TRADITIONAL METHOD VERSUS PROBLEM-BASED LEARNING

Which is the best teaching method for medical undergraduate students?

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INTRODUCTION

Controversy about the curricula of medical schools is not new. In the 1870s, the College of Physicians complained about the knowledge of physiology and anatomy in a medical school.⁽¹⁾ Most medical schools in the United Kingdom (UK) have engaged in major reforms in their curricula. More recently, the General Medical Council (GMC) document *Tomorrow's Doctors* outlined principles on which reform should be based.⁽²⁾ The main concerns were that doctors felt inadequately prepared for the role of pre-registration house officers (PRHO) as a result of undergraduate training. The GMC wanted to develop doctors capable of independent learning and critical thought. The GMC called for an end to factual overload in curricula, the integration of basic and clinical sciences and a move away from didactic teaching to encourage problem solving, critical thinking and lifelong learning. It also wanted PRHOs to be better prepared in communication and practical skills as well as in team work.

In response to this, various medical schools introduced problem-based learning (PBL) as the method for delivering the core knowledge, thus replacing the traditional lecture-based curricula. Other changes have been introduced in the curricula such as increased clinical contact, skills training, more emphasis on communication skills, more community placements, the introduction of special study modules (SSM) (where students study a range of topics in depth), elective placements in the final year and a 'shadowing period' working alongside a PRHO.^(3,4,5,6)

WHICH IS THE SUPERIOR METHOD?

Review of the literature shows that controversy still exists.

Manchester University medical school introduced a PBL-based curriculum in 1994, and this has been subjected to various studies.

One study considered whether the new Manchester PBL curriculum produced any differences in perceptions of how well graduates are prepared for the role of PRHOs.⁽³⁾ A questionnaire was sent to the 1998 Manchester graduates (traditional course) and the 1999 Manchester graduates (new course) three months into their first PRHO placement. A similar questionnaire was sent to their educational supervisors. The GMC's *The New Doctor* document⁽⁷⁾ was used as a basis for defining competencies required of a graduating medical student. This lists broad areas of competence (eg, communication skills) as well as specific skills (eg, suturing), which in turn represent composites of knowledge, skills and attitudes that should be built on in 'general clinical training'. The questionnaire was in two sections. The first asked the graduates to consider 'How well

did the course prepare you for....?' followed by a list of broad areas of competence as defined in *The New Doctor*. In relation to competence in more specific procedures, the question was 'How well did the course provide you with a competence in...?' A similar questionnaire was sent to the educational supervisors.

Results from graduates tended to favour the new course in all areas except for one – understanding disease process. Traditional course graduates considered that they were well prepared in understanding disease process. However, the educational supervisors noted no difference between the two courses in this area. The PBL group felt that they were better prepared in communicating effectively, working in a team and coping with uncertainty. These attributes are usually related to PBL. The educational supervisors also noted that the latter group was better in communicating effectively and coping with uncertainty.

The other areas where the new graduates were possibly better prepared related to the other changes in the curriculum (eg, 'being aware of legal and ethical issues, understanding the relationship between primary and social care and hospital care') and were not an end result of PBL.

Another study looked at the same cohorts, but on a small scale (7% of the total number of graduates), working in two hospitals, and asked whether there were any differences between the new course graduates (PBL) and the traditional course graduates in the types of scenarios they recalled as 'critical incidents' or 'challenging cases' while working as PRHOs.⁽⁴⁾ The focus of this study was on differences between the two, rather than causal links. They used interviews with the graduates to generate their data. These were held three months after they had started working as PRHOs. The four types of critical incidents identified were:

- relating to clinical practice
- limitations of competence
- emotional involvement
- communication

The graduates of the new curriculum seemed to be much better at dealing with uncertainty, knowing their personal limits and asserting their right for support when they felt that these limits had been reached. These could be attributed to some extent to PBL. However, both groups experienced similar problems with communication, which should have been made easier for those graduating from the PBL course.

Another group studied communication skills among Manchester graduates (traditional and PBL-based curriculum).⁽⁶⁾ They interviewed 47 PRHOs in total (24 from the traditional curriculum and 23 from the PBL-based

Principal Recommendations of the GMC's *Tomorrow's Doctors* report⁽²⁾

1. The **burden of factual information** imposed on students in undergraduate medical curricula should be substantially reduced.
2. **Learning** through curiosity, the exploration of knowledge, and the critical evaluation of evidence should be promoted and should ensure a capacity for self-education; the undergraduate course should be seen as the first stage in the continuum of medical education that extends throughout professional life.
3. **Attitudes** of mind and of behaviour that befit a doctor should be inculcated, and should imbue the new graduate with attributes appropriate to his/her future responsibilities to patients, colleagues and society in general.
4. The **essential skills** required by the graduate at the beginning of the pre-registration year must be acquired under supervision, and proficiency in these skills must be rigorously assessed.
5. A '**core curriculum**' encompassing the essential knowledge and skills and the appropriate attitudes to be acquired at the time of graduation should be defined.
6. The 'core curriculum' should be augmented by a series of '**special study modules**' which allow students to study in depth areas of particular interest to them, that provide them with insights into scientific method and the discipline of research, and that engender an approach to medicine that is questioning and self-critical.
7. The 'core curriculum' should be **system-based**, its component parts being the combined responsibility of basic scientists and clinicians **integrating** their contributions to a common purpose, thus eliminating the rigid pre-clinical/clinical divide and the exclusive departmentally based course.
8. There should be emphasis throughout the course on **communication skills** and the other essentials of basic clinical method.
9. The theme of **public health medicine** should figure prominently in the curriculum, encompassing health promotion and illness prevention, assessment and targeting of population needs, and awareness of environmental and social factors in disease.
10. Clinical teaching should adapt to **changing patterns in health care** and should provide experience of primary care and of community medical services as well as of hospital based services.
11. **Learning systems** should be informed by modern educational theory and should draw on the wide range of technological resources available; medical schools should be prepared to share these resources to their mutual advantage.
12. **Systems of assessment** should be adapted to the new style curriculum, should encourage appropriate learning skills and should reduce emphasis on the uncritical acquisition of facts.
13. The design, implementation and continuing review of curricula demand the establishment of effective **supervisory structures** with interdisciplinary membership and adequate representation of junior staff and students.

curriculum) from two different hospitals. The aim of this study was to explore the concepts relating to communication between the two cohorts from the different undergraduate courses. The PBL graduates demonstrated highly developed cognitive schemata, which enabled them to describe and report a wider range of communication skills and behaviours together with more advanced complex interpersonal skills. Meanwhile, traditional course graduates lacked a depth of understanding and displayed relatively surface knowledge of the value of being an effective communicator. These differences between the two courses were seen in the descriptions of PRHOs' experiences of communication scenarios, with the PBL graduates providing richer descriptions of their approaches to patient care and the role communication plays in their work.

A different study assessed the University of Liverpool's new PBL-based curriculum by interviewing groups of doctors from five different hospitals.⁽⁵⁾ In total, 17% of the graduates were interviewed. The interviews were group based and took place about ten months after the PRHOs had been in their job and had worked in both medicine and surgery. The discussion involved some pre-selected topics based on the role of a PRHO according to the GMC and the participants' views on the course. The PRHOs felt that as a result of their course they had attained the required learning skills for postgraduate training. However, they expressed concerns about their perceived levels of knowledge of the sciences such as anatomy, pharmacology and pathology. They felt themselves 'lacking' in knowledge in individual basic sciences when they compared themselves to traditionally educated graduates in the years above them in medical school. They believed they would have to work harder than traditional graduates when sitting professional examinations.

Similarly, the same group of authors interviewed the educational supervisors of the above graduates.⁽⁸⁾ These took

place about ten months after the new group of doctors had been working. Twenty-five percent (41 interviews) of the educational supervisors were interviewed. The supervisors felt that these new graduates were better prepared for their role of PRHOs than their previous cohorts. There was near unanimity that they were competent communicators, had good attitudes, were aware of limitations and were good team workers with good inter-professional understanding. The controversial aspect was the knowledge base issue. Nearly all interviewees recognised that the PBL graduates knew 'less science'. However, they all considered that the new graduates were competent in their role of PRHO. Some felt they would be at a disadvantage when they would sit for Royal College examinations and would then have to learn the basic sciences. Of note was the fact that different supervisors had different expectations depending on their specialty. Many supervisors admitted that they had to learn from scratch or relearn basic sciences for their Royal College examinations.

The above studies from the new PBL-based curricula in Manchester and Liverpool medical schools demonstrate that the new goals (ie, better communication skills, good teamwork and problem solving, as well as independent lifelong learning) have been achieved. However, I think it is worth mentioning that the new curriculum had much more emphasis on communication skills. Thus, both PBL and the new curriculum design may have enabled the new course graduates to have better communication skills. However, a common theme for both medical schools is the issue regarding knowledge in basic sciences. Both the Manchester and Liverpool graduates of the PBL curriculum felt they knew less basic science than the traditional curriculum graduates. However, the educational supervisors of the Manchester graduates felt that there was no difference in this aspect between the two groups, while the Liverpool educational supervisors felt that these new graduates did indeed know less basic sciences.

It is also important to note that these studies were performed a short time after graduation (three months for the Manchester graduates and ten months for the Liverpool graduates) and thus the longterm differences between the two groups are still unknown in the UK.

So, are there any studies showing the longterm outcome between the two with a larger number of participants involved? Are the above results mirrored in other international studies?

A study that took place in the Netherlands explored junior doctors' perceptions concerning the general competencies required for professional practice.⁽⁹⁾ It analysed the responses of 1,159 students from one PBL and four non-PBL medical schools to a questionnaire survey administered 18 months after graduation. This was a much larger study than the above mentioned British ones and took place later after qualification. PBL graduates gave higher ratings for the connection between school and work, their medical training and preparation for practice. The majority of PBL graduates, but less than half of the non-PBL graduates, indicated that communication skills had been covered sufficiently and that they had learned profession-specific methods, communication skills and teamwork in medical school. These are all features of what PBL should enhance and develop in medical students. There was no difference between the two schools in the ability to work independently, the development of which is a characteristic outcome of PBL. However, in the result analysis the authors mentioned that the PBL school (Maastricht University) has an extensive communication skill programme and questioned the result that the better communication skills could be just attributed to characteristics inherent in PBL, the parallel communication skills programme or both.

In another large (n = 1,441) comparative study done in the Netherlands a questionnaire was sent to PBL graduates and traditional school graduates asking them to rate themselves compared to the other group on relevant professional skills.⁽¹⁰⁾ The mean time since graduation was nine years. The PBL graduates' ratings were better in interpersonal skills, competencies in problem solving, self-directed learning and information gathering but had lower ratings in medical knowledge.

One can criticise most of the above studies as they were done by:

- measuring perceptions of preparedness of graduates and comparing those perceptions across courses
- asking graduates to compare their own performance with those colleagues they knew who had not trained in the same medical school

There was no actual measure of reported differences in performance between the two groups and observers may have overestimated their own competencies or underestimated those of others, or both. Besides, it is known that self-assessment may not be closely correlated to actual performance.^(11,12)

Thus, it is important to check the validity of the 'self ratings' and 'own ratings versus others' results by comparing them against other findings/studies reported in the literature. The above individual results have been echoed by various other studies, thus supporting the methods of research that were used.⁽¹³⁾

A recurring theme in all the above studies is the perceived lack of adequate knowledge in basic sciences in the PBL graduates. *However, is there any other evidence for or against this possible problem?*

Perceived knowledge may be different from actual knowledge. The possible problem with having studies relying on perceived knowledge is shown to some extent by two different studies by the same authors. In a qualitative study, students reported that they felt deficient in basic science knowledge, particularly in anatomy, on entering clerkship.⁽¹⁴⁾ There was no difference between the two courses. The other study concerned medical students who took part in a computerised anatomy test consisting of both clinically contextualised items and items without context.⁽¹⁵⁾ There was no statistical significant difference between the two courses, but the two highest school scores were from the traditional course.

A Swedish study showed that PBL graduates had not been hindered in the longterm by the reformed PBL curriculum they underwent.⁽¹⁶⁾ A University of Belfast study showed evidence that knowledge of anatomy had decreased since the move away from the traditional type courses.⁽¹⁷⁾

Canadian and American data is arguably more objective. Student performance was compared between the two schools by:

1. basic science knowledge following two pre-clinical years
2. the Medical Council of Canada Qualifying Examination (MCC) Part I, written upon completion of the four-year MD
3. Part II of the MCC Qualifying Examination, an assessment of clinical performance after 17 months of postgraduate education

Paradoxically, the only striking difference between the two groups was the better performance of the traditionally trained doctors in communication skills!⁽¹⁸⁾

In another study, the PBL classes had higher scores than their traditional counterparts.⁽¹⁹⁾ This study demonstrated a positive advantage of PBL on performance of knowledge-based skills for Steps 1 and 2 of the United States Medical Licensing Examination (USMLE) following the implementation of a PBL curriculum.

CONCLUSION

One can argue at great length for or against any method of delivering the core curriculum. I think that the UK studies are unable to establish which is the best teaching method. One has

to note that important concepts have been introduced into the new curricula (eg, clinical contact, skills training, communication skills, community placements, the introduction of SSM, ethics and law). Thus, certain improvements may be due to the change in the curriculum rather than PBL.

One obvious debate from the above studies relates to basic science knowledge. I think that graduates from the

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traditional-based curricula have better basic science knowledge than PBL graduates. Therefore, the price paid for the PBL graduates may be a lower knowledge in basic sciences. However, what is adequate knowledge in basic sciences? In the Liverpool study, different educational supervisors had different perceptions of adequate basic science knowledge depending on their specialty. Furthermore, the level of basic science required in undergraduate education is not defined.

On the other hand, most of the above studies show that the communication skills, team work, problem solving, critical thinking of PBL graduates are better. If one wants to really compare the two methods of delivering the core curriculum then the best way would be to study head-to-head and independently both schools from undergraduate to postgraduate levels.

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