The story goes that, in days of yore when water was scarce, the breadwinner of the family had the first go in the bath with fresh water, and by the time the youngest in the family, usually the baby, was placed in the bath the water was so murky that the baby was unnoticed and had a good chance of being thrown out with the bath water. Do the current trends in Anatomy education in medical school indicate that this important subject is about to suffer a similar fate? Is the medical curriculum becoming so “murky” that the basic foundations of medicine are being neglected? Have we become so concerned with the method of teaching and learning that the objectives of medical education are being forgotten?

The AMEE Guide by Louw et al. (2009) gives a detailed consideration of the place of Anatomy in the medical curriculum. This Viewpoint examines the fate of Anatomy in the medical curriculum with a historical perspective and goes on to prognosticate the potential dangers of current trends related to the teaching of Anatomy to medical students.

Much has been written about the growth of the basic medical sciences, including Anatomy, in the post-Flexnerian era. Flexner's landmark report (Flexner, 1910) has often been blamed for the unbridled growth of the sciences at the expense of the admittedly important clinical disciplines. Flexner's report was published at a time when medical schools were rapidly becoming ‘trade schools’. Concern for the proliferation of sub-standard medical schools without the academic environment of the university was the stimulus to the report, which advocated the development of the sciences basic to medicine, if the medical student was to become a professional who could adapt to the vagaries of clinical practice. Often forgotten is the fact that he also stressed the need for developing the humanistic side of medicine in the medical curriculum.

With the technological advances in the twentieth century the basic sciences grew in ‘leaps and bounds’. The exponential increase in medical knowledge and the concomitant development of technical skills since that time resulted in the growth of the specialties, and subsequently of the sub-specialties, as we know them. Anatomy and Physiology, including Histology were at one time the responsibility of a single department, from which Anatomy separated first, followed by Histology, which established itself either as a separate department or a sub-department within Anatomy. Disciplines evolve over a long period of time and are identified by boundaries which at times may be indistinct. The specialist, identified with a particular discipline, tends to “discipline” those who come into contact with him. The longer the discipline survives the more firmly is it rooted and the more it resists encroachment by, or merging with, other disciplines (Eye, 1975). Anatomy became so entrenched within the medical curriculum that Anatomy departments became a law unto themselves, often forgetting the ultimate purpose for which the subject was taught to medical students.
Another confusion that seemed to prevail in the minds of Anatomy teachers was between the objectives and the method of learning. Dissection of the cadaver was seen by some as a psychomotor skill which the medical student needed to develop, rather than as a means of acquiring the cognitive skills of gross anatomy. The insistence on meticulous dissection was prevalent in the medical curriculum of the mid-twentieth century. It prevails even to this day in some medical curricula, compromised only by the increasing difficulty of obtaining cadavers. Are the skills of dissection a necessary objective for the medical student who is being trained to be a basic doctor? In my opinion the answer to this question is in the negative, unless the goal of medical education is to train specialists in Surgery and its subs-specialities, where manual dexterity is prerequisite, or in Forensic Pathology, where cadaver dissection is essential. On the other hand, is dissection mandatory as a method of learning gross anatomy? Learning theory leads us to believe that learning styles vary, and students learn best by different means. Personally, I learnt gross anatomy best by dissecting the region and reconstructing what I dissected in diagrams. However, to insist that all students should learn thus flies in the face of established learning theory. Such insistence led to another problem which has partly contributed to the fate of Anatomy in the medical curriculum.

Dissection of the entire cadaver by every student takes an inordinately long time. The occupation by Anatomy of a significant proportion of the pre-clinical curriculum was justified by this fact. As the curriculum became increasingly crowded, something had to give, and the subject of Anatomy became the victim. The proportion of time in the time-table for the subject of Anatomy was drastically reduced. Many schools resorted to different ways of teaching gross anatomy, such as using prosected specimens or models; others, short-sightedly, excised large chunks of the subject without due regard to the effect such cuts would have on the budding professional.

A second factor which led to the fate of Anatomy in the current medical curriculum was the nature of the Anatomy teacher. Mid-twentieth century Anatomy teachers were largely medical graduates who had specialized in Anatomy. As the century progressed the increasing difficulty medical schools faced in recruiting medical anatomists inevitably led to non-medical anatomists being employed to teach medical students. Some universities even had to resort to recruiting anatomy teachers who were entrusted with the task of teaching the subject, sometimes concurrently, to students in many health professions, and even to non-health professions students. These practices often resulted in the subject being taught to medical students in a non-specific way, unless the teacher took deliberate steps to become aware of the requirements of the medical student. There were some non-medical Anatomy teachers who did take this precaution. I am aware of at least one teacher who pursued a course in medicine to familiarize himself with the “anatomical” requirements of the medical students he was teaching. Such instances were rare. More commonly, Anatomy was taught by such individuals without due regard to the needs of the medical student. The practice of teaching the subject to a group of multi-professional students simultaneously led to inappropriate emphases being placed on the requirements of each health professional. The middle of the second half of the twentieth century witnessed increasing concerns being raised about the lack of relevance of the Anatomy that the medical student was being required to learn.

Western Reserve Medical School in Cleveland, Ohio was ahead of its time when, in 1952, it decided to change the organization of its curriculum from the traditional discipline-based
one to an integrated organ systems curriculum (Ham, 1962). It is important to recognize that the organ systems approach to the medical curriculum was implemented more than two decades before the introduction of the pioneering problem-centred curriculum at McMaster Medical School in Hamilton, Canada (Louw et al., 2009). The integrated approach to the medical curriculum was one reaction to the lack of relevance in the teaching of the basic sciences. The assumption was that, if the basic sciences were learnt in relation to each other (horizontal integration) and in relation to the clinical sciences (vertical integration), application of learning would be enhanced, and hence the student would appreciate the relevance of what was learnt. While both these types of integration did not necessarily involve problem-based learning (PBL), the latter was a method which would encourage the student to consider the basic sciences in an applied way. PBL is, in fact, a strategy of learning. One of its objectives is to enable the student to think about application when learning the basic sciences. It should not be forgotten, however, that such application can also be encouraged in courses which do not use PBL.

As quite rightly pointed out by Louw et al. (2009), integrated curricula based on organ-systems, including problem-centred curricula, resulted in a certain degree of fragmentation of Anatomy, and, if curriculum planners were not careful, the omission of some important components of the subject. Fragmentation resulted from the regional nature of Anatomy being sometimes contradictory to the organization of the curriculum according to organ systems, which were not necessarily regional in location. Omission resulted from the potential gaps when the subject was taught in relation to pre-identified problems. Both these disadvantages could be overcome if advocates of PBL are not so dogmatic about this strategy of learning. Extremists who advocate this method often refer to “pure PBL programs”, as distinct from “hybrid programs”. I agree with the contention that the former is a misnomer, and the need for the latter term does not arise, as all PBL programs have some degree of didactic teaching, often given cosmetically acceptable labels other than “lectures” (Hamdy, 2008). I cannot agree with those who contend that didactic teaching should be abolished at all cost in PBL programs. If certain components of Anatomy need to be learnt through didactic means, so be it. The Arabian Gulf University, which adopts a problem-centred curriculum based on organ systems in its pre-clerkship phase, has designed a noteworthy system of Anatomy teaching, which supplements the PBL tutorials, without compromising the strategy of PBL. The opportunities to demonstrate continuity of structures and to attend to gaps in the learning of Anatomy ensure that the subject retains its due place in the curriculum (Abu-Hijleh et al., 2005). Application is further enhanced by a course in Applied Anatomy during the clerkship phase of the curriculum, where important concepts are reiterated and the spiral of learning is exemplified (Abu-Hijleh et al., 2004).

The above argument begs the question “What is relevant Anatomy?” The answer to this question lies in the goals of the institution. And this is where disagreement is evident. The complaints that are voiced about the current teaching of Anatomy are justified, but tend to be exaggerated, depending on the complainant. The surgeon, for instance, may insist on the medical graduate having an adequate knowledge of Anatomy to undertake postgraduate surgical studies. If each specialist insists upon the level of any basic science which is adequate to undertake corresponding specialization, the medical student would not be able to cope with the content, and would, usually, resort to the most expedient way of overcoming immediate hurdles, such as imminent examinations. Surface or strategic learning would be resorted to, as students may not have the time to pursue a deep approach to learning. There is no disagreement that the latter approach is what is
desired. The curriculum planner, then, has to adopt a system of determining common components for Anatomy in an undergraduate curriculum, referred to as a “core curriculum”, which every undergraduate medical student must acquire irrespective of the specialty of choice in the postgraduate phase (Bandaranayake, 2000). Within this core, one can determine the essential (i.e. “must know”) components. A competency-based curriculum, in which content is determined from expected competencies, is ideal for determining these core and essential elements, as long as agreement is reached on the nature of the end product of undergraduate medical education (Bandaranayake, 1985).

In a paper entitled “Knowledge which cannot be used is useless”, Cox (1987) stressed the importance of placing boundaries in the curriculum on “subject matter (which) includes all the relevant underlying knowledge of basic science necessary to comprehend (those) illnesses and their management”. However, equating relevance to applicability is inadequate and it is necessary to ask the question ‘Used for what?’ If the answer to this question is confined to “That which can be applied in clinical practice”, deep learning will be thwarted as sometimes it is necessary to understand facts, concepts and principles, which may not be used directly by the clinician, but is essential for the professional to acquire in order to understand the clinically relevant information. For example, in order to understand the central connections of the vagus nerve in the brain stem, which the physician applies in clinical practice, the student needs to know the manner in which the brain stem is formed and the locations of functionally distinct nerve cell groups within it. Furthermore, some parts of Anatomy, such as in Embryology, are parts of a story, which has to be told from the beginning to the end. Understanding is essential for the student to develop the ability to integrate both horizontally and vertically.

I was amazed to hear, in a recent “talk-back” radio program, a comment made by an associate professor of Anatomy in a renowned medical school in Australia that he did not see any reason as to why a medical student should ‘know’ what the human liver looked like. He argued that the basic doctor would never use this ‘knowledge’ in practice. If he was referring to knowledge in a macroscopic sense, how could the doctor interpret two-dimensional images of the liver without visualizing its three-dimensional form? If he was referring to microscopic structure, how could he identify variation from the normal in pathological conditions of the liver if he does not ‘know’ what the normal liver looks like? Unfortunately such statements are made either by individuals who are not fully aware of the thought processes involved in clinical practice, or are so engrossed in the strategy of PBL that they sacrifice content at the altar of process.

Unless undergraduate medical education pays attention to the early warning signs of an inadequate foundation in the sciences basic to medicine before it is too late, it runs the risk of gradually losing its status associated with professional education. Perhaps it is too drastic to prognosticate that the medical school would revert to the ‘trade school’ of the pre-Flexnerian era. Yet we run the risk of gradually getting rid of the baby with the bath water, and we may well be producing ‘process experts’ without an adequate understanding of the prerequisite knowledge through which this expertise could be practised. The sooner these sciences regain their rightful place in the undergraduate curriculum, the sooner would medicine regain its pre-eminent place amongst the professions, which it is gradually losing.
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