

Academic Staff Perspectives Towards Adoption of E-learning at Melaka Manipal Medical College: Has E-learning Redefined our Teaching Model?

Bhardwaj A, Nagandla K, Swe KMM, Abas ABL

Department of Orthopaedics Surgery

Melaka Manipal Medical College

Malaysia

Corresponding Author

Amit Bhardwaj

Department of Orthopaedics Surgery

Melaka Manipal Medical College

Malaysia

Email: dramitortho@gmail.com

Citation

Bhardwaj A, Nagandla K, Swe KMM, Abas ABL. Academic Staff Perspectives Towards Adoption of E-Learning At Melaka Manipal Medical College: Has E-Learning Redefined Our Teaching Model?. *Kathmandu Univ Med J* 2015;49(1):12-8.

ABSTRACT

Background

E-learning is the use of Information and Communication Technology (ICT) to provide online education and learning. E-Learning has now been integrated into the traditional teaching as the concept of 'blended learning' that combines digital learning with the existing traditional teaching methods to address the various challenges in the field of medical education. Structured e-learning activities were started in Melaka Manipal Medical College in 2009 via e-learning platform (MOODLE-Modular Object-Oriented Dynamic Learning Environment).

Objectives

The objective of the present study is to investigate the faculty opinions toward the existing e-learning activities, and to analyse the extent of adopting and integration of e-learning into their traditional teaching methods.

Methods

A cross sectional study was conducted among faculties of Medicine and Dentistry using pre-tested questionnaires. The data was analyzed by using the statistical package for social science, SPSS, version 16.0.

Results

The result of our survey indicates that majority of our faculty (65.4%) held positive opinion towards e-learning. Among the few, who demonstrated reservations, it is attributed to their average level of skills and aptitude in the use of computers that was statistically significant ($p<0.05$).

Conclusion

Our study brings to light the need for formal training as perquisite to support e-learning that enables smooth transition of the faculty from their traditional teaching methods into blended approach. Our results are anticipated to strengthen the existing e-learning activities of our college and other universities and convincingly adopt e-learning as a viable teaching and learning strategy.

KEY WORDS

Blended learning, e-learning, medical education, MOODLE

INTRODUCTION

There is a profound change in the medical education curriculum with the development of new learning technologies, rapid growth of internet and advent of World Wide Web (WWW). This technology mediated teaching and learning is widely known as e-learning.¹ This is also called Web-based learning, online learning, distributed learning, computer-assisted instruction, or Internet-based learning.² The advantages of e-learning are the flexible teaching and learning that enhances individualised and self-directed learning. The learners can choose the place and time of educating themselves thereby overcomes the geographical barriers.³

The human resource capacities of many universities are unable to cope with the existing academics structure, demands and needs. This can be overcome by incorporating 'blended learning' that combines digital learning with the existing traditional teaching methods (face to face lectures and bedside teaching).⁴ The technology used in e-learning can vary from an audio-tape or a DVD or multi point videoconferencing facility, to the usage of social software for creating a virtual learning environment.^{1,5} For e-learning to be more effective, the learning objectives should be clear and the course designed to meet all the domains of learning that includes knowledge, skills and attitudes and with adequate training to embrace the technology.⁶

The objective of the present study is to investigate the knowledge, attitude and perception of the faculty towards e-learning and to analyse the extent of integration into their teaching methods. By identifying the positive attitudes and the impediments, the results of this survey is expected to further strengthen the college wide e-learning activities.

METHODS

A cross sectional study was conducted among faculties of Medicine and Dentistry at Melaka Malaysia from October 2012 to December 2012 to find out the faculty opinions towards adoption of e-learning in their teaching activities. Data were collected in the form of pre-tested self administered questionnaires, which contain the following sections: socio-demographic profile, skills and aptitude on the use of computer, knowledge and use of existing e-learning technology (MOODLE), experiences and attitudes towards e-learning, faculty opinion on novel e-learning techniques, and initiatives to be adopted for optimization and upgrading the existing e-learning facilities. The questionnaires were validated by pilot study conducted on faculty in science lectures. After obtaining consensus on the validity and relevancy of the questionnaire from the members of the research and ethical committee it was distributed to all members of the faculty of medicine and dentistry. The purpose of the study was explained and informed consent was obtained.

The data were screened for accuracy and incomplete data were excluded from analysis. The data were analyzed by using the statistical package for social science, SPSS, version 16.0. To assess attitudes of faculties towards E learning, fourteen statements were constructed and five points Likert scale was used for scoring, 5. Strongly agree, 4. Agree, 3. Not Sure, 2. Disagree and 1. Strongly Disagree.

RESULTS

Socio-demographic profile

There were 64 faculties in Medicine and Dental and among them 57 respondents (42 medicine and 15 dental) participated in this study which gave a response rate of (89 %). Among them, four responses were excluded due to incompleteness of data and total 53 responses included in analysis. Regarding base line character of faculties, age distribution was 29-67 year and teaching experiences range from one year to 36 year with mean 11.79 years. There were total 41 (77.4%) male faculties and 12 (22.6%) female faculties participated in the study and among them 79.2% were Indian lecturers followed by Myanmar, Malay, Srilanka and Chinese.

Skills and aptitude on the use of computer

Majority 49 (92.5 %) of respondent used laptop as daily use of computer and 34 (50.9%) use computer for teaching, communication and research. Twenty two (41.5%) spent 5-10 hours per day with their laptop and 21 (39.6%) spent less than five hours, 4 (7.5%) spent more than 15 hours per day.

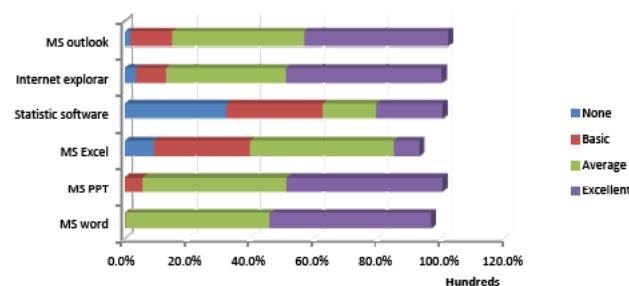


Figure 1. The knowledge and skills on the usage of computer and software

Fig 1 showed that majority of faculties have competent skill in MS words (50.9%), MS power point (49.5%), Internet explorer (49.1%) and MS outlook (45.3%) and average skill on MS words (45.3%), MS power point (45.3%), MS excel (45.3%), Internet explorer (37.7%) and MS outlook (41.5%). Regarding use of statistical software only (20.8%) of faculties has competent skill in statistical software and majority of them (60.2%) responded that they have very basic knowledge on statistical software.

Knowledge and use of existing e learning technology (MOODLE),

Regarding use of college Moodle, 79.2% of faculties had Moodle account. About 49.1% use the following as teaching resources-power point slides, case discussions, quizzes and 32.1% upload videos for students (Fig 2).

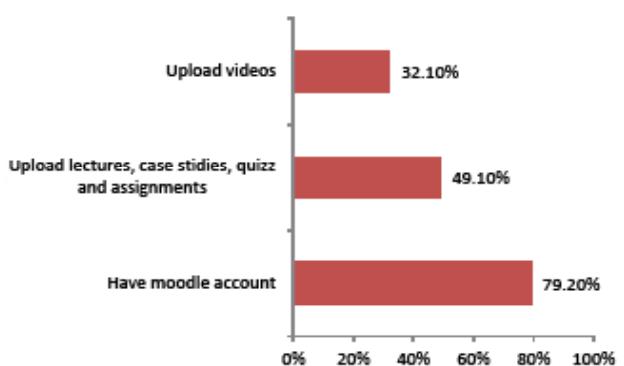


Figure 2. Usage of college Moodle

Experiences and attitudes towards e-learning

The questionnaire statement is shown in Table 1. Regarding the perception of the e-learning, about 65.4% of faculty held positive opinion towards e-learning (Fig 3). About

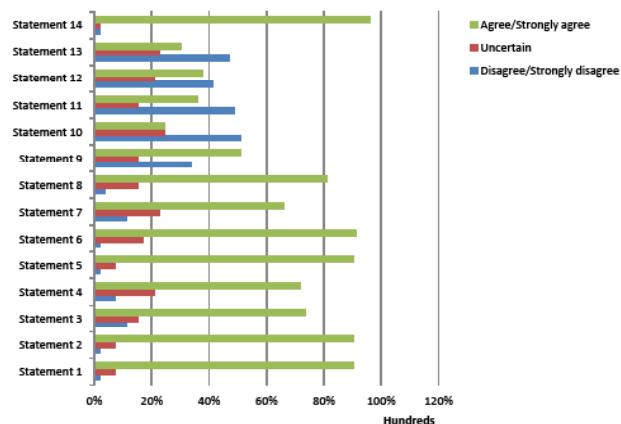


Figure 3. Perception of faculties toward E-learning activities

34.6% demonstrated reservations towards e-learning.

Association between the skillfulness in computer usage and perception of e-learning

To determine whether the perceptions towards e-learning is related with the skills and aptitude of compute usage, we performed analysis with Mann Whitney U test that revealed the use of e-learning is less time demanding than traditional education process among the respondents with high skills on computer usage and it was statistically significant ($P<0.05$). The rank sum values are shown in table 1.

Faculty opinion on novel e-learning techniques

Regarding the novel approaches in e-learning such as blended Problem based learning that includes both online and traditional approach, integrating the clinical

Table 1. Mann Whitney U analysis on association between the skillfulness in computer usage and perception of e-learning

SN.	Statement	Computer skill	Number	Mean rank score for MU rank test
1	E-learning modalities are useful tool in medical education	Average High	26 27	24.27 29.63
2	The use of educational technologies serves to provide rich educational resources and experiences.	Average High	26 27	23.31 30.56
3	E-learning provides extensive education for the learners	Average High	26 27	25.37 28.57
4	E-learning improves student's participation in the educational process.	Average High	26 27	25.73 28.22
5	Formal staff development online Teaching and learning guidance should be facilitated for implementation of e –learning activities in the campus.	Average High	26 27	27.50 26.52
6	E-learning improves the effectiveness of teaching	Average High	26 27	24.79 29.17
7	E-Learning saves the time and effort of both teachers and students	Average High	26 27	28.27 25.78
8	E-learning needs well prepared online materials	Average High	26 27	27.37 26.65
9	The use of Internet reduces the interest of students for face to face educational activities	Average High	26 27	30.33 23.80
10	E-learning may result in decline in students performances	Average High	26 27	28.90 25.17
11	E-learning may reduce the interactive discussion between the faculty and students	Average High	26 27	28.31 25.74
12	E-learning may result in difficulty in monitoring and evaluation of the students	Average High	26 27	27.56 26.46
13	The use of e-learning is more time-demanding than traditional education processes	Average High	26 27	32.92 21.30
14	Technological infrastructure is crucial for successful implementation activities	Average High	26 27	26.75 27.24

skills and bed side clinical teaching with e-learning, 75% of faculty demonstrated willingness towards adoption of these techniques. About 15.7% were uncertain and 8.8% revealed negative responses.

Initiatives to be adopted for optimization and upgrading the existing e-learning facilities.

Most of the faculty member stated the need for workshops and formal training on use of college Moodle for strengthening the e-learning activities.

The screenshot shows the MMMC Moodle homepage. On the left, there's a sidebar with links like 'More menu', 'Setting Status', 'Course Catalogue', 'General Forum', 'Class Room', 'Calendar', 'External Link', 'Internal Link', 'MMMC Website', 'MMMC Staff Webmail', 'MMMC Student Email', 'M2 Connect', 'M2 Academic Education', 'M2 Courses', 'M2 Quizzes', 'M2 Discourse', 'M2 Projects', 'M2 Assessments', 'M2 Gradebook', 'M2 Resources', 'M2 Newsfeed', and 'M2 Activity Stream'. Below this is a 'General Forum' section. The main content area has a 'Course categories' section listing MBBS courses such as Community Medicine, ENT, Ophthalmology, Medicine, Psychiatry, Surgery, Orthopaedics, Paediatrics, Obstetrics & Gynecology, Discipline Integration, Others, and more. To the right, there's a 'Turn editing on' button, a 'Academic Office Corner' with a 'Reply' link, a 'Upcoming Events' section stating 'There are no upcoming events', a 'Go to calendar...', a 'Latest News' section with links to 'M2's New Year...', '20 Oct. 02.04', '20 Oct. 02.04', 'Batch 22 Semester 2 0 15 Time Table...', '26 Oct. 02.04', 'Admin Notice...', '7 Dec. 02.04', 'Admin Notice...', 'Batch 25 Sem 1 Time Table...', and 'Other Regions...', and a 'Calendar' section showing the month of January 2013.

Figure 4. Screen Capture of MMMC Moodle

DISCUSSION

The recent innovations in technology has revolutionized the teaching and learning process and hence the need for the students and educators to become adept in utilizing them. The traditional instructor centred teaching is shifting to learner centred model that facilitates the student to control their own learning. This is facilitated by the acquisition and use of information distributed and perceived by technological means referred as the electronic form of learning or e-learning as defined by Mauna Jamain.⁷ Definitions are important in understanding the various modalities of e-learning. It can be either as distance learning that uses information technology to transfer the contents to the learners who are at remote locations. The other form is computer based or assisted learning that uses stand-alone multimedia packages for teaching and learning.⁸ A new concept that has emerged is the blended learning that refers to the combination of e-learning technology with the traditional face to face teaching for example, having a lecture along with online tutorial. The term "just-in-time" learning refers to the access to the texts, textbooks or research article either in a virtual database, Pub med or digital repositories through laptops, palmtops or computers. This facilitates the learner who can be a junior doctor or a busy clinician to find an answer for their current clinical condition. Thus, Just in time integrates learning with clinical practice and is referred to as convergence.⁹

The popular e-learning education software tools are the Virtual Learning Environment (VLE or LCM) systems such as WebCT™ (now known as Blackboard Learning System™)¹⁰ and Moodle™ (modular object-oriented dynamic learning environment). They are also referred as Course Management System, Learning Management System.¹¹ Moodle was originally developed by Martin Dougiamas to help educators create an online course that provides

environment for practical and interactive classes.¹² These VLEs are multi-user environment and the course constructors can create, develop, store, reuse, manage and deliver digital learning content through a central object repository that delivers e-learning strategies to students both from the main campus or from geographically separated location.¹³

The traditional didactic lectures are slowly becoming a thing in the past and medical education is adopting more innovative and effective ways of interactive teaching. This is realistically executed by live teaching technology software that is integrated with MOODLE Or Blackboard learning system that serves as a platform for asynchronous teaching (discussion forums) an synchronous teaching (Real time audio tutorials or teleconferencing). This provides the blended teaching environment that combines the face to face teaching with the clinical practical sessions.¹³

THE MELAKA MANIPAL MEDICAL COLLEGE EXPERIENCE

Background

The Melaka Manipal Medical College (MMMC) was established in September 1997. MMMC is unique for its twinning programme according to which, the programme envisages a two and a half year preclinical training course in Manipal in India, followed by two and a half years of clinical training in Malaysia. In July 2003, the government of Malaysia and Malaysian Medical Council recognized the MBBS degree of Melaka Manipal Medical College (MMMC), which is conferred by Manipal University, Manipal, India. IT facilities were started in fourth quarter of 2001 at MMMC. Internet access was at 2 Mbps with telecom Malaysia as the ISP. Networking facilities comprising of Cisco equipment were setup to provide connection to all IT hard wares. Since then, computers were used in administrative task and teaching aids.

The medical education unit in our college has developed the online e-learning platform using MOODLE platform in 2009. MOODLE is Modular Object-Oriented Dynamic Learning Environment.¹¹ The e-learning strategies in our college through MOODLE includes development of course, addition of resources such as power point slides, recorded lectures, videos, webinars and webcasts, clinical case discussions, providing external links for recommended websites, online journals and discussion forum for students. It serves as an interactive forum between students and the educators discussing the clinical cases and the contents can be accessed to any degree for any variable period of time. Both the Students and instructors are linked with exchange of information and ideas. They communicate either asynchronously through emails or synchronously via Moodle online chat forums. Besides these, MOODLE is a platform keeping the students abreast with information regarding the academic calendar, timetables, schedules, and examination results. The instant messaging access and the curriculum files are stored for the students to access whenever they want.¹²

Adoption of new technology is a formidable task and requires support and willingness of the staff and students using it. Therefore it is imperative to develop a strategic plan for successful implementation of e-learning in an institutional setting. With the establishment of e-learning platform in our college, it is crucial to gauge the level of faculty's adoption of e-learning and its integration into their teaching activities. Determining faculty's perceptions on the existing e-learning activities based on their personal experiences will enhance our current understanding of the levels of the usage of college e-learning facilities hitherto that will guide the decision makers in planning and developing more comprehensive and novel e-learning initiatives.

The results of our survey reveals that majority of our faculty demonstrate considerable knowledge and aptitude on computer and its software usage. Regarding the usage of the Moodle, about 49.1% of staff up-load power-point slides, case studies, quizzes and 32.1% have included video demonstration of procedures as their module content. In general most of the learning activities include lecture presentations, and assessments such as assignments and quizzes for formative assessment for the students at the end of the semester. For additional references, there are links available for external resources. Besides these, there are forums for academic posts of the marks and announcements of the course schedules.

Our survey findings brings to light that about 49.1% of faculty are involved in the delivery of the course content through Moodle. Regarding the perceptions towards e-learning, majority of the faculty members held positive opinions. These results of our survey on perception, reinforce the findings of earlier studies by Kleiman et.al.^{7,13,14} However, about 34.6% of faculty members had reservations towards e-learning and perceived that e-learning may be time demanding and may result in difficulty in monitoring the students and can reduce the interest for face to face or conventional/traditional teaching. This perception is perhaps related to the skills and knowledge of the computer usage as demonstrated statistically by Mann Whitney U test ($p<0.05$).

According to Becker et. al. teachers with less traditional views on education perceive e-learning as viable option.^{15,16} In a study by Maha Mohamed Ali El Tantawi, using Moodle as e-learning resource, it is highlighted that the students supported the fact that e-learning is a compliment to traditional face to face teaching methods.¹⁷ This reinforces the earlier results by Costa-Santos et. al. (2007) that the use of Moodle is generally accepted as a supplement to traditional methods of teaching.¹⁸ Selvakumaran et. al., reported in his study among Malaysian students feedback on utilizing e-learning on a Physiology course, the majority did not agree that online learning can replace traditional, face to face education.¹⁹ This should prove to dissuade the fact that e-learning would replace traditional lectures.

While in our study, 96% of faculty responded that technological infrastructure is crucial in the successful implementation, it is erroneous to comment that this is the only principal factor contributing for its limited use. In a study by Edirippulige S et al, it is stated that the initiatives, enthusiasm and creativeness of the medical educators and policy makers provides synergy for innovation.²⁰ It is worth reinforcing at this stage, that educators must be encouraged to become active participants in the design of e-learning instead of imposing on them. Our results also indicate that the faculty training on the online course, planning and designing the teaching materials are the recommended priority for the strengthening of e-learning activities.

Our survey has shown that the faculty are open to novel techniques of e-learning that includes the blended Problem based learning, integrating clinical skills and bed side teaching with e-learning. In a study by Woltering V et al, comparing the traditional problem based learning with blended problem based learning where the students work with the online program on the first day and the tutor participates on the final day it was concluded that blended PBL resulted in more motivation and subjective gains compared to traditional PBL.²¹ In a survey of under graduate medical students by Gormley et al, it was identified that the use of e-learning in clinical skills education had a positive impact on the learning of clinical skills and was comparable to other traditional forms of clinical skills teaching.²² The evidence is further strengthened from a study by Potomkova J, where real paediatric case scenarios are combined with review of current literature for evidence based bedside teaching and learning.²³ The results highlighted effective knowledge transition with this approach and supported the continuing medical and professional development of the educators.

REFLECTIONS AND RECOMMENDATIONS

Despite the fact that Moodle was introduced as college e-learning portal of delivery since three years, our survey revealed that among the registered faculty members of Moodle, 62% have imbibed online teaching into their curriculum. It is also revealed from our survey that only few faculties from each department are involved with this technology of teaching, while the others are yet to be persuaded to teach online. From the authors view, the common basic ground the faculty has not yet started to teach online is probably related to the technology not being understood and as well as its principles of course planning, construction and adaptation. This calls for more concerted efforts towards providing formal training and assistance to help them make the transition from teaching in the traditional classroom to teaching online. However, our survey on perception towards e-learning was encouraging as majority held positive opinions towards e-learning. The authors also recommend the need for periodic e-learning workshops for the faculty to develop additional skills in the use of technology, identify the appropriate curriculum

content, customising and revising the content and updating on innovative and new teaching resources.

There are various e-learning resources available for the educators that provide high quality peer reviewed sharable e-learning materials. These include the Association of American Medical (AAMC's) MedEdPortal, a repository for curriculum and assessment materials that contains up-to-date peer reviewed teaching materials and virtual patient banks. The others are-The Health Education Assets library (HEAL), The Multimedia Educational Resource for Learning and online Teaching (MERLOT), The International Virtual Medical School (IVIMEDS) is an international organization that is setting new standards in e-learning medical education and has partnership with various medical schools using this blended approach of learning. Jorge G. Ruiz, et al in their review on impact of e-learning in medical education suggested that motivation of staff towards adoption of online teaching can also be achieved through faculty developments such as promotions thereby rewarding the educators for their dedication and effort in developing quality and effective online resources in their department.²⁴

FUTURE VISION OF E-LEARNING AT MMMC

Enhancements of the medical graduate's basic principles of patient communication, clinical and examination skills using virtual patient databases and patient simulators mannequins. According to review by Cook et.al,²⁵ a virtual patient is defined as a specific type of software program that simulates the real life clinical scenarios, whereby the students assume the role of health care providers in obtaining a history, conduct physical examination and to arrive at a diagnosis. Introducing Podcasts that refers to a series of digital media files, either audio or video that are released episodically and the lectures, whiteboards

and power point presentations are viewed. Envisaging on online international CME programmes for the Continuing Medical Education (CME) and Continuing Professional Development (CPD) of the faculties in the college.

CONCLUSION

The current literature clearly indicates that it is imperative to integrate e-learning in medical education. This integration into undergraduate, postgraduate and continuing medical education represents a shift of the role of the educator from distributors of learning contents to facilitators of learners and as well as assessors of competency. By undertaking this study, we highlighted the current levels of e-learning usage in our college. This study has provided the administrators the exact opinions of the faculty towards e-learning. Overall, the experience of the Faculty of Medicine and dentistry at Melaka Manipal Medical with e-learning using Moodle after three years appears promising. Among the faculty who are still not confident with technology, the priority recommendation is to provide formal training and periodic workshops. The future research is to analyse the student's opinion on e-learning, and to evaluate the effect of e-learning in medical education. From the educators perspectives, future direction is to assess the differential use and adaptation of e-learning across the various specialities, and incorporating e-learning with problem based clinical cases, bed side clinical teaching and in clinical skills simulation trainings.

ACKNOWLEDGEMENT

We thank all the faculty of Melaka Manipal Medical College who have contributed significantly towards the preparation of the study by filling the answers in the questionnaire in stipulated time.

REFERENCES

- Khogali SE, Davies DA, Donnan PT, Gray A, Harden RM, McDonald J et al. Integration of e-learning resources into a medical school curriculum. *Med Teach* 2011; 33(4):311-8.
- Francis Lau, Joanna Bates. A Review of e-Learning Practices for Undergraduate Medical Education. *Journal of Medical Systems* 2004 February; 28(1).
- Bates, A.W. Technology, e-learning and distance education. 2nd ed. Routledge; 2005.
- Burg G, French LE. Hautarzt. The age of Gutenberg is over: a consideration of medical education--past, present and future. 2012 Apr ;63 Suppl 1:38-44.
- Sandars J, Homer M, Pell G, Crocker T. Web 2.0 and social software: the medical student way of e-learning. *Med Teach*. 2010 Jun 18.
- Cook DA. Web-based learning: pros, cons and controversies. *Clinical Medicine* 2007; 7(1): 37-42.
- Muain Jamlan . Faculty Opinions Towards Introducing e-Learning at the University of Bahrain. *The international review of research in open and distance learning*. 2004; 5(2).
- A P Choules. The use of e-learning in medical education: a review of the current situation. *Postgrad Med J* 2007 April; 83(978): 212-6.
- Blackboard TM website <http://www.blackboard.com/>
- Maikish A. MOODLE: A Free, Easy, and Constructivist. Online Learning Tool. *Multimedia & Internet@Schools*. 2006; 13(3): 26-28.
- Moodle. Retrieved on March 01, 2012.: <http://moodle.org/about/>, (2012).
- Raymond G and McKimm J. Medical Education and e-learning opportunities in the South Pacific. *Samoa Medical Journal* 201; 2 (3):32-40.
- Kleiman, G. (2000). Myths and Realities About technology in K-12 Schools. LNT Perspectives. The Online Journal of the Leadership and the New Technologies Community. Retrieved April 25, 2004 from: <http://www.edc.org/LNT/NewsIssue14/feature1.htm>
- Teather D. How to Learn the Hardware Way. *The Guardian* 2000;23(3): 77 – 9
- Becker H. When Powerful Tools Meet Conventional Beliefs and Institutional Constraints. *Computing Teacher* 1991;18(8): 6–9.
- Hannafin R, Savenye S. (1993). Technology in the Classroom: The teachers' new role and resistance to it. *Educational Technology* 1991; 33(6):26–31.
- Maha Mohamed Ali ElTantawi. Using Moodle as an e-learning solution in dental education- a one year experience. European, Mediterranean & Middle Eastern Conference on Information Systems 2012 (EMCIS2012) June; 7-8.

18. Costa-Santos C. 'E-learning at Porto Faculty of Medicine, a case study for the subject Introduction to Medicine'. *Studies in Health Technology Information*. 2007; 129(2): 1366–71.
19. Seluakumaran K. 2011. 'Integrating an open-source course management system (Moodle) into the teaching of a first-year medical physiology course: a case study'. *Advances in Physiology Education*. 2011; 35(4): 369-77.
20. Edirippulige S, Rohana BM, Smith AC, Fujisawa Y, Herath WB et al. Evaluation of e-learning practices in undergraduate medical education: results of a survey in Sri Lanka. In: Proceedings of the ECEH'07. *European Conference on e-Health* 2007 Oct; (217-224): 11-12.
21. Woltering V, Herrler A, Spitzer K, Spreckelsen C. Blended learning positively affects students' satisfaction and the role of the tutor in the problem-based learning process: results of a mixed-method evaluation. *Adv Health Sci Educ Theory Pract*. 2009 Dec; 14(5):725-38.
22. Gormley GJ, Collins K, Boohan M, Bickle IC, Stevenson M. Is there a place for e-learning in clinical skills? A survey of undergraduate medical students' experiences and attitudes. *Med Teach*. 2009 Jan;31(1):e6-12.
23. Potomkova J, Mihal V, Zapletalova J, Subova D. Integration of evidence-based practice in bedside teaching paediatrics supported by e-learning. *Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub*. 2010 Mar; 154(1):83-7.
24. Ruiz JG, Mintzer MJ, Leipzig RM. The impact of E-learning in medical education. *Acad Med*. 2006 Mar; 81(3):207-12.
25. International Virtual Medical School website. <http://www.ivimeds.org/index.php/about-ivimeds>