Introduction

Integrated teaching and problem-based learning (PBL) are powerful educational strategies. Difficulties arise, however, in their application in the later years of the undergraduate medical curriculum, particularly in clinical attachments. Two solutions have been proposed—the use of integrated clinical teaching teams and time allocated during the week for PBL separate from the clinical work. Both approaches have significant disadvantages. Task-based learning (TBL) is a preferred strategy. In TBL, a range of tasks undertaken by a doctor are identified, e.g. management of a patient with abdominal pain, and these are used as the focus for learning. Students have responsibility for integrating their learning round the tasks as they move through a range of clinical attachments in different disciplines. They are assisted in this process by study guides.

Method

The implementation of TBL is described in one medical school. One hundred and thirteen tasks, arranged in 16 groups, serve to integrate the student learning as they rotate through 10 clinical attachments.

Results

This trans-disciplinary approach to integration, which incorporates the principles of PBL offers advantages to both teachers and students. It recognizes that clinical attachments in individual disciplines can offer rich learning opportunities and that such attachments can play a role in an integrated, as well as in a traditional, curriculum. In TBL, the contributions of the clinical attachments to the curriculum learning outcomes must be clearly defined and tasks selected which will serve as a focus for the integration of the students’ learning over the range of attachments.

Keywords

*Clinical clerkship; clinical medicine; education, medical, undergraduate; problem-based learning, *methods; teaching, methods.

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Problems with integrated teaching and problem-based learning in the clinical years

Major changes in educational strategies have been recommended in the curriculum of medical schools over the past two decades.° Three trends were identified in the SPICES model for educational strategies—curricula which are student-centred, problem-based, integrated, community-based, core with electives and systematic.4 Such strategies, however, have not been applied with equal success in all phases of the curriculum. In the later years there are tensions between a commitment to PBL and integration with multidisciplinary teaching and learning, on the one hand, and to learning based on a series of clinical attachments in the different disciplines which provide rich learning opportunities on the other hand.

Problems with integration

The General Medical Council,1 emphasizing a move towards integrated teaching, suggested that ‘courses based on departmental disciplines are likely to be abandoned in favour of those relating to systems of the body or topics of relevance to the overall scope of the course’. Integrated teaching has been widely adopted, particularly in the early years of the medical curriculum. In later years, however, where the teaching takes place in clinical attachments, the situation is more complex. Attachments, whether they are in surgery, obstetrics, psychiatry or some other subject, provide learning opportunities which are related to the practice of the discipline with little, if any, emphasis on integrated teaching and learning.

Inter-disciplinary clinical clerkships offer potential advantages for clinical teaching.5,6 Their use, however,
is associated with significant problems. Greer Williams described the difficulties many teachers have experienced when they attempted to introduce integrated clinical teaching.

The concept of integrated teaching suffered wounds eventually proving fatal when students arrived in the four-month basic clerkship of the third year. Someone had envisioned a clinical environment in which there would be no lines of departmental jurisdiction and the students would learn principles and practices common to all specialties. Internists and paediatricians in charge of basic clerkships on their wards at University Hospitals judged the scheme to be unworkable ... Surgical teachers decided that team teaching was not worth the time spent ... The basic clerkship thereafter broke down into three months in medicine or paediatrics and one in surgery.

Similar problems with integrated clinical teaching were identified about the same time in the Medical School at the University of Dundee. Clinical teaching teams, introduced to facilitate multidisciplinary teaching, were short-lived and after several years there was a return to discipline-based clinical attachments. In contrast, a system-based integrated course with lectures, small group work and independent learning, introduced in Dundee in 1973, flourished and proved the basis for further curriculum development and closer integration of the teaching.8

It can be concluded that integrated clinical teaching delivered by multidisciplinary teams is difficult to arrange, does not to fit in with the clinical and service commitments of staff and, in practice, often does not achieve its potential.

Problems with PBL

Difficulties also with the use of PBL have been experienced in the later years of courses. Foley has drawn attention to the absence of reports of PBL in the clinical years. ‘There has been an abundant flow of information written about problem-based curricula in the basic sciences’, he suggested. ‘However, there is little collective information about its use in the clinical setting. Many programs produced interesting innovations in clinical education, but they should not be labelled PBL’. Where PBL has been described in the clinical context, it is often offered as an addition to the clinical experiences based on paper patient simulations and not as an integral part of the clinical experience.10

Time scheduled during the week when students have a separate integrated problem-based programme in addition to their clinical work has the serious disadvantage that it does not encourage links between theory and practice, and fails to exploit fully the clinical attachment as a rich context for learning.

Task-based learning (TBL) – a practical alternative

Task-based learning offers a practical approach to integration and PBL in the later years of the medical course. In TBL, the focus for learning is a set of tasks addressed by a doctor in clinical practice. The learning is built round the tasks and learning results as the student tries to understand not only the tasks themselves but also the concepts and mechanisms underlying the tasks.

This paper describes the application of TBL in the context of an integrated curriculum in the School of Medicine at Dundee.

A task-based approach in the Dundee curriculum

The Dundee curriculum

The new spiral curriculum introduced in Dundee in 1995 has three phases and an emphasis on a system-based approach to integrated teaching and learning. There is vertical integration with the first phase emphasizing normal structure, function and behaviour, the second phase abnormal structure, function and behaviour, and the third phase the practice of medicine. In year four of the Dundee curriculum, students rotate round 10 clinical attachments, spending 4 weeks in each (Table 1).

At planning meetings for the new curriculum, the importance of integrated teaching and learning in the third loop of the spiral was recognized. There was concern, however, that, if an integrated approach was adopted, the benefits of an exposure to the different disciplines and subjects in the context of the clinical attachments would be lost. The approach to integration in phase three, was designed therefore to take account

<table>
<thead>
<tr>
<th>Year 4 Clinical attachments</th>
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<tr>
<td>1  General medicine</td>
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<td>2  Specialized medicine</td>
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<td>3  Ageing and health/dermatology</td>
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<td>4  Surgery</td>
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<td>5  Orthopaedics/Accident and emergency</td>
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<td>6  ENT/Ophthalmology</td>
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<td>7  General practice</td>
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<td>8  Obstetrics and gynaecology</td>
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<td>9  Child health</td>
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<td>10 Psychiatry</td>
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of the rich learning opportunities offered in the clinical attachments.

TBL was adopted as the key educational strategy in this phase of the Dundee curriculum and was used as the basis for integration and PBL in this clinical context. Specified tasks undertaken by doctors, such as the management of a patient with abdominal pain, provide the focus for learning. Students take responsibility for integrating their learning as they move through a range of clinical attachments in the individual disciplines. Students look, in each attachment, at the tasks from the perspective of the attachment. They see, for example, acute abdominal pain in the surgery attachment, medical causes of abdominal pain in the medical attachment, gynaecological causes in the O & G attachment, abdominal pain in children in the child health attachment and undifferentiated abdominal pain in the general practice attachment. Students learn not only about the task, but also acquire the necessary understanding of the basic and clinical medical sciences and, in addition, generic competencies such as communication skills and problem solving. How each attachment contributes to this is indicated in the curriculum documents.

In a traditional curriculum, the disciplines to which students are attached for their clinical placement, determine the aims and objectives of their learning. Thus in a surgery attachment, students see as their aim the acquisition of competence in surgery. The same applies in the other clinical disciplines. In TBL, in contrast, learning about the individual disciplines is not the primary aim. Instead, the attachments are seen as offering a rich learning opportunity for students to master the overall goals for the year, with a set of tasks as the focus for the learning.

The tasks
One hundred and thirteen clinical tasks were derived as the focus for the learning and, for convenience, arranged into 16 groups, as shown in Appendix 1.

Criteria for inclusion of a task in the list included:
1 The task is an important one facing a doctor.
2 The task is likely to be encountered by students during their clinical attachments and usually in more than one attachment.
3 The task can serve as an appropriate focus for learning clinical medicine, for reviewing the basic medical sciences and for the development of the generic competencies expected of a doctor.

The list of tasks was prepared by a process which involved all clinical teachers. Clinical teachers in each of the 10 clinical attachments, system working groups, such as the cardiovascular system, and convenors for themes such as medical ethics and health promotion, were asked for suggestions for tasks relating to their clinical discipline, body system or theme. This preliminary list was reviewed by the Phase 3 curriculum subcommittee in terms of the criteria described above, and areas of omission and duplication were identified. Lists of tasks or problems produced by other schools to guide curriculum development and student learning were also studied. A revised list of tasks was then produced. To make the list more manageable, 16 categories of tasks were identified and each of the tasks were allocated to one of the categories. The revised list was then passed back for comments to those who had contributed to the initial list. A final list was produced and agreed by the Phase 3 Committee, taking into account the comments received. This was considered by the Undergraduate Medical Education Committee and the Faculty Board of Medicine for final approval.

Integrated learning
In Phase 1 and Phase 2 of the curriculum, the teacher has responsibility for the system-based integration. Each week of the course has an identified theme to which the disciplines make a contribution. This is reflected in the teaching, including the problem-based small group work, the clinical skills programme and the integrated practical sessions.

In Phase 3, more responsibility for the integration is given to the students. They are assisted, however, by the provision of the overall integrating framework of the 113 tasks within which they can operate. In this TBL approach, students look at the tasks through the window or filter of each of the attachments in turn, acquiring an integrated view of medicine in line with the expected learning outcomes. The 10 clinical attachments represent the various contexts in which medicine is practised, and students build an understanding of each of the tasks from these different perspectives. Management of a patient with abdominal pain is shown as an example in Fig. 1. Students, as they pass in turn through each attachment, build on their understanding of abdominal pain and the learning issues associated with this task, expanding and looking in more depth at what they already know and can do. The 12 learning outcomes for the medical curriculum were specified.15 Student study guides16 described how mastery of these was achieved through a study of the tasks as students passed through the attachments. Six of the learning outcomes are shown in Fig. 1. Students learned relevant clinical skills in each attachment relating to the task, e.g. to examine the abdomen in the
medical attachment, to assess mental state in the psychiatric attachment. They learned practical procedures such as vaginal examination in the gynaecology attachment. They learned communication skills including communicating with a child and his or her parents in the child health attachment. With regard to patient management they learned when surgery was indicated in the surgical attachment and when patients should be referred. Ethical issues raised included communication with relatives in patients with cancer. Students were encouraged, as an aspect of professionalism, to assess their own understanding of abdominal pain and the related issues, and to take steps to remedy any deficiencies they identified. In the same way, the other six learning outcomes — patient investigation, health promotion and disease prevention, information handling and the use of computers, an understanding of basic and clinical sciences relating to the topic, clinical judgement and decision making and the role of the doctor in the health service — were considered and related to the management of abdominal pain in the different attachments.

A grid was prepared identifying where the clinical attachments contributed to an understanding and mastery of the learning outcomes related to each of the tasks. The contribution was categorized as major, significant, minor or insignificant. The attachments making a contribution to the task of abdominal pain are shown in Fig. 1.

Study guides

Study guides were prepared for each task or group of tasks. The study guides were designed to help the students to manage their own learning, and to assist them with the challenge of integrating their learning in the 10 clinical attachments using the 113 tasks as a focus. The guides highlighted the learning issues for each of the tasks as they related to the learning opportunities in the clinical attachments and the learning outcomes. The guides also described the potential contribution of the learning resources available in the library, self-learning area, the clinical skills unit and the computer learning suite.

Student assessment

The students’ achievement of the expected learning outcomes by the end of the year are assessed using a range of methods including portfolios prepared by the students during the year and an end-of-year assessment comprising a written assessment and an OSCE. Students who are not able to demonstrate an integrated mastery of the tasks by the end of the fourth year are required to repeat the year or to study further the core competences in the fifth year. Students who have achieved the required standard by the end of the fourth year study subjects of their own choosing in the fifth year in a range of special study modules. All students, however, are required to complete a minimum number of special study modules in year 5, a 12-week clinical attachment in which they shadow a house officer, and a ‘preparation for the PRHO year’ block.

Discussions and conclusions

TBL and the clinical environment

The educational concept and the underlying philosophy of TBL has been described. In this paper we illustrate how a task-based approach provides the basis for integrated and problem-based teaching and learning in the later years of the medical curriculum where traditionally the educational programme is based on a series of attachments in a range of disciplines. This clinical environment can be enormously educational.
‘Knowledge in this model’ suggests Davidoff18 ‘is not so much received as discovered. In short, clinical learning is ‘experience examined’. In TBL, students are encouraged to see patients illustrating the range of specified tasks and reflect on the tasks from the perspectives of the clinical context in which the patients are seen.

Advantages of TBL in clinical years

This TBL approach to integration and PBL has been implemented, and is being currently monitored and evaluated. Experience gained to date shows that it offers a number of advantages.

1 Integrated teaching and learning can be delivered without the need to create integrated clinical teaching teams. Even with careful planning and goodwill, the development of such teams is notoriously difficult. With TBL, the integration becomes the responsibility of the student. This is facilitated through the provision by staff of an appropriate structure or framework designed to guide the students’ learning. The integration in TBL can be viewed as a further development from the interdisciplinary or multidisciplinary approach to integration which is commonly adopted in the earlier phases of the medical curriculum. In this progression to trans-disciplinary integration13 manifested in TBL, the disciplines become part of the learners' real world experience and through these the students filter the broader aims and goals of the integrated curriculum. This trans-disciplinary stage is the eleventh and final step in an integration ladder.13

2 The integration is both vertical and horizontal. Consistent with a constructivist approach to learning, students build on their understanding of medicine gained in the early years and develop their appreciation of the medical sciences round the tasks in the context of clinical care. The importance of this vertical integration was emphasized by the General Medical Council who envisaged ‘the continuum of a substantial basic science component into the later years of the course’.

3 In a traditional curriculum, community-based teaching is often perceived by students and teachers as separate from hospital-based teaching, and few attempts are made to integrate the two. The task-based approach achieves this integration by looking at the range of tasks from the perspectives of both the hospital and the community contexts of medical practice.

4 PBL has much to offer as an educational strategy.19,20 TBL represents a problem-based approach to learning which is applicable in the clinical context.14

5 TBL encourages students to take responsibility for their own learning and provides them with a framework to do so. Study-guides assist students to integrate their learning and to view the tasks from the perspectives of the different clinical attachments. The guides highlight for students and teachers the contributions that each clinical attachment and each task are expected to make to the overall learning outcomes for the curriculum.

6 TBL supports ‘education for capability’. The students’ learning is directed to mastery of the competencies relating to the tasks. Higher level objectives are encouraged including the development of the ‘reflective practitioner’.21

7 The context for the learning is discipline-based clinical attachments. These are readily available in teaching and district hospitals and in the community. TBL helps to ensure that they offer a rich learning environment.

Requirements

For this approach to work, however, there are a number of requirements:

1 Students and staff must accept that the primary aim of the attachments relates to mastery of the overall learning outcomes. Development of competence in the discipline which is the subject of the attachment is of secondary importance.

2 Teaching and learning opportunities provided during the clinical attachments need to reflect the expected learning outcomes for the curriculum.

3 Activities and assignments which students are expected to undertake should reflect the emphasis on the tasks and the expected learning outcomes, and not on the subject or the discipline.

4 Study guides and documentation for students, including the timetable, should relate the work in the attachments to the curriculum learning outcomes and the prescribed list of tasks.

5 The assessment should reflect the integrated task-based nature of the programme.

Conclusion

Task-based learning is a powerful educational strategy which is effective in the later years of the medical course where other approaches to integrated and PBL may run into difficulty. Task-based learning offers in a traditional curriculum and in an outcome-based curriculum15 an attractive combination of pragmatism and idealism, ‘pragmatism in the sense that learning with an explicit sense of purpose is seen as an important source of student motivation and satisfaction; idealism in that it is consonant with current theories of education’.11
Acknowledgements

We are grateful to the many teachers who have contributed to the development and implementation of the task-based approach in Phase 3 of the curriculum at Dundee.

References

8 Harden RM, Davis MH, Crosby JR. The new Dundee medical curriculum: a whole that is greater than the sum of the parts. Med Educ 1997;31:264–71.

Appendix 1

Tasks identified as a focus for the students’ study during the clinical attachments in year 4.

1 Pain
   - Pain in the leg on walking
   - Acute abdominal pain
   - Loin pain and dysuria
   - Joint pain
   - Back and neck pain
   - Indigestion
   - Headache
   - Cancer pain
   - Earache

2 Bleeding and bruising
   - Bruising easily
   - Pallor
   - Haemoptysis
   - Vomiting blood
   - Rectal bleeding
   - Blood in urine
   - Anaemia
   - Post-op bleeding

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Appendix 1 (Contd.)

3 Fever and Infection
- Chest infection
- Rash and fever
- Urethral discharge
- PUO
- Immunisation
- Sweating
- Hyperthermia
- Sepsis

4 Altered consciousness
- Immobility
- Falls
- Collapse
- Confusion
- Dizziness
- Fits

5 Paralysis & impaired mobility
- Loss of power on one side
- Tremor
- Peripheral neuropathy
- Muscle weakness
- Immobility
- Falling over

6 Lumps, bumps & swelling
- Lump in the neck
- Lump in groin
- Lump in breast
- Swollen scrotum
- Joint swelling
- Swollen ankles
- Skin lump

7 Nutrition/weight
- Thirsty and losing weight
- Difficulty swallowing
- Weight loss
- Seriously overweight

8 Change in body function
- Wheezing
- Pleural effusion
- Shortness of breath
- Cough
- Change in bowel habit
- Cannot pass urine
- Incontinence
- Raised blood pressure
- Palpitations

9 Skin problems
- Skin rash
- Itching
- Psoriasis
- Mole growing bigger/bleeding
- Blistering
- Photosensitivity
- Bedsore
- Jaundice
- Burn
- Wound

10 Life threatening/Accident and Emergency
- Shock
- Involvement in accident
- Fracture

11 Eyes
- Loss of vision
- Painful red eyes
- Squinting in child
- Foreign body in child

12 Ear Nose and throat
- Ringing in ear
- Going deaf
- Earache
- Sore throat
- Hoarseness
- Stuffy nose

13 Behaviour
- Anger
- Anxiety
- Phobias
- Drug addiction
- Suicide
- Sleep problems
- Bereavement
- Alcohol dependence
- Schizophrenia
- Tiredness
- Depression
- Adolescence

14 Reproductive problems
- Pre-menstrual syndrome
- Infertility
- Normal pregnancy
- Menstrual problems
- Contraception
- Sterilization
- Smear results
- Painful intercourse

15 The child
- Child abuse
- Downs syndrome
- Prematurity
- Poor feeding
- Failure to thrive
- RDS
- Developmental delay
- SIDS/Near miss

16 Priority setting, decision making and audit
- Dying patient
- Population screening
- Waiting lists
- Triage
- Acute v chronic