

### Critical Thinking Position in Clinical Students of Zahedan University of Medical Sciences, 2015

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**Introduction:** thinking method is considered as a basic requirement in clinical decisions and professional competency in healthcare services. Therefore, the extant study was conducted to discover talented students and identify the role of each of the factors affecting the position of critical thinking among students of Zahedan University of Medical Sciences during 2015.

**Methodology:** 280 students from 7 different groups participated in this descriptive-sectional study; 40 students were selected from each group entered into the study. In this research, a questionnaire was used that its first part consisted of demographic information of students such as age, gender, etc. and the second part consisted of California Critical Thinking Skills Test (version B) including 34 point items that was designed in 5 scopes of cognitive skills of critical thinking including analysis, inference, induction, deduction, and evaluation. Collected data were analyzed through SPSS Software using independent t test.

**Findings:** The highest mean score of critical thinking skill obtained to  $11.28 \pm 69.3$  in Dentistry, University and lowest mean score obtained to  $10.06 \pm 35.3$  in Nursing and Midwifery University. There was a significant difference between clerkships and interns in terms of mean score of critical thinking skill in scope of evaluation ( $P=0.001$ ) and induction ( $P=0.019$ ); in this case, medical interns had higher scores compared to clerkships.

**Conclusion:** results showed low critical thinking skill among medical students. According to the importance of critical thinking in clinical reasoning, educational policy-makers, planners, and managers should reform educational programs, prepare the proper educational environment and facilities at medical level to strengthen critical thinking among students of medicine.

**Keywords:** Critical Thinking, Clinical Students, Medical Science.

### بررسی وضعیت تفکر انتقادی دانشجویان بالینی دانشگاه علوم پزشکی زاهدان در سال ۱۳۹۵

**مقدمه:** تفکر انتقادی از جمله نیازهای ضروری هر جامعه ای است. این تفکر جزء نیازهای اساسی در تصمیم گیری های بالینی و صلاحیت حرفه ای در عرصه مراقبت های بهداشتی درمانی بشمار می رود. بنابراین پژوهش حاضر با هدف کشف دانشجویان مستعد و شناخت نقش هر یک از عوامل موثر در وضعیت تفکر انتقادی میان دانشجویان دانشگاه علوم پزشکی زاهدان در سال ۱۳۹۵ انجام پذیرفته است.

**روش کار:** در این مطالعه توصیفی مقطعی تعداد ۲۸۰ نفر از دانشجویان دانشکده پزشکی، دانشکده دندانپزشکی و دانشکده پرستاری- مامایی از ۷ گروه مختلف در مطالعه شرکت کردند، از هر گروه ۴۰ نفر به صورت تصادفی ساده، انتخاب شده و وارد مطالعه شدند. در این پژوهش، از پرسشنامه ای که قسمت اول شامل اطلاعات دموگرافیک دانشجویان شامل سن، جنس و ... می باشد و قسمت دوم نیز شامل پرسشنامه آزمون مهارت های تفکر انتقادی کالیفرنیا (فرم ب) بود و حاوی ۳۴ سؤال چندگزینه ای در پنج حیطه مهارت های شناختی تفکر انتقادی (تحلیل، استنباط، استدلال استقرایی، استدلال قیاسی و ارزشیابی) طراحی شده بود استفاده شد. داده ها پس از جمع آوری با نرم افزار آماری SPSS و آزمون های T مستقل و ANOVA آنالیز شدند.

**یافته ها:** از کل شرکت کنندگان، ۱۳،۶۲ درصد افراد در مقطع دکتری و مابقی (۸۶،۳۷ درصد) در مقطع کارشناسی در حال تحصیل بودند. بیشترین میانگین کل نمره مهارت تفکر انتقادی در دانشکده دندان پزشکی برابر  $28.11 \pm 69.3$  و کمترین میانگین نمره در دانشکده پرستاری مامایی برابر  $10.06 \pm 35.3$  می باشد. میانگین نمره مهارت تفکر انتقادی در حیطه های ارزشیابی و استدلال استقرایی در بین کارآموزان و کارورزان اختلاف معنی داری داشت، به گونه ای که کارورزان پزشکی نمرات بالاتری نسبت به کارآموزان را بدست آوردند ( $P < 0.05$ ).

**نتیجه گیری:** نتایج این مطالعه نشان دهنده وضعیت بهتر سطح مهارت تفکر انتقادی دانشجویان پزشکی در مقطع بالینی می باشد اما حتی در این گروه نیز سطح این مهارت قابل قبول نیست، با توجه به اهمیت این تفکر در استدلال بالینی لازم است سیاستگذاران، برنامه ریزان و مدیران آموزشی با اصلاح برنامه آموزشی و فراهم آوردن امکانات و محیط آموزشی مناسب بخصوص در بالین در تقویت تفکر انتقادی دانشجویان رشته پزشکی گامهای موثری بردارند.

**کلید واژه:** دانشجویان بالینی، تفکر انتقادی، علوم پزشکی

### تقييم التفكير الناقد لطلاب المراحل السريرية في جامعة زاهدان للعلوم الطبية في عام ٢٠١٥

**المقدمة:** يعتبر التفكير الناقد من الاحتياجات الضرورية لكل مجتمع و يعتبر هذا التفكير عامل أساسي من أجل اتخاذ القرارات الضرورية السريرية والعمل في العناية الطبية والعلاجية. الهدف من هذه الدراسة هو كشف الطلاب صاحبى الإستعداد اللازم ودور كل عامل مؤثر في تفكيرهم الناقد. أجريت هذه الدراسة على طلاب جامعة زاهدان للعلوم الطبية عام ٢٠١٥ (٢٠١٦).

**الطريقة:** في هذه الدراسة الوصفية المقطعية تم مشاركة ٢٨٠ طالب من سبع مجموعات مختلفة من فروع الطب البشري وطب الأسنان والتمريض والقابلات القانونية وتم اختيار ٤٠ طالب من كل مجموعة بصورة بسيطة عشوائية وتم استخدام ورقة أسئلة يتضمن قسمها الأول على المعلومات العامة للطلاب مثل السن، الجنس،... الخ. وفي القسم الثاني تتضمن أسئلة نظمية للإمتحان كالكاليفورنيا للتفكير الناقد (النسخة ب) وتحتوي ٣٤ سؤالاً. في مجالات مهارات التفكير الناقد الخمسة وتشمل (التحليل، الإستنباط، الإستدلال الإستقرائي، الإستدلال القياسي والتقييم). لقد تم تحليل المخططات بعد جمعها ببرنامج SPSS بالاعتماد على اختبار t المستقل واختبار ANOVA.

**النتائج:** من كل الطلاب المشتركين بالدراسة ١٣،٦٢٪ من طلاب الدكتوراه و ٨٦،٣٧٪ من طلاب الليسانس. أعلى معدل علامة لمهارة التفكير الناقد كانت في كلية طب الأسنان وكانت  $28.11 \pm 69.3$  وأقل معدل علامة كان في كلية التمريض وكانت  $10.06 \pm 35.3$ . معدل علامة مهارة التفكير الناقد في مجالات التقييم والإستدلال الإستقرائي بين طلاب الطب المتعلمين وطلاب الطب المتدربين (في المرحلة السريرية) كانت مختلفة بشكل واضح حيث حصل الطلاب المتدربين على علامات أعلى وكان ( $P < 0.05$ ).

**النتيجة:** لقد أثبتت نتائج هذه الدراسة أن مستوى مهارة التفكير الناقد عند طلاب الطب المتدربين (في المرحلة السريرية) أعلى من طلاب الطب المتعلمين ولكن عند أولئك المتدربين أيضاً هو مستوى غير عال وغير مقبول. نظراً لأهمية هذا التفكير في الإستدلال السريري يجب على المنظمين وواضعي سياسة التعليم والبرمجة التعليمية أن يقوموا بتهيئة الجو المناسب التعليمي وتوفير الإمكانيات من أجل تقوية التفكير الناقد لطلاب الطب لكي يقوموا بفعل مؤثر في هذا المجال.

**الكلمات المفتاحية:** الطلاب في المراحل السريرية، التفكير الناقد، العلوم الطبية

### زاهدان ميديكال يونيورسیتی میں کلینیکل شعبے کے طلباء میں تنقیدی صلاحیتوں کا جائزہ

**یہیک گراؤنڈ:** تنقیدی فکر رکھنا ہر فرد کے لئے نہایت اہمیت کا حامل ہے۔ میڈیکل اسٹوڈنٹس کے لئے تنقیدی فکر کلینیکل سطح پر فوری فیصلے کرنے اور ان کی پیشہ ورانہ صلاحیتوں میں نکھار کے لئے ضروری ہوتی ہے۔ اس بنا پر دوپڑا سولہ میں زاهدان میڈیکل یونیورسٹی میں طلباء کی تنقیدی صلاحیتوں کو جانچنے کے لئے یہ تحقیق انجام دی گئی۔ اس میں یہ بھی جائزہ لیا گیا کہ طلباء کی تنقیدی صلاحیتوں کو شکل دینے میں کونسے عوامل موثر ہیں۔

**روش:** اس تحقیق میں دو سو اسی طلباء کو شامل کیا گیا جس میں ڈنٹل کالج، میڈیکل کالج، نرسنگ، اور میڈیٹائفری کے طلباء کا نام لیا جاسکتا ہے۔ ہر گروہ میں سے چالیس طلباء کو ریڈم طریقے سے چنا گیا۔ اس تحقیق کے لئے ایک سوالنامہ مرتب کیا گیا تھا جس میں طلباء کی ڈیموگرافیک تفصیلات اور سن اور جنس کے بارے میں سوالات تھے۔ گئے گئے تھے۔ اس سوالنامے کے دوسرے حصے میں کیلی فورنیا کریٹیکل اسپیشیالٹیز کے مطابق سوالات تھے۔ مجموعی طور سے اس میں چونتیس سوالات تھے۔ ڈیٹا کی جمع آوری کے بعد اس کا تجزیہ ایس پی ایس اور ٹی ٹسٹ اور اینووا کے ذریعے کیا گیا۔

**نتیجے:** اس تحقیق میں صرف چودہ فیصد افراد ڈاکٹریٹ کی لیول پر تھے اور بقیہ پوسٹ گریجویٹس کے طلباء تھے۔ سب سے زیادہ نمبر میڈیکل اسٹوڈنٹس نے حاصل کیے جبکہ اس کے بعد انٹرنز نے حاصل کیے۔

**سفرارش:** اس تحقیق سے یہ معلوم ہوتا ہے کہ کلینیکل سطح کے طلباء میں بہتر تنقیدی صلاحیتیں ہوتی ہیں البتہ اس مہارتوں کا یہ معیار بھی قابل قبول نہیں ہے۔ اسی وجہ سے تعلیمی پالیسیاں بنانے والوں کے لئے ضروری ہے کہ وہ کلینیکل لیول پر تعلیم کی بہتر سہولتیں فراہم کریں تاکہ مجموعی طور پر میڈیسن سے جڑے ہوئے طلباء بہتر تنقیدی مہارتیں حاصل کرسکیں۔

**کلیدی الفاظ:** کلینیکل سطح، تنقیدی فکر، طلباء

## INTRODUCTION

People have unique characteristics; for instance, they are different in terms of physical, emotional and other personal characteristics. Critical thinking is the most important variable that is different among people. Thinking method is an underlying, because life philosophy of a person is based on thinking method of that person. Thinking is the final solution of person so that the quality of life is definitely related to the quality of thinking. This point exists in either personal and social level or world level (1). In addition to individual differences, the educational system should be updated in order not to expand these differences. In general, clinical sciences and medical education should be in line with increasing transformations of the 21st century, so that the experiences obtained from the past, in particular in the 20th century, including analysis of factors affecting health, comprehensiveness of health, changes in health management system, role of technology in health, the issue of medical ethics, and medical education so that they should be organized in a way in which, graduates can solve problems, use informational sources, are familiar with technology, are self-actualize, have communicational skills and holistic attitude toward health respecting for professional ethics; to achieve such goal, the most appropriate methods should be selected to create lasting changes in thinking, attitude and performance of the learner (2). In this regard, critical thinking is a positive activity and required process for growth of society and organization. This kind of thinking is an important aspect of professional performance, in particular among clinical students and employees (3). Critical thinking is the essential part of clinical decision and professional competency (4). In fact, the use of critical thinking in clinical conditions is highly valuable so that clinical decision-making requires a proper clinical knowledge, information gathering skill, and the knowledge to adopt strategies in order to solve the problem of patient (5). Critical thinking-based decision making would increase the power of practitioners, nurses and other clinical staffs to handle critical circumstances and promote quality of health care services. Lack of critical thinking and self-confidence leads to an expanded gap between information and performance as well as the higher doubt to abilities of nurse in critical conditions (6).

Various studies have been conducted to examine critical thinking skills of students at different educational levels during the course or work environment; some of these studies indicated non-optimal level of critical thinking among students. A study showed that medical students never used critical thinking skills when facing wrong exam questions and 8.1% of them only paid attention to some faults in lesson handouts (7). Also, researches show that academic institutions have failed in their attempts to obtain critical thinking skills. A large number of students repeat courses several times per annual and some others may make fundamental changes, postpone graduation or fail in graduation due to weak academic performance that a part of it may be attributed to defects in critical thinking skills (8). Critical thinking would lead to a convenient life through making reasonable relationships between people, making

decisions based on analysis of a situation or separation of optimal elements. Therefore, it can be stated that our society and world society will fail if we are not capable of recognizing the case.

This issue is highly significant and since there are few studies on different health course students considering weak critical thinking, the objective of this study is to examine the critical thinking position among students of Zahedan University of Medical Science to test if there is a significant relationship between critical thinking and each of demographic variables including education level, gender, education course, and educational major. Furthermore, summary of importance and necessity of critical thinking can be described as follows:

1. It is matched with rational properties of human such as curiosity and progress seeking.
  2. Learning is based on self-learning activity.
  3. It is in line with trans-industrial era and its increasing transformations.
  4. It is adopted from main educational and training goals.
- Nowadays, necessity of critical thinking has become a demand in universities. However, the conducted studies in this field indicate that this demand has not been satisfied in practice. Hence, the mentioned reasons may act as a barrier to learning and fostering the curiosity and progress seeking among students of society who play a vital role in realization of educational goals. Therefore, the purpose of this study is to discover talented students and identify the role of factors affecting critical thinking position among students of Zahedan University of Medical Science during 2015.

## METHODS

This is analytical-descriptive and sectional study that was conducted to examine and compare critical thinking position among students of Zahedan University of Medical Science during 2015. Statistical population of the study consisted of all students in clinical science of Medical University, clinical courses of Dentistry University and students in Nursery-Midwifery and Paramedical Universities based on their majors.

$$n = \frac{z^2 \times \delta^2}{d^2} = 277 \quad z = 1.96 \quad \delta = 1.7 \quad d = 15\% \\ \delta = 0.2$$

Sample size obtained to 280 members and since 7 different groups of 3 universities participated in the study, 40 members were selected and entered into the study out of each group using simple random sampling. Sampling method was based on multistage cluster and students of each university assigned into the sample as agents considering their number, gender and university.

Various determinant tests have been designed to identify and examine critical thinking; of that, California Critical Thinking Skills Test is the most authenticate and popular test that was employed in the present study. This questionnaire is available in the appendix.

Researcher obtained permission of education deputy of the university to determine time and place in order to fill out questionnaires; after the introduction, the researcher explained the goals of study and the correct way of

responding to questions. The required time set to 45 minutes, so that questionnaires were filling out anonymously by samples in the presence of researcher and in a calm environment. In addition, the laboratory's majority from paramedical university and optometry major from Rehabilitation, University were added to study population.

Questionnaire of this study had two parts including demographic information about students (age, gender, marital status, work experience, clinical experience, and GPA of previous semester) and the applied instrument in this study (CCTS (version B)) that its validity and reliability of Persian version had been proved (9).

This test consisted of 34 5-point items in five scopes of cognitive skills of critical thinking (analysis, inference, induction, deduction, and evaluation). This questionnaire was designed based on a public field of knowledge that is simply accessible because of natural maturity in elementary and secondary schools. Moreover, no content knowledge with an expertise in a particular field was required to respond to questions.

A correct response obtained score 1 and total of correct response formed the full score. Maximum score was equal to 34 and minimum score was equal to 0; the obtained score from each part of the test varied between 0 and 16 so that scores of evaluation, analysis, inference, induction and deduction obtained for 14, 16, 14, 11, and 9, respectively. Collected data were analyzed through SPSS Software using ANOVA and independent t tests.

**RESULTS**

Of 206 participants, 64 members (31.06%) were from University Of Medicine, 21 members (10.195) from Dentistry University, 57 members (27.66%) from Nursery-Midwifery University and 64 members (31.06%) from Paramedical University. According to demographic information on population, 13.62% were educating in PhD and 86.37% were educating in BA degree. 2-member groups were compared

using an independent t-test and more than 2-member groups were compared using ANOVA test.

Mean of the total score of critical thinking in the University of Medicine obtained to  $14.07 \pm 25.4$ , in Dentistry University obtained to  $11.28 \pm 69.3$ , in Paramedical University obtained to  $12.06 \pm 95.2$  and in the Nursery-Midwifery University obtained to  $10.06 \pm 35.3$ . According to the result of the statistical ANOVA test, there was a significant difference between mean scores of critical thinking in different scopes and universities ( $P=0.0001$ ).

Table 1 indicates results of comparison between mean scores of students in different scopes of critical thinking and their relations to each university.

According to the result of the statistical ANOVA test in table 1, there was a significant difference between mean scores of critical thinking skills considering scopes of analysis ( $P=0.001$ ), inference ( $P=0.0001$ ), deduction ( $P=0.019$ ) and induction ( $P=0.0001$ ) in different universities; in this regard, university of medicine obtained the highest score level and Nursery-Midwifery University obtained the lowest score level. According to the result of ANOVA test, there was not any significant difference between mean scores of critical thinking in scope of evaluation in different universities ( $P=0.109$ ).

Table 2 indicates comparison between mean scores of medical students considering different scopes of critical thinking and their relation to training and interning courses. According to the result of the Independent t-Test in table 2, there was a significant difference between mean scores of critical thinking skill among clerkships and interns considering scopes of evaluation ( $P=0.0001$ ) and induction ( $P=0.019$ ); in this case medical interns obtained higher scores compared to clerkships.

According to the result of the Independent t-Test, there was not any significant difference between mean scores of critical thinking skill of interns and clerkships considering scopes if analysis (0.978) and inference (0.464).

**Table1. Mean scores of students in different scopes of critical thinking in each university**

	Medicine	Dentistry	Nursery-Midwifery	Paramedical
Mean score of critical thinking skill	14.0781±4.25872	11.2857±3.96412	10.0625±3.35802	12.0625±2.9538
P-value	0.0001			
Mean score of critical thinking skill in scope of analysis	4.0469±1.88923	3.1905±1.50396	2.8070±1.60844	3.4688±1.53239
P-value	0.001			
Mean score of critical thinking skill in scope of evaluation	5.1875±2.06924	4.66667±1.77012	4.4561±1.78356	4.5469±1.52159
P-value	0.109			
Mean score of critical thinking skill in scope of inference	4.8438±1.72947	3.4286±1.93834	2.9474±1.52855	4.0469±1.57792
P-value	0.0001			
Mean score of critical thinking skill in scope of deduction	5.0625±2.23873	4.4286±2.03891	4.0000±1.71131	4.6875±1.50000
P-value	0.019			
Mean score of critical thinking skill in scope of induction	7.4063±2.18013	5.7619±2.23394	5.1754±2.09696	6.0781±1.85425
P-value	0.0001			

Table2. Mean scores of medical students (clerkships and interns) in different scopes of critical thinking		
	Clerkships	Interns
Mean score of critical thinking skill	12.6765±3.69045	15.6667±4.35758
P-value		0.015
Mean score of critical thinking skill in scope of analysis	3.8824±1.93476	4.2333±1.85106
P-value		0.978
Mean score of critical thinking skill in scope of evaluation	4.3235±1.73591	6.1667±2.00144
P-value		1.001
Mean score of critical thinking skill in scope of inference	4.4706±1.33110	5.2667±2.03306
P-value		0.464
Mean score of critical thinking skill in scope of induction Mean	3.8529±1.70796	6.4333±1.97717
P-value		0.0001
score of critical thinking skill in scope of deduction	7.2059±2.18507	7.6333±2.18905
P-value		0.982

## DISCUSSION & CONCLUSION

According to the results of this study, there was a significant difference between mean scores of critical thinking skill in different universities considering different scopes. It should be explained that medical students and sometimes dentistry students obtained higher scores and had better critical thinking. Accordingly, it can be stated that there was a significant difference between universities considering mean scores of critical thinking in scopes of analysis, inference, deduction and induction so that medical and dentistry students had a better situation. However, it should be noted that this significance or better score of these students is not that much considerable naming it a good position. According to the comparison between majors and results of applied statistical tests, mean of total scores of critical thinking in different scopes was significantly different between majors. In this case, medical and dentistry student obtained higher scores. The last result obtained from comparison between interns and clerkships; in this case, there was a significant difference between mean scores of critical thinking skill among students educating in different majors; however, there was not a significant difference between mean scores of critical thinking considering different scopes of analysis, inference, and deduction. This indicates that the difference between increased education duration and critical thinking growth are not relatively related to each other, but researcher assumes that this minor change may be attributed to long clinical courses of medical students, numerous cases, and clinical decision that are made by these students.

In general, findings obtained from studies conducted by Khalili (2001), Hosseini and Bahrami (2002), Islami (2003), Babamohammadi and Khalili (2004), Miller (2003) indicated significant difference between critical thinking of students based on education level, educational major and gender, whereas, findings of studies conducted by Babamohammadi and Khalili (2004), Gharib et al. (2009), Mcgrass (2003) and Teper (2004) indicated no significant difference between critical thinking of students considering the mentioned

variables. The most important point that is emphasized by Iranian researches is related to educational shortcomings that influence negatively on some skills; these shortcomings consist of mismatch between the lessons' content and educational process, lack of time, repetitive lessons, traditional teaching methods, inappropriate evaluation methods, and weak evolution method of critical thinking skill. However, lack of such critical skill is not just related to Iran. Seemingly, use of traditional teaching strategies may be a reason for the weak level of critical thinking among students, educating at different levels and lack of significant statistical difference between critical thinking abilities of two studied groups. Different researchers have obtained different results about critical thinking skills among students in different majors (10-16).

Since university students benefit from implicit teachings besides official academic teachings during the education course, it is expected that critical thinking is developed during academic education. However, the results of this study and similar researches in Iran show that current teaching methods have not effectively improved critical thinking skills; hence, educational programs should be revised. Some effective measurements include changing teacher-based educational strategies for student-based strategies, reducing repetitive and non-essential lessons, making students participate in learning, raising topics for discussion in class, and moderating role of the professor as a lecturer in class. In other words, not only essential content should be taught, but also application of critical thinking skills should be taught in order to develop independent studies of students as well as their thinking power. However, correct planning and application of specific strategies can be used to teach critical thinking skills during education.

Low mean scores imply that teaching and learning strategies should be such organized to increase and strengthen thinking and criticizing the power of students (10-13).

It was found in this research that students were high ability in scope of evaluation of reasons so that this scope was in relation with the proper ability to identify proposed reasons

in the scope of inference, consideration of evidences, and lack of personal propensity of results; on the other hand, the weakest ability was related to inference because of weak relative thinking among students and lack of usage of skill properly. Relativism helps the person to consider all aspects of a reality in his/her judgments preventing from absolute judgment and preparing person to receive more information. According to the study conducted by Islamic et al. To nursery students of Tehran University of Medical Science, the highest score of students was related to the scope of interpretation. Interpretation of subjects is based on the ability to identify presumptions and attitudes that should be guessed by the person; in their study, the lowest score was related to the scope of inference that is matched with result of our study (12). According to research results, pre-university teachings are required to improve critical thinking. In fact, this skill should be taught before university to be developed in university; therefore, infrastructural change in education system is the basic need that should be taken into account by education officials. Since job status and career success of people are affected by academic teachings, the university plays a vital role in growth of critical thinking skill. Hence, changes in curriculum and concentration on modern educational methods affects the tendency and participation of students and their ability of problem-solving through self-initiation. Clinical environment is a factor affecting growth of critical thinking among students. There are some barriers to the growth of this skill such as time limitation, large number of students, lack of facilities in sectors, lack of familiarity with modern equipment, and clinical experiences of students that are observed instead of participation. Appropriate educational environment and application of learning assist tools are underlying points that should be noted. Clinical teaching along with proper use of nursery process would lead to growth of abilities such as accuracy, inference, presumption and attitude diagnosis increasing the ability of interpretation (14-16).

### RECOMMENDATION

According to the results of this study, the most common barrier to growth and development of critical thinking is the

use of traditional methods in the education system and educational approach that are based on repetitive imitation. In fact, educational environment should be full of empathy, understanding and respect for each other. Personal characteristics affecting this process are interesting, motivation, self-efficacy, etc. Transformational leadership was introduced as an effective factor in higher education institutions.

In summary, some recommendations can be presented to promote these skills in medical sciences:

1. Teaching bases of critical thinking to students through curriculum, teaching in job for professors of university using critical thinking strategies.
2. Study of critical thinking at the entrance time to university and graduation in universities and recording results; in this case, results can be used to investigate evolution process of critical thinking and validation of universities.
3. Teaching students in universities through groups and discussions focusing on the development of intellectual process among students.
4. These evaluations should be done broadly in higher scales to determine the score of critical thinking in society.
5. Preventing from passive teaching methods and valuation of students based on intellectual processes for problem solving.
6. Educational planers should make some changes in headlines considering critical thinking skills during academic education even in low educational levels.
7. It is recommended using transformational management in universities considering incentive of individuals to choose an academic major, matching content of lessons with semester time, and creating safe space full of empathy to express opinions and develop critical thinking skill in an educational environment.

In conclusion, it can be stated that clinical students have low-level critical thinking skill and since this thinking method is highly important in clinical reasoning, policy makers, planners, and educational managers should strengthen critical thinking of students in medicine correcting curriculum, preparing facilities and educational environment, in particular clinical environment.

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