

Issues and Priorities of Medical Education Research in Asia

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Abstract

This article addresses the roles, issues, approaches, rationale, pitfalls, priorities and balance of research in medical education, particularly its “disarray” status in Asia. Research in medical education has influenced education in many ways. Most importantly, it provides legitimate evidences to stakeholders on which to make educational decisions. It also has a wider social impact on teaching practice and subsequent clinical practice. However, in Asia, medical educational research has not substantially influenced educational policy and medical practices. Moreover, it fails to receive comparable attention as in developed countries. A number of constraints that have hampered the development of educational research in Asia are identified: low socio-economic condition of the region; cultural and religious values and beliefs of the people; lack of congruence between the mission and vision of medical schools; leadership crisis; lack of financial resources; inadequate exposure to medical educational research in undergraduate training; lack of collaboration and commitment; and unforeseeable short-term outcome of medical education. The article concludes with some specific recommendations to strengthen research and to create a research culture in the region, including active leadership and commitment of the institutes/organisations, careful assessment and strategic settings of the priorities of medical educational research, establishment of a regional centre for medical education research, availability of financial resources, wider dissemination of research findings, collaboration with the developed countries and initiative to publish regional-based medical education journals, including electronic journals. Appropriate research environment and culture will enable stakeholders to obtain evidence-based information from educational research to increase the relevance, quality, cost-effectiveness and equity of medical education and practice in Asia.

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Introduction

Medical schools traditionally rest on the “three-legged stool” of research, education and service. Hence, medical teachers are sometimes referred to as “triple-threat academicians”.^{1,2} Medical teachers are, by this definition, original and productive investigators together with committed teachers, and compassionate practising physicians. There have been increasing calls for medical schools to embrace a fourth obligation: “social responsiveness”.^{3,4} In recent years, medical schools worldwide have been increasingly confronted with the challenge of making their curricula relevant to the needs of the times. One response to this challenge is an increased interest in research in medical education.⁵ This article addresses the issues, approaches, rationale, pitfalls, priorities, roles and

balance of research in medical education, particularly its “disarray” status in Asia.

There is a distinct gap between the status of medical education in Asian countries and that of developed countries. Medical education in Asia has colonial-biased, subject-oriented, teacher-centred, discipline-based, lecture-focused and hospital-based traditions, which failed “to train medical students appropriately for national health needs and for medical schools to assume leadership role in shaping services oriented to the needs of the community”.⁶ Similar situation is also prevailing in medical education research that has failed substantially to influence educational policies and medical practices in the region.

A recent study by Tutarel⁷ on the geographical distribution of medical education publications from 1995-2000 portraits

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the alarming situation of the medical educational research in Asia. Papers published from Asia in *Academic Medicine* (1%) and *Medical Education* (8%) were negligible in number. Efforts are desperately needed to bridge the information gap between the developed and developing countries and to minimise “information poverty” in this “resource-poor” region in order to improve the quality of medical education and healthcare services.⁸

Educational Research: Recent Trends

Research in education generally falls into either the quantitative or qualitative tradition. Irby⁹ has depicted this dichotomy in medical education in 2 ways: biomedical and holistic. Cribb and Bignold¹⁰ described this scenario as a tension between “objectifying” and “humanising” trends in medical education. To date, the biomedical or objectifying approach has dominated medical education. In recent years, there has been a shift from models of research based on quantitative, experimental and quasi-experimental methodologies towards qualitative and descriptive methods of research in naturalistic settings.^{11,12} In a study of research projects in medical education in the United Kingdom (UK), Grant¹² reported that most of the research undertaken was non-experimental and was, in fact, qualitative. Qualitative research was found to be much more appropriate in assessing the effectiveness of educational programmes.¹³

Harden⁵ described 5 approaches to research in medical education: experimental, fact-finding, action research, open-ended research and creative research. Recognising the limitations of other approaches, he suggested that action research is the “heart” of medical education. Due to its practical and problem-solving nature, action research is very popular among teacher-researchers.

Does Medical Education Research Matter?

Research in medical education usually deals with the scholarly analysis of context, input, processes and outcomes of educational programmes in order to improve their functioning by providing new evidence either for decision-making or to advocate a change in the system.⁵ Over the years, it has contributed substantially to the understanding of the learning process by exploring and examining educational theories and curricular and pedagogic policies and processes, recognising and examining trends in education, identifying difficult and problematic areas and providing descriptions of these with appropriate solutions. It also has influenced education in many ways and underpins many of the recommendations put forth to governmental and non-governmental organisations, which have influenced policies and the practice of medical education worldwide. Most importantly, research provides legitimate evidence to stakeholders on which to make educational decisions. Armed with knowledge and supported by findings, one is

able to identify more easily the merits and demerits of traditional practices, and is less likely to follow blindly the latest educational fad. Any area in medical education can be a focus of research as it is almost a virgin area. The main aim of research, as Harden⁵ has described, is to bridge the gap between educational theory and the practice of the subject.

Research has its wider “social impact” – the ability to bring about changes – on teaching practice and subsequent clinical practice.¹⁴ It supports a fertile educational environment. The results of research “have impact on how medical students and doctors learn, how they are taught, assessed and selected, and how their courses are organised, funded and administered”.¹⁵ Areas of major development in medical education research include basic research on the nature of medical expertise, problem-based learning (PBL), performance assessment, continuing education and assessment of practising physicians.¹⁶ Through appropriate research, medical schools fulfil one of its social contract: improving the healthcare of the population. Thus, medical education research certainly “has its impact at the bedside, in the consulting room and in the wider community”.¹⁵

Recent Trend: Evidence to Guide Educational Decision-making

Currently, in medical education, a trend has emerged to utilise “trustable research findings” in place of “personal opinions” as a basis for educational management and decision-making.¹⁷ The educational community is also becoming more aware of the importance of evidence in educational decision-making. It is also expected that educational researchers, teachers, academic administrators, health managers, care-providers and policy-makers, join together to develop strategies, and set priorities to enable educational research to guide future medical education, justify huge investment and address social accountability.^{3,4,15,18,19} This has given rise to “evidence-based medicine (EBM)” and “best evidence medical education (BEME)”.^{17,20,21} Utilising the research findings, most medical schools are inclined to move from opinion-based tradition to evidence-based education. BEME is the practice and implementation of methods and approaches to education based on the best evidence available to teachers in their practice.²¹

Medical Education Research in Asia: Law of Diminishing Non-returns?

Medical education research has gained importance in medical schools in the developed countries. However, it has not received the same level of attention elsewhere, especially in Asian countries, and the problems associated with undertaking such activities are profound and seem intractable (Table 1).

Table 1. Barriers to Medical Education Research in Asia

Poor socio-economic condition
- Lack of funds
- Donor-funded projects: “commissioned research”
Cultural and religious conservatism
Lack of relevance
- Medical training ignores community health needs
- Research has different purposes, scopes and outcomes
Leadership crisis
- No institute to undertake medical education experiments
- No “culturally relevant” policy and guidelines
- Half-hearted commitments of regional and international organisations
- ‘Brain drain’ of health professionals due to poor working environment
Faculty development
- “Triple-threat model” inhibits educational research
- Low availability of training on qualitative research methodology
- Educational research reaps no professional reward
- Weak collaboration among departments and institutes
Information poverty
- Lack of up-to-date books and journals
- High subscription costs of journals
- No regional medical education journal
- Scanty publication: language barrier, editorial bias, uncertainty among professionals about journal options for their publications
- Poor Information Technology facilities and training
- Information gap between developed and developing countries
Unforeseeable short-term research outcome
- Impact on healthcare is difficult to assess and is long-term in nature

Poor Socio-economic Condition

The main problem that hampered the development of medical education research is the socio-economic conditions found in most Asian countries. According to the World Bank, about 66% of countries are “low-income economies” or “lower-middle-income economies”.²² In most countries, donor-funded and foreign consultant-dependent medical educational projects are initiated with an interest to claim visible and fairly immediate results that have little scope for priority-based research in medical education. These projects fail to strengthen the local research culture and mostly conduct research with limited output. Sometimes, these projects are halted suddenly due to a change in the donor’s mission or to changes in the government or political situation of the country. This was the case with the Further Improvement of Medical Colleges Project²³ in Bangladesh funded by the World Bank and Overseas Development Administration (ODA) in the UK, which was abandoned at its peak hour of achievements. Moreover, the education system in most countries was developed from the ideology of their colonial legacy, which fails to meet the needs of the community. Without local needs and involvement, research

remains a rather artificial activity heavily dependent on foreign funds and responsive only to concerns outside of Asia.

Cultural and Religious Conservatism

Cultural and religious beliefs and values also play an important role. Asians are known to be culturally and religiously conservative. They tend to support the existing social, political and educational arrangements and are reluctant to provide information – an attitude developed and inherited from their colonial past. Moreover, the intentions of those who seek information become highly suspect; consequently, the information given is sometimes unreliable or non-productive. Many well-documented medical education research projects conducted in the region have not been published. Even if they are published, it is only in local journals, and sometimes in their native language rather than in well-established international journals. This is due probably to a combination of conservatism and poor grasp of English among professionals. Other factors for poor research activity and publications include editorial bias (low interest in developing countries, ignorance of local research conditions and weak representation of developing countries on journal editorial boards), uncertainty among professionals about journal options for their publications, poor access to information due to the high costs of journals and books and limited Information Technology (IT) facilities.^{7,8}

Incongruence Between Mission and Vision

Medical education in Asia is not need-based. Major decisions about medical education and healthcare are often made by bureaucrats based on advice from international donor agencies. The decisions are based on national and international political and economic interests, deliberately ignoring the relevance of medical education research. Educational research is meant to benefit teaching and learning. At present, research conducted by medical schools, health ministries and other agencies have different purposes, scopes and outcomes. Moreover, as most educational innovations and researches are conducted in Western countries, it is sometimes difficult to transfer those in Asian context.

Leadership Crisis

There are about 850 medical schools in 50 Asian countries;²⁴ unfortunately, not a single one of them has flourished like McMaster University, University of New Castle, University of Maastricht, University of Dundee and the University of Illinois at Chicago to carry the medical education flag in Asia and to foster medical education experiments.

The regional and national associations of medical

education tend to lead a quiet life, conducting sporadic activities. Academic and research leadership, with true commitment to medical education, has yet to develop. Ironically, number of renowned medical educationists in Asia have, and still are, contributed much in developed countries. This “brain drain” may have come about because they failed to find a suitable environment to contribute in their own country.

Unlike the developed countries, international organisations and regional and national associations/councils fail to prescribe specific and “culturally relevant” medical education policies suited to their own regions. The Edinburgh Declaration,²⁵ crafted by the World Federation for Medical Education (WFME) in 1988, and intended to bring changes to medical education worldwide, has failed to impact on the region. Half-hearted commitment of these organisations is also a limiting factor; for example, WFME is yet to organise its global activity in any Asian countries on medical education.

Lack of Financial Resources

Another important problem is funding for this field, which is neither pure medicine nor pure education.¹² For the health sector, fund allocation is less than adequate, and most of this limited fund is directed towards hospitals ignoring education and training. Above all, educational projects often fail to fit into the defined scope of the research grants of various organisations as they do not have obvious “industry linkages and commercialisation potential”.²⁶ Leading organisations in education and healthcare are more interested in investing their resources in research in disease prevention and promotion. International pharmaceutical companies often like to seize the opportunity to undertake clinical drug trials in Asian countries to advance their commercial agenda. Unfortunately, renowned medical teachers and clinicians often fall into this trap and ignore the real needs of their countries.

The author’s own experiences from working in Asian countries have shown that the funds available for research and development in medical education are paltry, amounting to little more than a couple of decent grants for clinical research. It sometimes happens that research committees in medical schools accord low priority to medical educational research proposals by labelling them as “faculty development programmes” and give the verdict that monetary involvement or investment is not necessary, as the project has no commercial potential. Pirrie²⁷ has described this scenario as the “law of diminishing non-returns” in medical education research. The professional self-esteem of teachers, Bligh and Parsell¹⁵ have expressed, may take a tumble when they learnt that their research proposals have been dismissed as such or rated as having

little importance. Pirrie’s concern is more than that of the “status” of the teacher: “It is not just the *amour propre* of individual researchers that is at stake. The fact is that the persistence of the *status quo* effectively blocks the advancement and regeneration of medical education research”.²⁷ This situation cripples the medical education system and, in a long run, lowers the quality of healthcare of a country.

Evaluation becomes necessary whenever an innovation or intervention is carried out to document its impact. The development of such technology to measure a broad array of programme parameters is often costly and logistically difficult. When budgets are tight, policymakers are interested, wrongly, to channel scarce funds to meet basic programme needs rather than programme evaluation.²⁸

Poor allocation of funds leads to a shortage of books and journals on medical education in the libraries of medical schools. The shelves of most medical libraries are filled with outdated books that hamper medical teachers’ pursuit of education research. Moreover, the lack of computer facilities and IT training restricts medical professionals’ access to on-line medical education and other related journals and information.

Medical education departments/units in most medical schools lack funding and resources. Often, teaching staff from other departments act as part-time faculties. Medical educators are sometimes perceived as aliens since their tasks are restricted to certain educational aspects. Funds are also seldom available for staff to attend conferences to disseminate study findings and share information and ideas.

Inadequate Exposure to Education Research Methodology

The lack of adequate emphasis on research methodology and bioethics in undergraduate medical education results in medical graduates (and future teachers) being unfamiliar with these concepts. Training on research methodology for medical teachers and healthcare professionals focuses mainly on the quantitative model. Such an emphasis encourages teachers to use quantitative methods to assess the effectiveness of educational innovations or interventions even when qualitative methods may be much more appropriate¹³. The use of randomised control trial (RCT), which is considered as the gold standard of outcome research, is seldom used in medical education^{29,30}

Curriculum committee members, policymakers, teachers with a clinical background and members of funding agencies are familiar with biomedical approaches to research and, hence, feel uneasy with projects that focus on educational interventions. Under- or non-representation of medical educationists in committees renders the situation even

more critical.

The traditional “triple-threat model” is being used as the main basis for faculty development and meting out rewards in most medical schools in the region. Productive clinical research is the major criterion used in handing out promotions and rewards in various disciplines while a lower status is accorded to teaching. Sadly, the pursuit of educational research by medical teachers does not lead to any commensurate professional rewards.

Lack of Collaboration and Commitment

In the developed countries, various professionals, such as clinicians and basic scientists, educators, psychologists and social scientists, have joined hands to pursue medical education in an effort to enrich their disciplines.¹⁵ In Asia, this phenomenon is mostly absent. Even within the same university, collaboration between the medical education department and other departments is often non-existent.

One vivid manifestation of the low commitment placed on the educational research is the lack of quality journals widely available and dedicated to medical education in Asia. Medical education journals, such as *Medical Education*, *Medical Teacher*, *Academic Medicine*, *Teaching Learning in Medicine*, *Education for Health*, *Basic Science Educator*, and *Meducator* originated from the developed countries and are expensive for individual or institutional subscription. However, no attempt has been made to publish an “Asian version”, which can be made more affordable.

Unforeseeable Short-term Research Outcome

Evaluation of educational programmes is hardly practised in the region. Any assessment of the precise impact of educational programmes on healthcare is a long-term task, as it focuses on healthcare improvement of the community which is not readily or immediately measurable. It is also sometimes hard to make a link between a proposed intervention/innovation in medical education and its impact on tomorrow’s doctors³¹ and patient care.³² This leads to a misunderstanding of research in medical education and what it can offer.

Recommendations and Conclusion

Like other parts of the world, medical education in Asia has also experienced many changes and challenges in the last few years. Most countries have taken initiatives to reform medical education in order to make their curricula more responsive to the needs of their countries and communities. The profile of the doctor has been refashioned; the curricula has been reviewed with an increased use of community as learning resources; innovative approaches to medical education, such as problem-based learning^{6,33} and community-oriented education⁶ have been adopted; greater flexibility has been introduced into the educational

Table 2. Ways to Strengthen Research Capabilities in Medical Education in Asia

Leadership and commitment
<ul style="list-style-type: none"> - Developing “culturally relevant” regional guidelines for medical education - Active commitment of institutes and organisations to medical education - Provisions for curriculum evaluation, quality assurance and accreditation mechanism
Relevance
<ul style="list-style-type: none"> - Community needs assessment - Strategic setting of priorities for educational research - Ongoing and inbuilt curriculum evaluation mechanisms - Evidence-based decision-making
Establishment of centre for medical education research
<ul style="list-style-type: none"> - Needs analysis - Training health professionals - Funding research projects - Creating a research environment - “Clearing house” for educational literature - Publishing journals
Availability of financial resources
<ul style="list-style-type: none"> - Establishing and strengthening medical education department - Funding research projects - Upgrading library facilities with Information Technology provisions - Allocating budget for curriculum evaluation, quality assurance and accreditation mechanism - Wider dissemination: attending conferences
Research methodology
<ul style="list-style-type: none"> - Separate “species” of medical education researchers - Multi-professional research teams - Usage of more qualitative methods, action research and randomised control trials - Linkage of professional rewards to educational research - Outcome-based research with long-term follow-up - Encourage researchers to publish in well established journals
Access to information
<ul style="list-style-type: none"> - Free or affordable electronic access to publication and scientific information - Launch Asian medical education journals, including on-line journals - Provision of local editions of international/Western journals - Subsidise journal subscriptions - Collaboration with institutes in developed countries

programmes; teachers’ training on medical education has been initiated; and quality assurance, accreditation and curriculum evaluation mechanisms are being implemented. The establishment of medical education units in many medical schools and initiation of teachers’ training programmes in recent years have led to increased interest in teaching methodologies and sporadic research activities in medical education. The overall outcome is not frustrating, rather encouraging, as an “educational environment for change” is beginning to emerge in the arena of medical education.^{6,34} However, medical education research in Asia has not substantially influenced educational policies and

practices like that of developed countries, which is reflected by the scanty published studies on this important area.^{7,33} The foremost task is to identify the problems (Table 1) that tend to such a “disarray” situation and their possible solutions (Table 2).

Medical education research will flourish in Asia if medical schools, governmental and non-governmental agencies re-look their missions to assess the prevailing realities followed by strategic setting of priorities. The nature and areas of medical education research and its achievable goals must be defined by allocating the necessary funds. Need-based reorientation of medical education should be a high priority agenda.^{6,35}

The prestige of medical education can be raised in the region by consolidating its knowledge base and through effective and wider dissemination of research findings among professionals and other stakeholders. Research findings must contribute to an improvement in the education environment and health of the community, while the efforts of researchers must be duly recognised and appropriately rewarded. To maximise the use of research among medical teachers and policymakers, it must be accessible, comprehensive, convincing and relevant.^{21,36} Researchers must conduct planned studies to make educational activities truly evidence-based. Curriculum evaluation,²³ quality assurance³⁷ and the accreditation mechanisms³⁸ should be in place in the medical schools to generate evidences for curricular changes and educational management. Qualitative methods^{15,39} and action research^{5,15} are to be practised to investigate the processes and practices in medical education. In addition, where feasible and applicable, RCTs are to be undertaken to assess the effectiveness of educational innovations and interventions.^{29,30}

As the triple-threat approach threatens to stifle medical research, Pellegrin and Arana⁴⁰ have argued in favour of using the “specialisation model”⁴¹ (first mooted by the renowned economist Adam Smith) to create a separate “species” of researchers to conduct medical education research. This can be adopted in Asia as well. Multi-professional research teams¹⁵ are to be encouraged to conduct outcome-based research with long-term follow-up of educational effectiveness.

A regional centre for medical education research,⁴² with affiliated national institutes, can be established with the help of regional and international organisations. The goals of the centre should be to conduct a needs assessment in order to identify areas of priority, provide training to the healthcare personnel, facilitate well-funded, peer-reviewed and academically credible research, disseminate research findings with the publication of a medical education journal and to create a “research environment”. The centre should have a documentation centre that acts as a clearing house

for educational literature. This would solve a perennial problem faced by education researchers in Asian countries: non-availability of books and journals on medical education.

In developing countries, healthcare professionals are faced with the problem of having very limited access to the latest information.^{43,44} To overcome this problem, following initiatives are to be taken: free access to on-line materials, publication of low-cost editions of books and journals for the local market, publication of medical education journals including on-line journals, subsidised journal subscription rates, establishment of regional databases, and collaboration with the institutes of developed countries. The *British Medical Journal* has already taken initiative to provide free electronic access to its 23 specialist journals to more than 100 of the poorest countries in the world.⁴⁵ The World Health Organisation has provided institutions in the developing world free or affordable electronic access to the publications of many big commercial publishers.⁴⁶

The author is optimistic that research will produce information that can be used by every stakeholder – from policymakers to medical teachers – to increase the relevance, quality, cost-effectiveness and equity of medical education, which have a direct impact on the healthcare of the region where about 60% of the world population resides. The more research there is and the better it gets, the greater will be its impact on medical education and practice. The optimism and assumption of educational research, as expressed by Shaeffer,⁴⁷ are also true for medical education in Asia:

“..... the ‘garden’ of research will prosper if ‘a hundred of flowers’ bloom, more kinds of people (teachers, students, policymakers and professional researchers) should be encouraged to use more kinds of skills and techniques (quantitative and qualitative, from education and from social sciences) at all level of society (nation, province, district and individual school) in more kinds of research projects. This implies the need for more funds, for greater flexibility in research finding, and for the introduction of concepts of research into the general training program.”

Let’s seize the time! The sooner we get on with it, the better it is.

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REFERENCES

1. Alpert JS, Coles R. Careers in academic medicine. Triple threat or double fake. *Arch Intern Med* 1988;148:1906-7.
2. Yap HK. Academic medicine in Singapore. *Ann Acad Med Singapore* 1998;27:757-8.
3. Spencer J. More of the same, only different. *Med Educ* 1999;33:877-8.

4. Boelen, C. Towards unity for health: challenges and opportunities for partnership in health development. Working paper for the WHO International Conference, Phuket, Thailand, 10-13 Aug 1999. Geneva: World Health Organisation, 1999.
5. Harden RM. Approaches to research in medical education. *Med Educ* 1986;20:522-31.
6. Abeykoon P, Mattock N. Medical education in South-East Asia. New Delhi: Regional Office for South-East Asia, World Health Organisation, 1996.
7. Tutarel O. Geographical distribution of publications in the field of medical education. *BMC Med Educ* 2002; 2:3.
8. Horton R. North and South: bridging the information gap. *Lancet* 2000;355:2231-6.
9. Irby DM. Shifting paradigms of research in medical education. *Acad Med* 1990;65:622-3.
10. Cribb A, Bignold S. Towards the reflexive medical school: the hidden curriculum and medical school research. *Stud Higher Educ* 1999;24: 195-209.
11. Hammersley M. The relevance of qualitative research. *Oxf Rev Educ* 2000;26:393-405.
12. Grant J. Research in medical education in the UK. *Med Educ* 1990;24: 185-7.
13. Buckley G. Partial truths – research papers in medical education. *Med Educ* 1998;32:1-2.
14. Bligh J. Evaluating the effects of research in medical education. *Med Educ* 2001;35:1094.
15. Bligh J, Parsell G. Research in medical education: finding its place. *Med Educ* 1999;33:162-3.
16. Norman G. Research in medical education: three decades of progress. *BMJ* 2002;324:1560-2.
17. Jason H. The importance – and limits – of best evidence medical education. *Educ Health* 2000;13:9-13.
18. Wartman SA. Research in medical education: the challenge for the next decade. *Acad Med* 1994;69:608-14.
19. Boelen C, Heck JE. Defining and Measuring Social Accountability of Medical Schools. Geneva: World Health Organisation, 1995.
20. Hart I. Best evidence medical education. *Med Teacher* 1999;21:5.
21. Harden RM, Grant J, Buckley G, Hart IR. Best evidence medical education. *Med Teacher* 1999;21:553-62.
22. World Bank Group. Data and statistics. Available at: <http://www.worldbank.org/>. Accessed December 27, 2002.
23. Majumder MAA. Development of a culturally relevant operational model for evaluation of the undergraduate curriculum in the medical colleges of Bangladesh [thesis]. Dundee: University of Dundee, 2000.
24. The Institute for International Medical Education. IIME database for medical school. Available at: <http://www.iime.org/>. Accessed December 27, 2002.
25. World Federation for Medical Education. The Edinburgh Declaration. *Med Educ* 1988;22:481-2.
26. Ministry of Science, Technology and Environment, Malaysia. Guidelines for the application. Users' manual for Intensification of Research in Priority Areas (IRPA) Program: 8th Malaysian Plan. Kuala Lumpur: Ministry of Science, Technology and Environment (Undated).
27. Pirrie A. Research in medical education: the law of diminishing non-returns? *Med Educ* 2000;34:333-4.
28. Kantrowitz M, Kaufman A, Mennin S, Fulop T, Guilbert JJ. Innovative tracts at established institutions for the education of health personnel: an experimental approach to change relevant to health needs. Geneva: World Health Organisation, 1987:57.
29. Torgerson, JT. Educational research and randomized trials. *Med Educ* 2002;36:1002-3.
30. Bligh, J. Medical teachers and evidences. *Med Educ* 2000;34:162-3.
31. Colliver JA. Effectiveness of problem-based curricula: Research and theory. *Acad Med* 2000;75:259-66.
32. Hutchinson L. Evaluating and researching the effectiveness of educational interventions. *BMJ* 1999;318:1267-9.
33. Khoo HE. Implementation of problem-based learning in Asian medical schools and students' perceptions of their experience. *Med Educ* 2003;37:401-9.
34. Majumder MAA. A review of the undergraduate medical curriculum. *Bangladesh Med J* 2002;34:47-50.
35. World Health Organisation. Reorientation of medical education: goal, strategies and targets. New Delhi: Regional Office for South-East Asia, World Health Organisation, 1988.
36. Petersen S. Time for evidence-based medical education. *BMJ* 1999;318:1223-4.
37. Ismail G, Mohamed M. The new wave university: a prelude to Malaysia 2020. Selangor, Malaysia: Pelanduk Publications, 1997.
38. World Federation for Medical Education. International standards in medical education: assessment and accreditation of medical schools' educational programs. A WFME position paper. *Med Educ* 1998;32: 549-58.
39. Stacy R, Spencer J. Assessing the evidence in qualitative medical education research. *Med Educ* 2000;34:498-500.
40. Pellegrin KL, Arana GW. Why the triple-threat approach threatens the viability of academic medical centers. *Acad Med* 1998;73:123-5.
41. Smith A. The Wealth of Nations. New York: Modern Library, 1973.
42. Wartman SA, O'Sullivan PS. The case for a national center for health profession education research. *Acad Med* 1989;64:295-9.
43. Pakenham-Walsh N, Priestly C, Smith R. Meeting the information needs of health workers in developing countries. *BMJ* 1997;314:90.
44. Kale R. Health information for the developing world. *BMJ* 1994;309: 939-42.
45. Smith R, Williamson A. BMJ journals free to the developing world. *BMJ* 2002;324:380.
46. Kmietowicz Z. Deal allows developing countries free access to journals. *BMJ* 2001;323:65.
47. Shaeffer S. Introduction. In: Shaeffer S, Nkinyangi J A, editors. Educational Research Environments in the Developing World. Ottawa: International Development Research Centre, 1983:7-26.