

The PBL-based Practical Research of Medical Education Mode Reform

Jian Sun*, Yue Li and Hui Li

North China University of Science and Technology, Tangshan, P.R. China

Abstract: With the development and transformation of the medical model based on medical technology, people's demands of medical services have increased, and to raise the overall quality of community health workers higher requirements for medical education have been proposed which also pose new challenges. More qualified health workers are required by the community, which also poses a new challenge to medical education. Limitations of traditional medical education are being exposed increasingly, and it is difficult to adapt to the rapidly changing needs of society, but there is an urgent need to explore and reform medical education model. According to the differences between groups of students at different educational levels, the paper analysed the feasibility of introducing PBL in the teaching system of medical students. PBL teaching method is an effective means to improve the quality of our medical students' training. The application of PBL teaching has obvious advantages in improving students' ability to solve practical problems of cooperation and self-learning and developing innovative thinking ability. In recent years, PBL has become a model of medical education with wide international concern. Some of the medical colleges have also launched PBL teaching practice, but it is still in the exploratory stage, and lacks experience.

Keywords: PBL, Clinical medicine, Medical education mode, Reform, Evidence-based medicine.

1. INTRODUCTION

With the social development and technological progress, the medical model has changed from being the biomedical model into a bio-psycho-social medical model, making a healthy and disease-centered medical science, and has entered a new period of development. This has promoted the transformation of medicine fields to strengthen prevention, and updated diagnosis and treatment technology, which show that medical science has undergone a fundamental change. The development and transformation of the medical model of medical technology, people's increasing demands of medical services, and the overall quality of community health workers put forward higher requirements for medical education which present new challenges. Limitations of traditional medical education have been increasingly exposed, suggesting that it is difficult to adapt to the rapidly changing needs of society. Therefore, there is an urgent need to explore and reform medical education model [1].

PBL is Problem-Based Learning, usually translated as "problem-based learning." In medical education, PBL's concept is often used as a teaching method, teaching mode or teaching philosophy. "Classic" PBL refers to medical students solving ill-structured problems of clinical cases to learn a learning strategy preclinical curriculum. PBL is a more advanced teaching method and concept, advocated by the current educational ideas with consistent goal of providing quality education. PBL revolves around the "problem" of team teaching and teachers provide only guidance. It has the advantage of changing the traditional teaching mode

From passive learning to active learning promoting group members' mutual division of labour, through various channels to find their own solution to the problem of information. In this way, students learn the necessary knowledge in the process of solving problems. It also helps to train the medical students learn independently and promote lifelong learning, communication skills, teamwork, spirit of humane care and practical application to solve difficult clinical problem.

In recent years, with the advancement of education reform, culture clinicians are paying more attention to the education of medical students. Education has changed from "cramming" followed in the traditional teaching method to the "issue-based" PBL teaching methods [2, 3]. PBL teaching model has been affirmed in the world of medical education, and has gradually become the new direction of clinical and medical education reform. Therefore, the problem of how to effectively apply this model to the national clinical teaching, the existing problems in the implementation of PBL teaching are worthy of being addressed with respect to every medical institution.

Early in the 1920s, the US medical community found biasness in medical education and the issue became intensified when medical students, easily overlooked their ability to memorize and practice ethical training. Therefore, how to train and strengthen the capacity of active learning among medical students have become the most important problems in modern medical education. The application of PBL teaching is meant to improve students' ability to solve practical problems of cooperation and provide self-learning training to enhance innovative thinking ability which has obvious advantages, but in teaching, most teachers focus only on the results of students based on problem solving and the results are not truly utilized. This information capabilities of stu-

*Address correspondence to this author at the North China University of Science and Technology, Tangshan, P.R. China; Tel/Fax: 13700356680; E-mail: 26023196@qq.com

dents is very unfavourable information capabilities should also include capacity utilization of information and in access to and use of the process information, the ability to analyse information more plays a key role [4-5].

The current principal contradiction in the medical education is no longer a shortage in the quantity of medical personnel, but the quality of the medical personnel that needs to be improved. Whether social, economic, scientific and technological development and higher requirements for the proposed health, or the enhanced competitiveness of international cooperation and urgent medical needs, there is still a need to improve the quality of medical education, and training of medical talents. Being a country where medical education is more popular, China's medical education has gradually become internationalized with the development of foreign exchange [6].

Educational reform in developed countries involves reform in the teaching methods, and reforms in developing countries mainly involve reform in the teaching content. Currently, the United States as a typical representative of the North American medical education has a leading position in the world. After 200 years of rapid development, several major medical educational reforms have been made resulting in an effective mechanism offering outstanding medical education to medical personnel which has become a reference point of medical education for the rest of the world [7].

Next, this study also describes the data and methodology used in more detail.

2. MATERIAL AND METHODS

With the social development and technological progress, the medical model changed from being the biomedical model into a bio-psycho-social medical model, marking an improved and disease-centered medical science, has entered a new period of development, which has promoted the transformation of all fields of medicine to strengthen prevention, and update diagnosis and treatment technology, thus, fundamentally modifying the entire field of medical science. Each branch of medicine continues to expand and lead to mutually cross the disciplines resulting in a large number of interdisciplinary and multidisciplinary medical curriculums. However, medical education is facing new challenges since new

technologies have emerged, and problems are being encountered when doctors increasingly confront a patient with diversification, therefore, higher requirements have been proposed to train medical health personnel, [8].

PBL is problem-based learning. PBL medical education and the traditional model of medical education based on (Lecture-Based Learning, LBL) are very different. PBL in the late 1960s was introduced in Canada McMaster University School of Medicine, and gained rapid development in the late 1980s in North America. In 1991, 70 percent of US medical schools adopted varying levels of PBL mode of teaching. Since the 1990s, some European medical schools began to experiment PBL curriculum. The University of Hong Kong in 1997 started teaching PBL, where PBL teaching currently accounts for 60% of all medical school education, and Harvard Medical School also adopted LBL application of PBL teaching.

$$\Phi = 1.79d^2 f_c^2 \tag{1}$$

The formula is designed to determine the main failure mode of PBL bond shear failure of concrete joints. Thus, although the formula is based on the test results with rebar specimen presented, but it does not directly reflect the impact of rebar.

By comparing the two widely used clinical teaching models at home and abroad: clinical teaching model of clinical teaching mode for traditional domestic medical education in Europe and America and other developed countries (Table 1), it was observed that bedside teaching mode involves the traditional model and strengths of European and American models, which basically meets the requirements of modern medical model for medical students.

Bedside teaching has changed from the past from oldbooks to clinical teaching model, through direct contact with patients for obtaining extensive clinical information. In the doctor's inspired teaching guide, combined with the knowledge learned from books, coupled with comprehensive analysis, or for certain clinical problems, the information is traced back to the past, to deepen the understanding of the disease [9].

Table 1. Comparison of different clinical stages teaching mode.

Mode	Contents	Place	Feature	Exam	Put in
Traditional clinical teaching mode	Teaching the theory observation, explain typical cases centralized	school	Teacher-centered, Explain in classes, Emphasis on theoretical knowledge	Close examination	Save time and money
US and European clinical teaching mode	Stay in the hospital all day, each teacher teaching 2-3 pupils	hospital	Student-centered, PBL teaching, Practice-oriented, emphasizes self learning	SP OSCE MSE	Spend a lot
Ningbo University bedside teaching mode	Students participate in a variety of medical activities in the hospital, then intensive classes	hospital	Student-centered, Practice-oriented, Ethics and Education	Department Examination, Students' Evaluation	Spend a lot

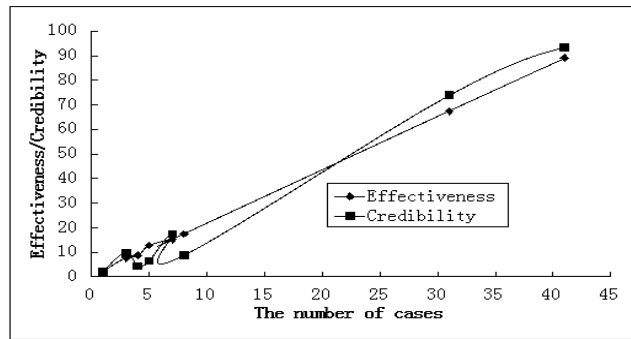


Fig.(1).Students' evaluation of the effectiveness and continuity about skill test.

Clinical stage is aimed at training qualified teaching of medical students, correcting their clinical thinking and improving students' ethics, thereby proving an essential element in medical education. Changing learning style from passive to active learning requires changing passive indoctrination into active participation. This process is conducive to stimulating initiative from students helping students in developing logical and analytical thinking skills and improving clinical competence.

Learning a foreign concept for making national education policies and providing educational services are educators' research priorities. A country's education can make a significant impact on the education of another country, which may also affect the education system at macro-policy level and more so at micro-level.

After externally modifying the mode of education with respect to the actual situation of the country, the educational practices of other countries are also changed, reflecting on the educational practices of another country. Although in the past 20 years of China's long-term medical education, it has achieved remarkable results, training a group of outstanding medical graduates from medical institutions, but it still requires internationalization of improved medical and health services.

$$q = 1.45[(d^2 * d_s^2)f_c + d_s f_y] - 26.1^2 \tag{2}$$

Where, d_s represents the rebar diameter. The formula represents the bearing capacity of PBL by concrete joints and holes in rebar joint control, and the formula reflects the impact of rebar.

In PBL teaching model and in the traditional model of medical education that is "(Lecture Based Learning, LBL)" teaching model, the design concept, the steps, and the implementation effects are fundamentally different. LBL teaching emphasizes discipline-based, teacher-centred, and lecture-based classroom. It is more concerned about the basic systematic medical science, which is complete and logical, and is learned step by step. In this teaching mode, students can master relatively comprehensive medical knowledge.

Although the teaching method can systematically and comprehensively impart theoretical knowledge and safely complete the teacher intended target, but it ignores the students' initiative, thus diminishing students' interest and curiosity. The PBL teaching mode was proposed to change the traditional teaching mode. It also poses a question on funda-

mental teaching and clinical practice. Students become the subject of learning and teaching, and teachers become the students of instructor or facilitator. This kind of teaching method has obvious positive effect on students' critical thinking.

$$Q = 0.6348A_c\sqrt{f_c} + 1.1673A_c f_y + 1.6396A_r\sqrt{f_c} \tag{3}$$

The formula preformed that the bearing capacity of PBL from the steel outer concrete, steel and concrete joints transverse ordinary common control, the failure mode is a concrete slab in the longitudinal splitting. Consider many factors, but the physical meaning vague. This paper has shown that making inference about the effect of educational attainment on migration can be highly sensitive to age-specific migration patterns.

In contrast, PBL teaching method is a more advanced approach to education, which has gradually become an important focus of medical education reform in the country, and is also consistent with theirs and goals of quality education. It is also essential to note that differences between the estimated parameters are larger across columns than across rows as given in Table2, which indicates that socioeconomic back-ground has a stronger impact on migration than education [10, 11].

Table 3 shows that: 46 medical students appeared in internal medicine and surgery clinical skills' assessment and the overall results were quite satisfactory and the students and physicians were also more satisfied. But because the implementation of this bedside teaching and clinical skills multi-station test method in medical schools of the country has not yet been reported, there is no room for comparison. Though absolute performance can only be evaluated, bedside teaching of medical students to master clinical skills are ideal.

For providing medical education, medical workers agree to adopt an, in-depth teaching mode which does not teach the concept of scientific treatment, it rather promotes the practice of evidence-based medical education, based on medical records of clinical practice. The medical knowledge of scientific capacity for innovation and found that the formation of a special students develop learning habits.

Clinical practice, medical records and case analysis can reflect the students' clinical logic, organizational skills, and good communication with patients and their families conducive to the smooth conduct of disease diagnosis and treat-

Table 2. Internal Medicine Clinical Skills distributed multi-station test scores.

Examination Content	Number of People	Highest Score	Lowest Score	The Average Score	Standard Deviation
Group 1(history taking)	46	93.33	43.33	76.30	10.89
Group 2((case analysis))	46	93.33	50.00	84.24	9.04
Group 3(physical examination)	46	100.00	72.50	92.15	5.98

Table 3. Departmental rotation examination compared to the situation two groups of students.

	Experimental Group				Control Group			
	Excellent	Good	Moderate	Excellent Rate (%)	Excellent	Good	Moderate	Excellent Rate (%)
Department Examination Results	32	24	4	93.3	6	48	5	91.5
Writing cases	19	41	0	100	0	46	13	80.0
Case analysis	25	35	0	100	0	43	16	72.9
Patient communication	17	35	8	86.7	0	39	20	66.1
Document Retrieval	18	42	0	100	0	0	40	0

ment. Thus, the students' ability to write medical records of patient for analysis and communication skills can reflect their actual ability to solve clinical problems.

$$Q = \alpha_1 \beta_1 A_c \sqrt{E_c f_c} + \alpha_2 \beta_2 A_c f_y \tag{4}$$

With the development and popularization of network technology, rich network resources are available to achieve evidence-based medical education to enhance students' self-learning ability. The results of the study on self-learning ability showed that PBL based applications through internship in paediatrics certificate of medical education, compared with LBL clinical teaching on students to solve practical problems and improve the ability of having a significant role in promoting, but also to give the students affirmed.

At the same time, evidence-based medical education is the medical model of human medical practice which effectively combines the patient's values and preferences so that physicians should not only be concerned about the disease to be cured, but must also be concerned about the quality of life of patients and should pay more attention to comprehensive treatment.

$$Q = 4.5ht\sqrt{f_c} + 0.91A_u f_y + 3.3 \ln d^2 \sqrt{f_c} \tag{5}$$

For example: the study treated two Leigh syndromes, in which the experimental group of students after literature review provided a comprehensive understanding of the treatment of mitochondrial disease, no cure for symptomatic conservative therapy in advanced disease. Children breathing gradually slowed down, the parents asked not to intubation and mechanical ventilation, in order to reduce

their suffering, quiet death. Therefore, according to the wishes of patients and their families to choose the treatment is part of evidence-based medical practice, students more in-depth understanding of rationality disease treatment.

3. THE ROLE OF PBL IN CLINICAL TEACHING

PBL pedagogy emphasizes on problem-based learning, students of all learning content around the "problem" this spindle start. It mainly starts with "OK Threads -> analysis of the problem -> gathering information ->self-discussed -> Establishment Solutions -> summary evaluation and feedback" and other steps will introduce problems to the students. Students are inspired to master self-learning ability and ability to solve problems in the whole process of clinical teaching. Based on the completion of each student while addressing the issue of teaching, and also completed the reproduction of knowledge, deepen the knowledge and understanding of the consolidation.

Therefore, PBL teaching method has its unique advantages and effects clinical teaching, mainly as follows:

1). Helps to Stimulate Students' Interest in Learning, and Improve Learning Efficiency

In PBL teaching mode, teachers introduce students to the problematic situation, in which students become the real "masters" of problem-solving. With the classroom initiative given to the students, students are not only provided an opportunity to be a part of active learning, rather it also promotes students' autonomy, and helps them to actively speak, fully express their views, develop independent learning ability to obtain knowledge and discovery issues, which greatly improve students' interest in learning.

2). Help Improve the Overall Quality of Students

Clinical teaching and training by PBL teaching method were designed to enable students to learn clinical expertise, and through active participation and problem solving it can strengthen -consciousness, competition and team spirit among students, in line with advanced learning to implement concepts and fulfil the requirements of quality education.

As medical oncology, the neck is painless lymph nodes in addition to common clinical manifestations of malignant lymphoma, its need and reactive hyperplasia, lymphatic system, chronic lymph node inflammation, metastasis differential diagnosis of cancer and other diseases. Through the answers to these questions, students in the acquisition of history provide a comprehensive clinical data, avoid misdiagnosis or missed diagnosis, help improve the overall quality of students.

3). Help Build a Theoretical Study and Practice Cohesive Platform

Problem-solving process, you need to curricular and extra-curricular, internal and external, direct and indirect experience closely together, gathering information through various channels, the expansion of knowledge to solve problems. Such training to solve the problem requires a good combination of cognitive skills which improve the ability of students to apply theory to solve practical problems.

4). Contribute to Teachers to Improve their Professional Quality and Achieve a Total Growth of Teachers and Students

PBL teaching mode put forward higher requirements for teachers to increase the overall quality of teaching methods employed by teachers, which pose challenges for teachers. Teachers must change their roles, bring new ideas, changing with time, and constantly improve the quality of teaching.

In traditional teaching group, teachers prepare lessons carefully in accordance with the syllabus, combining multimedia courseware for teaching. Classroom teacher teaches mainly through lectures on important and difficult chapters.

Results of the survey show the student clinical skills and satisfactory theory examinations. At the same time, bedside teaching and examination method has been recognized by the vast majority of teachers and students, there are 78.67 percent of the students think bedside teaching help or helpful (see Fig. 1), 89.59 percent of the students think we can proceed, 83.70% of the students on the skills test bed l Lu method positive attitude, 92.39% of students think we can continue.

PBL and CBL are the common models of medical clinical education, in common. PBL and CBL teaching emphasize on the initiative of students and the teaching method continues to mobilize the enthusiasm of students through the guidance of teachers. In PBL teaching, most of the problems raised are in the form of cases, whereas in CBL teaching, cases for analysis are considered by asking a question as shown in Fig. (2). In the CBL, because the case is at the centre of the teaching process, the teacher's role and the role of different students better way of thinking based on the gradual establishment of medical knowledge and expertise constraints, according to the school's teaching objectives. The criteria to select cases is shown in Fig. (3).

In PBL teaching methods, problem-driven integrated practice will not only help students to comprehend information sources and use information tools rather it also helps in developing analytical thinking in students enabling them to think independently. Practice runs found because of differences in English reading ability, the experimental group students to master. English is more difficult to retrieve than Chinese, but to master Chinese, students still need to improve their ability to retrieve. Further, since the paediatrics practice time is short, in less time in evidence-based medical education, students grasp the depth and difficulty enough, but less than nothing if the student to be familiar with the basics of evidence-based medicine, such as the concept of authenticity background step evaluation of the implementation, but also basic to teaching results of the study.

CONCLUSION

The study results suggest that the teaching method is worth applicable. to practice teaching generalized to clinical

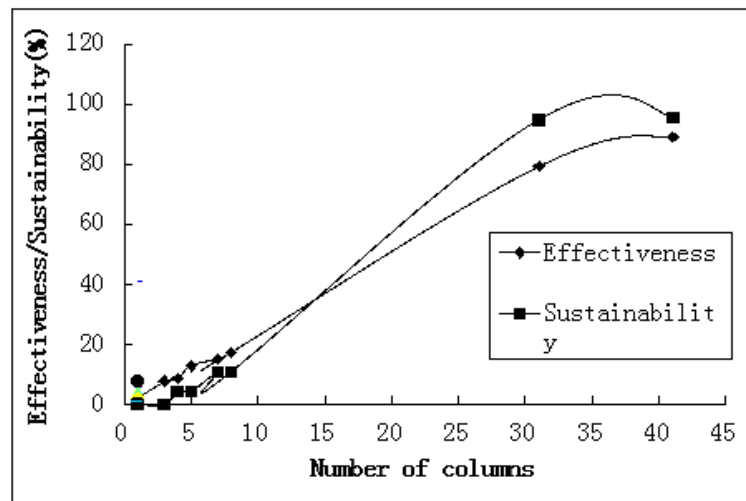


Fig.(2).Comparison between effectiveness and sustainability of teaching methods in inside and outside, women and children's.

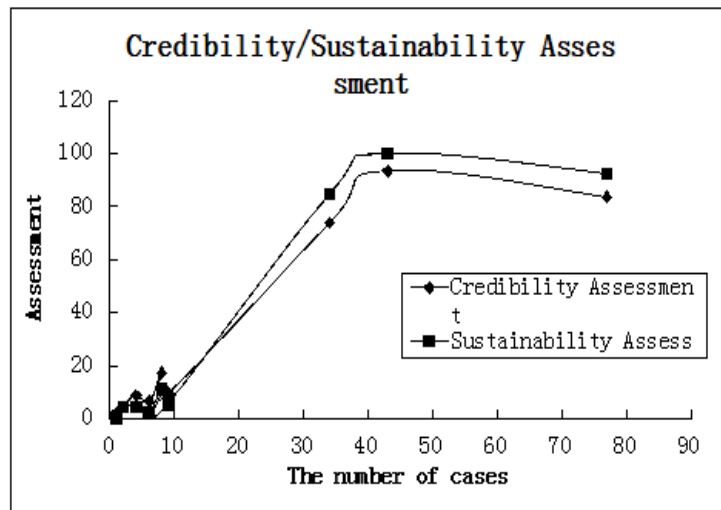


Fig.(3).Students' appraisal about credibility and sustainability of skill test.

practice as well as specialist training in standardized training; medical students will viewpoints and methods used in medical practice evidence-based medicine, the better for the patient service. In addition, in both teaching and learning, teachers in the teaching process, consolidate old knowledge, and learn new knowledge, and in this way their teaching skills are significantly improved.

From the information collected, the discussion is summarized highlighting the experimental design, preparation and operation of all members of the group of independent division of work completed, enhancing the spirit of teamwork. Students take part in discussions with team members and teachers, and receive guidance to improve the language skills, analytical and problem-solving skills, and promote the development of healthy relations between students and teachers. Students in the process of self-designed experiments, through exploration on their own, find ways to solve problems to stimulate innovative thinking ability.

Therefore, PBL theory is meant to guide students with whole new perspective and ideas and promote the reform in the teaching model of medical physics or similar professional experimental teaching.

PBL model in recent years related to the field of medical education in the country has been developed to some extent, but on a small scale applied to a single discipline, and is yet unable to form a large-scale comprehensive curriculum, but to understand the latest developments in PBL, mastering PBL is essential. On the basis of the full implementation of these preparations basically completed the combination of their own practice of PBL model, focused on high quality medical talent should become the consensus of medical education, but also must also focus on the development trend of China's medical education and reform.

In the 20th century, the contradiction between the requirements of the limitations of the traditional model of medical education and a modern bio-psycho-social medical model between the increasingly prominent, reform the curriculum and teaching methods of integration is to implement a number of medical schools, and gradually moving towards a new explore and establish medical education model.

To explore the old model of medical education, and create a new model of medical education are big challenges, which require overcoming many difficulties. Currently, at the national level, the main medical education reform is based on the concept of PBL education, which relates to a lot of problems that need to be solved. However, these issues are not only realistic but also urgent and need to be resolved.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

ACKNOWLEDGEMENTS

This work is supported by the Key Project of Guangxi Social Sciences, China (No.gxsk201424), the Education Science fund of the Education Department of Guangxi, China (No.2014JGA268), and Guangxi Office for Education Sciences Planning, China (No.2013C108).

REFERENCES

- [1] S. Bao, W. Wang, and T. Fan, "Medical physics is a research and development of medical imaging and tumor treatment of large medical equipment such as the source of the subject," *Chinese journal of medical apparatus and instruments*, vol. 31, no.3, pp.157-162, 2007.
- [2] Project of the ABIM Foundation, ACP-ASIM Foundation, and European Federation of Internal Medicine, "Medical professionalism in the new millennium," *Clin Med JRCPL*, vol. 2, no.116-118, 2002.
- [3] B.Barzansky, "Abraham Flexner and the Era of Medical Education Reform," *Academic Medicine*, vol. 85, no.9, pp.19-25, 2010.
- [4] A. H. Beck, "The Flexner Report and the Standardization of American Medical Education," *The Journal of the American Medical Association*, JAMA, vol. 291, no.17, pp. 2139-2140, 2004.
- [5] B. Kligler, V.Maizes, S.Schachter, C.M. Park, T.Gaudet, R. Benn, R. Lee, and R.N.Remen, "Core Competencies in Integrative Medicine for Medical School Curricula: A Proposal," *Acad Med*, no.6, pp.521-531, 2004.
- [6] Lazarus, "Drawing up the ten megatrends in medical education," *Oncology Times UK*, vol. 6, no.1, p.12, 2009.
- [7] J. C.Kolars, D. G. Larry, T. Peter, E. P. Marilyn, K. D. Wayne, and O. W. James, "The Effect of Student- and Teacher-Centered Small-Group Learning in Medical School on Knowledge Acquisition, Re-

- tention and Application,” *Medical Teacher*, vol. 19, no.1, pp.53-57, 1997.
- [8] J. B.Ziegler, “Use of Humour in Medical Teaching,” *Medical Teacher*, vol. 20, no.4, pp.341-348, 1998.
- [9] J. C.Perrenet, P. A. J.Bouhuijs, and J. G. M. M.Smits, “The Suitability of Problem-based Learning for Engineering Education: Theory and Practice,” *Teaching in Higher Education*, vol. 5, no.3, pp.345-358, 2000.
- [10] T. L.Cheng, L.Greenberg, H.Loesser, and D. Keller, “Teaching Prevention in Pediatrics,” *Academic Medicine*, vol. 75, no.7, pp.66-71, 2000.
- [11] P. A.Leggat, “Learning experience in medical education,” *Medical Teacher*, vol. 22, no.3, pp.288-292, 2000.

Received: June 10, 2015

Revised: July 29, 2015

Accepted: August 15, 2015

©Sun et al.; Licensee Bentham Open.

This is an open access article licensed under the terms of the (<https://creativecommons.org/licenses/by/4.0/legalcode>), which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.