TECHNIQUES, AND INSTRUMENTS

2. Methods, techniques, and instruments

This is a descriptive study with a quantitative approach using a non-experimental, cross-sectional design. The study population is comprised of first semester students of the Medical Surgeon degree from the Universidad Autónoma de Tamaulipas (UAT) south campus, enrolled in the August-December 2023 semester; the sample consisted of 194 non-randomly selected students.

The VAK Test of the Bandler & Grinder Neurolinguistic Programming model will be used for data collection, which will be structured through the Microsoft Forms digital tool; this questionnaire

focuses on three learning channels: visual, auditory, and kinesthetic, allowing an easier understanding of the preferred ways of information input, processing, and output.

It is a model based on the Neurolinguistic Programming (NLP) system, created by psychologist and philosopher Richard Bandler and linguistics professor John Grinder, to describe the dynamics between mind and language and how it affects our body, emotions, and behavior. The aforementioned instrument is composed of 40 Likert-type items, it is an easy-to-use questionnaire, widely distributed in the field of Spanish language education and recently used in essays with undergraduate students in the area of health.

The data obtained will be concentrated in a Microsoft Office Excel data sheet, which will be ordered congruently to be subsequently processed in the SPSS statistical software version 22, systematizing the descriptive results using frequency and percentage tables.

Ethical aspects:

Para garantizar la colaboración y disposición de los participantes en la investigación se cumplirán los To ensure the collaboration and availability of participants in the study, the following ethical criteria will be met: 1) all participants will sign a consent prior to completing the instruments; 2) participants could withdraw at any time; 3) all participants will be informed of the purpose of the research and 4) there will be protection of the personal data of all

participants in accordance with the Ley Mexicana de Protección de Datos Personales (Mexican Act for the Protection of Personal Data).

RESULTS AND DISCUSSION

194 Medical Surgeon degree students were surveyed, with a gender distribution of 122 women (63%) and 72 men (37%), and an average in academic performance of 9.03 (limits: 7.30 and 10.00). Regarding the most common identifications/dominances of learning styles, kinesthetics were for a total of 113 students, visual for 57 students and auditory for 24 students, as shown in table 1.

Table 1. Identification/dominance learning styles by gender

Learning styles	Gender		Total
	Female	Male	
Visual	39	18	57
Auditory	16	8	24
Kinesthetic	67	46	113
Total	122	72	194

To contrast the effects of these dominances, they were grouped by academic performance as follows: Group A, equal to or greater than 9.00 (116); group B, between 8.00 and 8.99 (75) and group C, between 7.00 and 7.99 (3). See table 2.

In group A there were 82 women and 34 men, in group B there were 40 women and 35 men and in group C 3 men. Regarding the distribution by learning style in both men and women, I prefer the kinesthetic style as shown in table 3..

Table 2. Academic performance by gender.

Gender	Group	Average	Total
Female	A	9.00 – 10.00	82
	B	8.00 – 8.99	40
Total			122
Male	A	9.00 – 10.00	34
	B	8.00 – 8.99	35
	C	7.00 – 7.99	3
Total			72
Total	A	9.00 – 10.00	116
	B	8.00 – 8.99	75
	C	7.00 – 7.99	3
Total			194

Table 3. Learning styles by average and gender.

Género	Promedio	Estilo			Total
		Auditivo	Kinestésico	Visual	
Femenino	9.00 – 10.00	7	45	30	82
	8.00 – 8.99	9	22	9	40
Total		16	67	39	122
Masculino	9.00 – 10.00	3	21	10	34
	8.00 – 8.99	5	23	7	35
	7.00 – 7.99	0	2	1	3
Total		8	46	18	72
Total	9.00 – 10.00	10	66	40	116
	8.00 – 8.99	14	45	16	75
	7.00 – 7.99	0	2	1	3
Total		24	113	57	194

As a result of the application of the ANOVA test, no significant differences (0.98) were observed, so the learning style is not related to the academic performance of the students. A comparison was drawn through the Leneve test for the homogeneity of variances (0.093), which means that the variances of the diverse groups are the same.

In a study by Fernandez et al. (2020), the prevalence of VAK learning styles among medical students and their impact on academic performance was explored; a high percentage of students identified themselves

with the visual learning style, followed by auditory and kinesthetic; visual students showed better performance in theoretical subjects, suggesting that teaching methods including graphics, diagrams, and visual presentations may be more effective in medical education.

Academic performance relating to VAK learning styles has been the subject of several studies; Martinez, Garcia & Sanchez. (2021) studied how these styles affect academic performance in Medical Surgeon degree students, revealing that students with an auditory learning style performed better in oral exams and presentations, while kinesthetic students excelled in internships and labs; this finding suggests that adapting assessment methods to learning styles can improve academic performance.

Garcia & López (2019) study highlighted the importance of adapting instructional strategies to VAK learning styles, in order to improve educational effectiveness; the authors suggest the use of a combination of visual, auditory and kinesthetic methods to address different student preferences. For instance, lessons may include visual presentations, group discussions, and hands-on activities to ensure all students have the opportunity to learn effectively.

Implementing pedagogical strategies tailored to VAK learning styles can be challenging, but also offers numerous advantages, in a study by Johnson et al. (2020) a pilot program was described, in which instructors used diversified teaching methods to meet

the needs of students with different learning styles; the results showed significant improvement in academic performance and student satisfaction, indicating that adapting teaching strategies can be highly beneficial.

While adapting pedagogical strategies to VAK learning styles has many benefits, there are also significant challenges and limitations; according to a study by Smith et al. (2018), one of the main challenges is the lack of adequate training for teachers, coupled with the need for additional resources and the time required to develop and apply diversified teaching methods may be limiting. According to Garcia & López (2019), educator training programs should include training in diversified teaching techniques and the use of educational technologies, in order to develop in teachers the necessary skills to create an inclusive and effective learning environment; also, the implementation of diversified teaching methods can be costly and require significant investment in time and resources.

It is imperative that educational institutions implement ongoing evaluation and feedback systems to monitor the effectiveness of pedagogical strategies tailored to VAK learning styles. Martinez, Garcia & Sanchez (2021) recommends the use of formative and summative assessments to measure the impact of these strategies on academic performance and student satisfaction, as well as regular feedback to help continually adjust and improve teaching techniques.

CONCLUSIONS

The findings highlight the importance of considering different pedagogical approaches in the educational context, acknowledging that students learn in diverse ways. Although learning styles are not related to academic performance, strategies that address these differences must be promoted, ensuring an environment of inclusive instruction tailored to the individual needs of students.

The relationship between VAK learning styles and academic performance in undergraduate surgeon students is complex and significant. Reviewed studies suggest that identifying and adapting instructional strategies to learning styles can improve academic performance, information retention and student satisfaction, because, by integrating pedagogical approaches that consider the diversity of learning styles, educational institutions can train more competent and prepared health care professionals.

However, it is essential to continue researching and developing effective methods to apply this knowledge in medical education, in order to better understand how VAK learning styles interact with other educational factors and how they can be effectively implemented in different contexts.

Future studies should focus on developing teacher training programs that allow them to identify and adapt their teaching methods to VAK learning styles. In addition, longitudinal studies are needed to assess the long-term impact of these strategies on academic performance and student satisfaction.

REFERENCES

- Acurio Acurio, S. L., Arotoma De La Cruz, I. L., Huaman Taquila, Y. K., Malásquez Cárdenas, C. S., & Mercedes Aponte, V. J. (2019). Estrategias de enseñanza y aprendizaje para desarrollar el pensamiento crítico.
- Arroyave, C. A. V. (2023). Programas de lectoescritura relacionados con estilos de aprendizaje en educación secundaria: una revisión sistemática de la literatura. *REVISTA INVECOM*, 3(2), 1-11.
- BOJORQUEZ, C. I., & MOROYOQUI, S. G. (2020). Relación entre inteligencia emocional percibida y ansiedad en estudiantes universitarios. *Revista espacios*, 41(13).
- Chipana Mamani, D. M., & Delgadillo Camacho, J. C. (2018). Estilos de Aprendizaje y estilos de enseñanza en el rendimiento académico de las asignaturas de Ginecología y Obstetricia de la Carrera de Medicina de la Universidad Pública de El Alto, gestión 2017 (Doctoral dissertation).
- Colpas, K. J. D. (2022). Modelo VAK: una estrategia para la enseñanza-aprendizaje de la lengua inglesa en estudiantes de cuarto grado. *Revista Unimar*, 40(2), 240-259.
- Cornejo, M. A. N., Desiderio, S. V. E., & Morillo, R. (2019). Estilos de aprendizaje y rendimiento académico en el contexto universitario. *Dominio de las Ciencias*, 5(1), 70-104.
- Dunn, R., & Dunn, K. J. (1978). *Teaching students through their individual learning styles: A practical approach*. Reston,
- Fernández, M., González, L., & Rodríguez, A. (2020). Prevalencia de estilos de aprendizaje VAK y su impacto en el rendimiento académico en estudiantes de medicina. *Medical Education Research*, 28(3), 145-158.
- García-Conislla, M. V. (2020). Relación entre la ejecución curricular y el desempeño docente. *Investigación Valdizana*, 14(2), 103-111.
- García, R., & López, P. (2019). Estrategias pedagógicas adaptadas a los estilos de aprendizaje VAK en la educación médica. *Education in Medicine Journal*, 12(2), 67-80.
- González Calixto, M. B., Córdoba Andrade, L., & Forero Romero, A. (2020). Estilos de aprendizaje y autodeterminación en la educación superior. Sello Editorial Universidad del Tolima.
- Johnson, D., Thompson, R., & Brown, L. (2020). Implementación de métodos de enseñanza diversificados para estudiantes de medicina. *Teaching and Learning in Medicine*, 32(1), 89-101.
- Llontop La Riva de Herrera, M. J. (2022). Inteligente emocional y estilos de aprendizaje en estudiantes de una institución de educación primaria, San Ignacio.
- López, M. J. C., Castillo, A. L., Maldonado, A. A. P., & Casados, J. C. (2020). Estrategias para potenciar el aprendizaje y el rendimiento académico en estudiantes universitarios. *Revista Venezolana de Gerencia: RVG*, 25(90), 579-594.

- Martínez, P., García, M., & Sánchez, F. (2021). Estilos de aprendizaje VAK y rendimiento académico en estudiantes de medicina. *Journal of Medical Education*, 37(2), 200-215.
- Matas, J. A. V. (2019). La creatividad en el contexto educativo: adiestrando capacidades. *Revista Tecnología, Ciencia y Educación*, 150-171.
- Méndez, L. S. A., Mancera, L. L. C., Urrego, O. A. F., Arteaga, I. H., Luna, J. A., Rodríguez, J. H. M., ... & Montes, A. M. V. (2021). Estrategias de enseñanza y aprendizaje: una mirada desde la investigación. Fondo Editorial–Ediciones Universidad Cooperativa de Colombia.
- Puga, R. U. (2020). Propuesta de modelo estratégico que muestra los elementos esenciales de la innovación curricular. *Revista Ensayos Pedagógicos*, 15(2), 253-275.
- Rojas, V., & Calle, R. (2019). Programación neurolingüística en la generación de redes afectivas para la resolución de conflictos en espacios pedagógicos. *Universidad Ciencia y Tecnología*, 2(2), 5-10.
- Segura Castillo, M. A., & Quiros Acuña, M. (2019). Desde el Diseño Universal para el Aprendizaje: el estudiantado al aprender se evalúa y al evaluarle aprende. *Revista Educación*, 43(1), 734-754.
- Smith, J., Brown, L., & Williams, H. (2018). Formación docente en la adaptación a estilos de aprendizaje VAK. *Journal of Educational Psychology*, 54(3), 321-330.
- Villegas, J. N. G., Villegas, I. I. G., & Villegas, M. A. G. (2018). Los Estilos de Aprendizaje de la Programación Neurolingüística de Bandler y Ginder (Visual, Auditivo y Kinestésico), en la Asignatura de Tópicos Avanzados de Programación en Contexto. *TecnoCultura*, 44-44.