

Incidencia del medio ambiente académico en la formación biomédica

Impact of the academic environment in biomedical training

Karen Galaviz Loya¹, Brenda Amador Negrete² y Haydeé Parra Acosta^{3*}

¹ Facultad de Medicina y Ciencias Biomédicas. Universidad Autónoma de Chihuahua. (México). galavizkaren14@gmail.com <https://orcid.org/0000-0003-2535-7412>

² Facultad de Medicina y Ciencias Biomédicas. Universidad Autónoma de Chihuahua. (México). brendaamador034@gmail.com <https://orcid.org/0000-0003-0284-0356>.

³ Departamento de Investigación Educativa. Facultad de Medicina y Ciencias Biomédicas. Universidad Autónoma de Chihuahua (México) hparra05@hotmail.com. <https://orcid.org/0000-0003-1720-7182>

* Correspondencia: hparra05@hotmail.com. Circuito Universitario. Campus II. C.P. 31125.

Recibido: 10/11/2020; Aceptado: 25/1/2021; Publicado: 1/2/2021

Resumen: Entre los aspectos que conforman el ambiente académico, se encuentran las habilidades y actitudes de los docentes, la comunicación entre docentes y estudiantes, la infraestructura, duración de clases y carga académica, los sistemas de apoyo y la seguridad personal. El presente artículo expone los resultados de una investigación que intenta responder la siguiente interrogante: ¿En qué medida los aspectos del medio ambiente académico inciden en la formación biomédica de los estudiantes? Los objetivos de investigación son: 1) Identificar los elementos del medio ambiente mejor valorados por parte de estudiantes y docentes, 2) Determinar si existen diferencias significativas en las percepciones que tienen los docentes y estudiantes respecto al ambiente académico; asimismo, 3) Identificar los aspectos del ambiente académico que contribuyen a la formación biomédica. Es un estudio transversal donde se aplicaron cuestionarios previamente validados a 185 estudiantes y 50 docentes. En los resultados sobresale, que lo mejor evaluado del medio ambiente es la actitud ética del docente y habilidades respecto a propiciar el estudio auto dirigido y/o autorregulado, el pensamiento complejo y crítico, así como su experiencia docente. Se observaron diferencias significativas entre los docentes y estudiantes respecto a las variables que integran el ambiente académico. Asimismo, resaltamos que un ambiente académico que garantiza la formación integral como médico se correlaciona significativamente con que los estudiantes se formen en valores, ética, trabajen de forma colaborativa y posean los conocimientos necesarios para el manejo integral del paciente.

Palabras clave: Educación Médica; Ambiente Académico; Estudiantes; Docentes.

Abstract: Among the aspects that integrate the academic environment are the skills and attitudes of teachers, communication between teachers and students, infrastructure, duration of classes and academic burden, support systems and personal safety. This article sets out the results of research trying to respond the following research question: What extent do aspects of the academic environment affect students' biomedical training. The objectives are: 1) to identify the best-valued elements of the environment by students and teachers, 2) to determine whether there are significant differences in teachers' and students' perceptions of the academic environment, 3) to identify aspects of the academic environment that contribute to biomedical training. It is a cross-cutting study where previously validated questionnaires were applied to 185 students and 50 teachers. In the results, it stands out that the best evaluated of the environment is the ethical attitude of the teacher and skills regarding promoting self-directed and/or self-regulated study, complex and critical thinking, as well as his experience. Significant differences were observed between teachers and students, compared to the variables that make up the academic environment. It also emphasizes in this study, that an academic environment that guarantees comprehensive training as a physician, correlates significantly with students training in values, ethics, working collaboratively and possessing the necessary knowledge for the integral management of the patient.

Keywords: Medical Education; Academic Environment; Students; Teachers.

1. Introduction

Training is a process that is built in permanent interrelation between the individual and the environment (1). Due to this, the concept of academic environment (AE) is a relevant topic of analysis and discussion since it is associated with the success and satisfaction perceived by students. The AE is a broad construct that refers to the material and intangible conditions of an institution, including relationships between people and characteristics of these interactions (2). Its definition involves the impressions, beliefs and expectations that the members of an educational community have of their own school, the associated behaviors and the symbols and statements that represent such behaviors. Among the aspects that constitute the academic environment, the abilities and attitudes of teachers and students, communication between teachers and students, the infrastructure of the faculty, the duration of classes and academic load, support systems, technologies of information and communication (ICTs) and personal security (3-4). All are important, since the quality of learning, respect for teaching and trust in teachers depend on them (3). In this sense, the AE has been identified as one of the aspects that favors the implementation of an effective study plan, which is why medical teachers have recognized the effects it has on construction at an academic and clinical level, as well as in the development of competencies of medical students (4).

The training processes by competencies, in the current context, are carried out from a comprehensive perspective of the context and with a complex approach, which affirms the equality of human beings and strengthens the values in the interactions established with others and with the community. In this sense, biomedical training recognizes diversity and the inclusion of what is different as an opportunity for personal and community growth and also promotes a commitment to those who need it most (5). So it is practical, dynamic, multifactorial and transdisciplinary, aimed at developing the maximum potential of students.

The public health problems we are facing today require competent physicians who promote health in a humane way. Doctors who contribute to improving the quality of life of people with a humanistic prospective vision (6), so that they provide high-quality medical care and face the current challenges of their profession with responsibility. Thus, one of the tasks of the tutor-teacher is to train the doctor in bioethics. Responsibility that includes ethical requirements for teachers and students (integrity, aptitude, knowledge, experience, respect, sincerity, justice, humility, prudence and exemplary nature) to the highest degree possible (7).

The pedagogical models seek to promote in students a positive attitude towards learning, considering their leading role in the construction of knowledge, and integrating them in an environment of participation and cooperation so that they contribute to the solution of health problems, showing openness to learn of others and to communicate with members of a group or their peers (8). Accordingly, it is necessary to create learning environments that promote interaction between teachers and students in a climate of trust and openness, which guarantee an education with quality and equity (7). Thus, the interest in analyzing the aspects related to the AE and assessing its incidence in medical training, has increased in order to establish strategies for the implementation of curricular modifications that allow innovating medical training in educational institutions (9) to face current challenges and challenges. For this, different instruments have been designed such as the Dundee Ready Educational Environment Measure (DREEM), Postgraduate Hospital Educational Environment Measure (PHEEM) and Clinical Learning Environment Scale (CLE). However, current information is lacking that shows the aspects of the educational environment that favor the training process of the doctor from a comprehensive and

humanistic perspective. In this way, in this article, the results of an investigation that tries to answer the following question are presented: To what extent do aspects of the academic environment affect the biomedical training of students from an integral and humanistic perspective? To do this, the following hypothesis was raised: there is a significant correlation between an academic environment and biomedical training when it guarantees comprehensive training, quality with inclusion and contributes to students learning to learn, conducting medical research, training in values and ethics, work collaboratively and possess the necessary knowledge for the comprehensive patient management.

The objectives that were raised to answer this question are: 1) Identify the elements of the environment best valued by students and teachers. 2) Determine if there are significant differences in the perceptions that teachers and students have regarding the academic environment. 3) Identify the aspects of the academic environment that contribute the most to biomedical, comprehensive and humanistic training.

2. Methods

The study design is cross-sectional and was carried out through the application of four questionnaires that were directed to students of basic sciences and students of clinical sciences, teachers of basic sciences and clinical sciences. The instruments were designed considering some of the variables of the DREEM questionnaire together with other questionnaires and the systematic review of several articles that explain the study variables. The questionnaires integrate three demographic variables and some 90 simple variables organized in two dimensions: Environment and Biomedical Training, which were validated through the application of four pilot groups made up of 40 elementary school students, 25 clinic students, 26 elementary school teachers and 20 clinical teachers, to analyze the reliability and internal consistency through Cronbach's alpha statistic.

The study population is 426 teachers and 1607 students of basic and clinical sciences of the career of Surgeon and Midwife of the Faculty of Medicine and Biomedical Sciences of the Autonomous University of Chihuahua. The size of the sample was estimated with the formula of William G. Cochran (10), obtaining a corrected sample of 236 people, with a sampling error of 0.06%. When stratifying the sample, it was made up of 50 teachers and 186 students. The final sample was left with 190 students and 71 teachers of basic and clinical sciences, obtaining a total of 261 responses as shown in table 1.

Table 1. Answers obtained by population group

Sample	Amount of answers
Basic Sciences Students	163
Clinical Sciences Students	27
Basic Sciences Teachers	32
Clinical Sciences Teachers	39
Total	261

The inclusion criteria were to be a teacher or student of any semester of basic or clinical sciences of the Faculty of Medicine and Biomedical Sciences of the Autonomous University of Chihuahua. The study variables are the academic environment as an independent variable and biomedical training as a dependent variable (table 2).

Table 2. Variables definición

Variable	Concepto	Indicadores	Escala de medición
<i>Independent</i>	Academic environment	Faculty and student attitudes, communication skills, faculty infrastructure, academic load, support systems, ICTs, and personal safety	Likert scale from 0 to 4: 0, "Never / Poor / Nothing" 1, "Few times / Regular / Little" 2, "Sometimes / Good / Enough" 3, "Frequent / Very good / Fairly" 4, "Always / Excellent / Totally".
<i>Dependent</i>	Biomedical training	It includes the integral management of the patient, the review of clinical cases, the development of critical and analytical thinking, the promotion of an education congruent with the health needs, the training of the humanistic doctor, learning in the interaction with patients, among others. .	

With these variables, the four digital questionnaires were designed, seeking that the questionnaires for teachers and students of basic sciences and those of clinical sciences had the same number of variables or items and that they were similar (Table 3).

Table 3. Type of questionnaires and number of variables.

Number	Type	Addressed to	Total variables
1	Basic Sciences Students	Students from 1st to 5th semester	90
2	Clinical Sciences Students	Students from 6th to 11th semester	97
3	Basic Sciences Teachers	Teachers from 1st to 5th semester	90
4	Clinical Sciences Teachers	Teachers from 6th to 11th Semester	97

The analysis of the information was carried out through descriptive and inferential statistics as follows. An exploratory analysis was carried out to assess whether the behavior of the variables was normal. Then, a descriptive analysis of means (univariate) to identify variables with a higher or lower value of $\langle X - 1\sigma, X + 1\sigma \rangle$ and the outstanding variables of the normality limits were determined, calling them upper and lower atypical, which are variables more and less valued by teachers and students. Comparisons were established between students and teachers of basic and clinical sciences in relation to the variables that make up the environment and biomedical training through a simple anova with the Tukey test with a significance level of p less than 0.05. Correlations were also made between the variables that make up the aspects related to the educational environment and the biomedical training of the students, using Pearson's criterion of medium to high correlation (0.50-1.00). For this, linear regression analysis was performed to specify the elements that best predict biomedical training.

Statistical analysis were performed using Statistical Package for the Social Sciences (SPSS 25) and Statistica 64 v.10. The research project was approved by the CI-006-20 research committee, thus ensuring the confidentiality of the information and data obtained in the surveys as established in the Federal Law on Protection of Personal Data; In these instruments, the purpose of the project is reflected and, as it is a virtual application, both students and teachers had the opportunity to decide to participate or not.

3. Results

The results of the validation of the questionnaire through Cronbach's alpha that was used to measure the internal consistency of each of the instruments showed a high degree of reliability (Table 4), which allows the results to be generalized to the target population.

Table 4. Degree of Reliability of the instruments.

Instrument	Cronbach alpha
Basic Sciences Student	0.991
Clinical Sciences Student	0.994
Basic Sciences Teacher	0.966
Clinical Sciences Teacher	0.989

3.1 The educational environment: descriptive analysis.

The analysis of means reported, according to the upper outlier $X + 1\sigma = 3.26$ that the most valued of the environment by teachers and students was that teachers demonstrate an ethical attitude, promote self-directed and self-regulated study, promote thought complex, critical thinking, demonstrate experience in the subject they teach and that administrative services are efficient. On the contrary, the least valued or, what stood out as a lower atypical ($X-1\sigma = 2.77$) was that the academic environment contributes to conducting medical research, the faculty trains students to have a healthy life, with exercise and nutrition According to the healthy eating plate, the workload allows students to study at home and in the library, and students and teachers know if the faculty has security services (table 5).

Table 5. Variables most and least valued by teachers and students about AE

Más valorado	Media/D.E.	Menos valorado	Media/D.E.
V.62 Teachers demonstrate an ethical attitude	3.27±0.96	I.2. The academic environment contributes to conducting medical research	2.55±1.14
V.64. Teachers promote self-directed and / or self-regulated study	3.38 ± 0.91	II.23. The faculty forms students to have a healthy life, with exercise and food according to the healthy eating plate	2.29±1.33
V.65. Teachers encourage complex thinking	3.28±0.97	II.28. The workload allows students to study at home and in the library	2.50±1.25
V.66. Teachers apply	3.34±0.91	IV.53. Students and	2.55±1.42

strategies to promote the development of critical thinking		teachers know if the faculty has security services	
V.71. Teachers demonstrate professional experience in the subject they teach	3.42±0.94		
VIII. 96. Administrative services are efficient	3.26±0.93		

3.2 Biomedical training: descriptive analysis.

The analysis of means reported, according to the upper outlier $X + 1\sigma = 3.19$ that the most valued of biomedical training by teachers and students was that it includes the review of clinical cases and that it seeks that students develop critical thinking and analytical. On the other hand, the least valued according to the lower atypical $X - 1\sigma = 2.83$ was that the faculty trains students to achieve environmental sustainability and to prevent pollution (table 6).

Table 6. Variables most and least valued by teachers and students about biomedical formation

Más valorado	Media/D.E.	Menos valorado	Media/D.E.
III.45. Biomedical training includes review of clinical cases	3.19±1.05	II.22. The faculty trains students to achieve environmental sustainability and prevent pollution	2.53±1.20
III.46. Biomedical training seeks for students to develop critical and analytical thinking	3.23±1.00		

3.3 Significant differences between students and teachers regarding the academic environment

This section shows the results of a comparative study that allows to verify the research hypothesis H1. There are significant differences between students and teachers of basic and clinical sciences with respect to the elements that make up the academic environment. These significant differences between teachers and students were observed in the following variables:

- The academic environment contributes to learning to learn; the differences were found between the clinical students and the basic students, the former being the ones who considered it more.
- The hourly load allows students to study in the library and at home; likewise, teachers promote communication skills. It is the basic and clinical teachers and basic students who consider it more compared to the clinical students.
- Teachers provide academic advice. It is the basic teachers who consider it more compared to the clinical teachers.

- The faculty has security services; It was observed that it was the elementary school teachers who valued it the most, compared to the basic and clinical students.
- Teachers communicate with students assertively; It was observed that it is the basic and clinical teachers who consider it more in relation to the basic and clinical students.
- Teachers demonstrate an ethical attitude. It is the teachers of basic and clinical sciences who consider it more compared to students of basic and clinical. Likewise, significant differences were observed between the students, those from clinics being the ones who considered them the most.
- Teachers motivate them to learn to learn. It is the basic and clinical teachers who consider it more compared to the basic students.
- Teachers promote self-directed and self-regulated learning, as well as collaborative work. It is the elementary school teachers who consider it more than the elementary school students.
- Teachers promote complex learning and critical thinking. It is the clinic teachers who consider it more than the clinic students.
- The teachers demonstrate professional experience, it is the elementary school teachers who consider it more compared to the cynical students.
- The administrative services are efficient, it is the basic teachers who consider it more than the basic and clinical students.

Thus, it is appreciated that basic teachers valued the variables related to the academic environment to a greater extent compared to basic and clinical students.

3.4 Significant differences between students and teachers regarding biomedical training.

The comparative results allow to verify the research hypothesis H1 that there are significant differences between students and teachers of basic and clinical sciences with respect to the elements that make up the environment and biomedical training. The significant differences between teachers and students were observed in the following variables of biomedical training:

- The faculty promotes learning in interaction with patients; It was observed that it is the basic teachers who consider it more compared to the basic and clinical students.
- The faculty trains students to be entrepreneurs, to plan and execute projects that benefit society. It is the basic and clinical teachers who consider it more compared to the basic and clinical students.
- The faculty trains students in value and ethics. It is the elementary school teachers who consider it more compared to the clinic students.
- The faculty trains students to achieve environmental sustainability and prevent pollution, to have a healthy life; likewise, it prepares them in the use of ICTs. In these variables, it is the clinic teachers who consider it more compared to the clinic students.

Thus, it can be seen that the clinical teachers are those who valued biomedical training more than the basic teachers and the basic and clinical students.

3.5 Aspects of the academic environment that are significantly related to biomedical training.

In this section, the results of the correlation analysis between the simple variables of the environment and the simple variables of biomedical training are shown. An academic environment that guarantees comprehensive training as a doctor is significantly correlated with helping the student learn to learn and conduct medical research. Likewise, with the

faculty promoting the training of the humanistic doctor, the students would possess the necessary knowledge for the comprehensive management of the patient, the biomedical training includes the review of clinical cases and the development of critical and analytical thinking. Likewise, an academic environment that trains students in values and ethics, as well as to work collaboratively, is significantly correlated with training humanistic doctors and students who possess the necessary knowledge for the comprehensive management of the patient, the review of clinical cases, the development of critical and analytical thinking, with biomedical training directed, supervised, evaluated and fed back by teachers and with training that includes areas based on scientific knowledge and reasoning. He also highlighted that an academic environment that trains students in medical research is significantly related to a quality education, with equity and inclusion, with training to be entrepreneurs and executing projects that benefit society, with training them to use information and communication technologies, with training directed, supervised, evaluated and given feedback by teachers; as well as, with the inclusion of essential areas based on scientific knowledge and reasoning.

Teachers who promote communication skills, skills for continuous professional development and skills for future professional practice are significantly correlated with biomedical training by enabling students to have the necessary knowledge for comprehensive patient management, including review of clinical cases and seeking that students develop critical and analytical thinking. In the same way, that teachers communicate assertively, motivate their students to learn to learn, promote self-directed and / or self-regulated study, as well as complex thinking and apply strategies for the development of critical thinking, motivating collaborative work, is significantly correlated with training students for comprehensive patient management, that training includes the review of clinical cases, biomedical training seeks that students develop critical and analytical thinking and is directed, supervised, evaluated and feedback from teachers, likewise, as they understand areas based on scientific knowledge and reasoning. Also, a significant relationship was found between the classrooms and the appropriate computer resources for the development of classes and learning with that biomedical training favors the integral management of the patient, includes the review of clinical cases and collaborates in the development of critical and analytical thinking.

Finally, a significant relationship was observed between academic and administrative services that meet the needs of students and teachers efficiently with biomedical training favoring comprehensive patient management, review of clinical cases, and the development of critical thinking and analytical. Also, that the training is directed, supervised, evaluated and fed back by the teachers and includes areas based on scientific knowledge and reasoning. This analysis shows the importance of teaching intervention in the environment to favor a supervised and evaluated humanistic biomedical training where doctors develop critical, creative and complex thinking for the integral management of the patient.

4. Discussion

The results showed that an academic environment that guarantees the comprehensive training of the doctor, trains students in values and ethics and encourages collaborative work in them, is significantly correlated with the humanistic training of the doctor for the comprehensive management of the patient. This is relevant since the fundamental objective of biomedical training must be oriented to the training of professionals prepared to contribute to the fundamental purposes of medicine, including the maintenance of health, the relief of suffering, the cure of disease, the control of unnecessary loss of life and

accompaniment during the transition to a dignified death (11). It is one of the challenges that current pedagogy analyzes with more interest and hope in this new millennium, educating in values (12). Thus, in the study of Román et al., they highlighted bioethics as the curricular tool where values and ethics play a predominant role in the training processes of medical students in search of high quality Public Health (13).

In our work we have seen that among the most highly valued aspects is that the teacher motivates his students to learn to learn and to develop a self-directed and / or self-regulated study, being the elementary school teachers who consider it the most. Promoting this type of learning in students is important, according to a study carried out in order to measure the perception of medical students about the educational environment at the IMSS, which showed that students who learn at their own pace Without fostering academic competition among them, they progressively improve their skills and refine their educational work within the institution (9).

This study also shows that, on the part of the teacher, favoring communication skills, for continuous professional development and for future professional practice through medical records and visit logs with patients affects the development of critical, analytical and complex for comprehensive patient management; this coincides with a study carried out by López et al. (14), whose objective was to inquire about the needs perceived by students and teachers to develop critical-analytical thinking, which showed that both teachers and students expressed the need to implement strategies that contribute to developing this thinking, due to the importance of within the academic training and performance of future health professionals. Another aspect that favors their future biomedical and professional training is research; however, it was one of the least valued aspects in this research.

Another area of opportunity identified is the workload, which does not encourage them to study at home and in the library, which also does not favor a healthy life with exercise and a balanced diet. This coincides with a study carried out in a Faculty in Peru, where the quality of the academic environment was evaluated through the DREEM scale; In this research, students negatively evaluated aspects such as poorly scheduled hours with poor application of teaching time and excessive fatigue (2). This is relevant according to a study, where the factors associated with academic stress in medical students were evaluated and it was found that the main concern of students is related to work overload, demands and performance; In this analysis, the students reported difficulties in time management, particularly with regard to the balance between social activities, academic tasks and limited opportunities for the development of personal relationships, which causes a lack of concentration in students , intellectual fatigue, lack of appetite for usual tasks, carelessness, sadness, decreased intellectual or physical performance, nervousness, modification of heart rate, blood pressure, metabolism and physical activity (15); in addition to negatively affecting student motivation.

Finally, it should be mentioned that one of the limitations of this study was the availability of the participants to answer the questionnaires, since because it was applied virtually and at the participants' will, it took more time than expected to collect the sample.

5. Conclusions

- The most valued by teachers and students regarding the academic environment was that teachers demonstrate an ethical attitude, promote self-directed and self-

regulated study, promote complex thinking and critical thinking, demonstrate experience in the subject they teach and that administrative services are efficient.

- The least valued by students and teachers regarding the academic environment was that the academic environment contributes to conducting medical research, that the faculty train students to have a healthy life, with exercise and nutrition according to the plate of good eating, that the Time load allows students to study at home and in the library and for students and teachers to know if the faculty has security services.
- The most valued aspect of biomedical training by teachers and students was that it includes the review of clinical cases and that it seeks for students to develop critical and analytical thinking.
- Significant differences were found between students and teachers of basic and clinical sciences regarding the academic environment and biomedical training.
- Among the aspects of the academic environment significantly related to biomedical training are an academic environment that guarantees comprehensive training as a doctor, an academic environment that trains students in values and ethics, as well as to work collaboratively and a faculty that trains students in research.
- Regarding teaching performance, he highlighted that there is a significant relationship between the following aspects with biomedical training: teachers promote communication skills and skills for continuous professional development, promote skills for future professional practice through medical records and logbooks. visits with patients and provide academic advice when requested by students, as well as, teachers communicate assertively, motivate their students to learn to learn, promote self-directed and / or self-regulated study, promote complex thinking, apply strategies to promote the development of critical thinking and promote collaborative work.

Supplementary material: the complete questionnaire is provided.

Funding: There has been no funding.

Acknowledgments: To the editorial committee of the Spanish Journal of Medical Education

Declaration of conflict of interest: The authors declare that they have no conflict of interest.

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