South-West Postgraduate Medical Deanery

Annual Regional Conference

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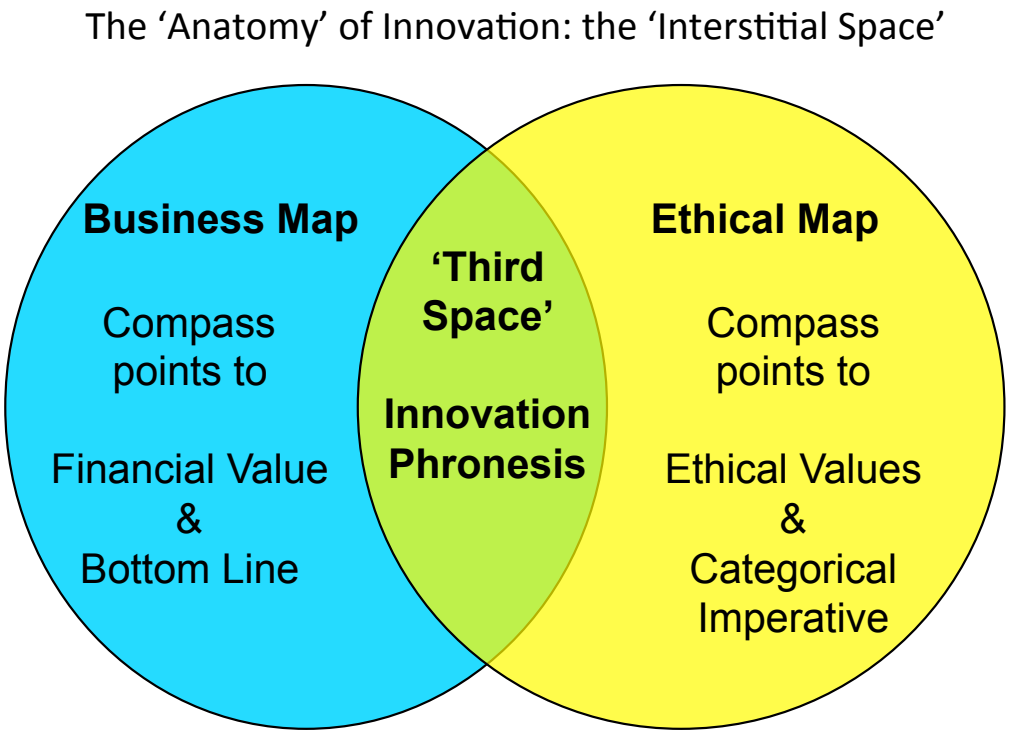
Innovation in Postgraduate Medical Education

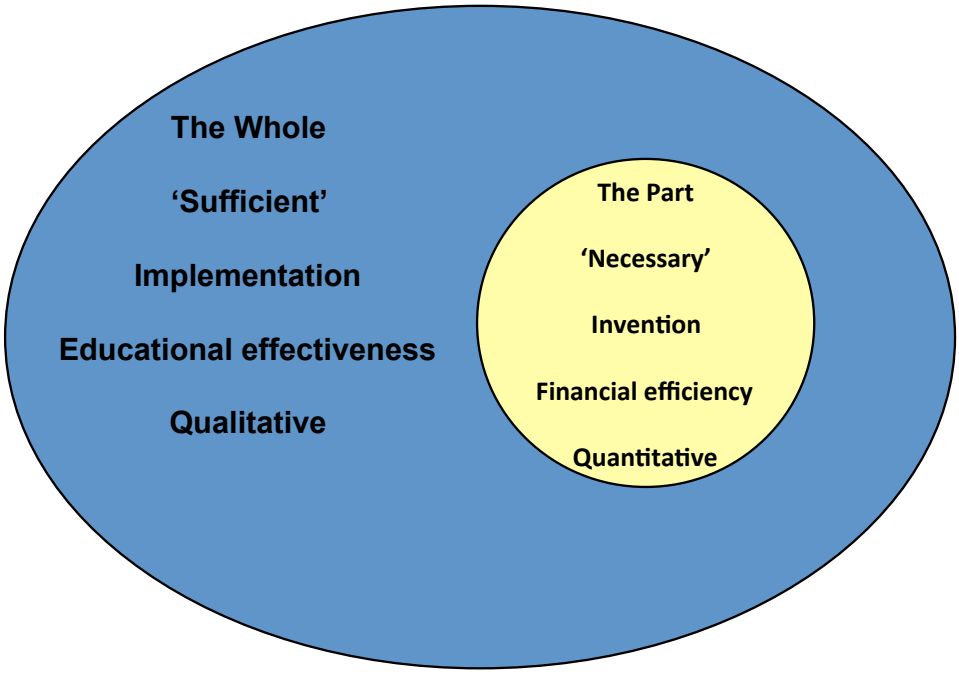
In this presentation I shall try to cover three areas. First, I'll provide a definition of Innovation in Education and describe its fundamental, underlying principles: get those wrong and you'll get nowhere. Then, we'll look at two famous examples of innovation and identify the processes at play there. Finally, I'll very briefly describe two examples of innovation in education at Kent, Surrey, and Sussex Postgraduate Medical Deanery [KSS], that will hopefully resonate with your own inquiries.

I'd like to start by defining Innovation as the combination of Invention and Implementation. I think that it has to include both the creative design for something new, and its implementation in real-life practice, since otherwise, we might have a great idea for a painting, but we won't actually have a painting – just a great idea. Usually, we think of innovation as operating in two broad directions, which are often intertwined: from 'bench to bed', in the process called 'technology transfer'; and from 'bed to bench' in the process we may call 'creative insight'. Always, however, it operates to a specific set of underlying principles, which provide its equivalent of an 'anatomy, physiology and biochemistry'



We can think of the ‘anatomy’ of innovation as comprising two maps and an overlapping interstitial space, usually referred to as the ‘third space’. On the one hand we have the Ethical Map, by which we are all bound as clinicians and as educators, since education is a morally charged activity, in which we set out deliberately to change people, through which we have a great potential for doing harm, and in which, therefore, we are bound by the same set of biomedical ethics. Here, I have summarised those ethics as Kant’s famous ‘Categorical Imperative’, the principle sometimes called the Golden Rule, expressed by medicine as the question ‘would you be happy for this doctor to attend a member of your family?’ On the other hand, we have the business map, whose compass points to financial value and to the bottom line, a powerful narrative of limited resources, which must be deployed to best effect. Potentially, these two maps pull away from each other, and if we are not careful, we can end up in an embattled position. The task is to make the one map translucent to the other, to bring into being a ‘third space’, which honours the needs of both maps, and in so doing, opens up a space where innovation may take place. ‘Render unto Caesar that which is Caesars, and unto God that which is God’s’, as the Christians say, or in the words of the Sufis, the mystical sect of Islam, ‘Trust in God and tie up your camel.’ It is only from here that newness can emerge.

The ‘Physiology’ of Innovation: Formal Logic



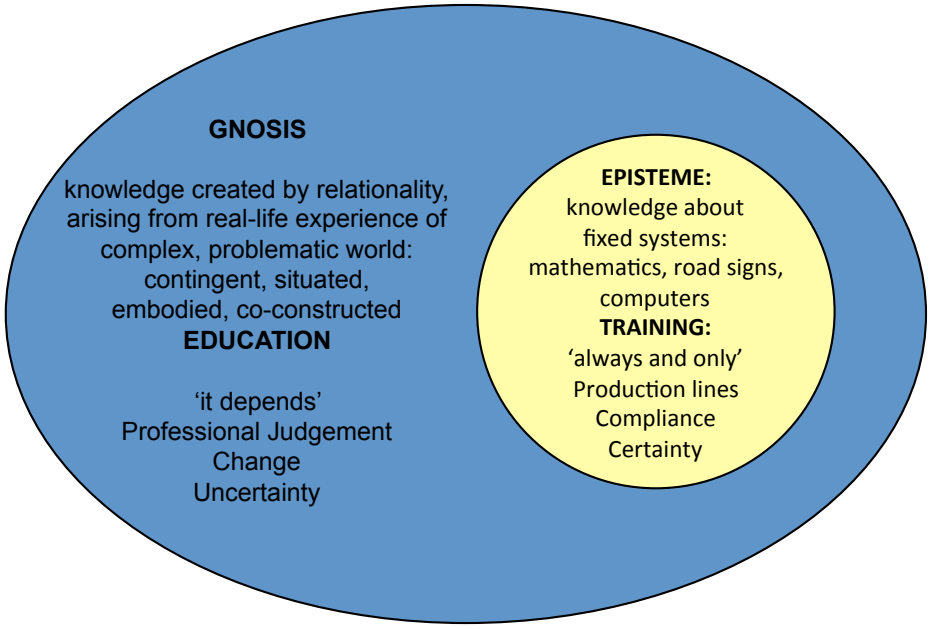
The ‘physiology’ of innovation is provided by the terms of formal logic, which underlie all of our language, laws, and meanings: we cannot think fruitfully, speak sensibly, or act appropriately, if we breach formal logic. This ‘egg diagram’ illustrates the relationship between the whole and the part, called in the terms of formal logic, the ‘sufficient’ and the ‘necessary’. The part is necessary for the whole to be sufficient, but the part is not a whole in and of itself – it is not sufficient. As we have already said, Invention – having an idea – is a necessary part of innovation, but it is just an

idea until it is implemented. Equally, without invention, there is nothing to be implemented – the whole requires the part.

Understanding the right relationship between the whole and the part is very important: if you mistake the part for the whole, then you have committed a 'category error' and whatever you propose, won't work. In innovation, a common category error is to mistake financial efficiency for educational effectiveness: financial efficiency belongs on the business map, belongs to Caesar, and sensibly tells us to tie up our camel! But it is only one part of achieving effectiveness, of making sure something is fit for its prime purpose, of creating education that works. Giving everyone an aspirin is financially efficient but may not be clinically effective; lining children up and telling them to play nicely together is financially efficient but rarely educationally effective. Similarly, a second common category error is to mistake quantitative data for qualitative data: numerical measurement may be quick and easy but it is unlikely to tell you what an educational problem is or how to solve it. The GMC Trainee Survey, for example, may provide quantitative data that 50% of the trainees in a particular department feel bullied, but in qualitative terms, that is quite a different problem in a department of two trainees to one of twenty trainees, and in neither case does it suggest an effective solution.

Can we be clear that I am not saying, here, that numbers are bad, and that I am saying that they are a part of a whole, necessary but not sufficient, and what's is more, used by you, everyday, in precisely that way? When you take my pulse or blood pressure, of course you are getting quantitative data about the efficiency of my circulation, and instinctively you are contextualising that as qualitative data about the effectiveness of my whole physical condition – you are holding the part and the whole in the right relationship. My point is, that successful innovation requires us to honour this fundamental relationship between part and whole, necessary and sufficient, since if we don't, if we fall into category errors like these two most common ones, then we shall be wasting our time and money.

The 'Biochemistry' of Innovation: Philosophy



The ‘biochemistry’ of innovation in education is provided by philosophy, and once again, we have an egg diagram, since once again, we have a logical relationship between Part and Whole, Necessary and Sufficient. The yolk of the egg, the necessary part, is a kind of knowledge called Episteme. This is a particular category of knowledge that deals with fixed systems, such as those in mathematics, or used by road signs, or used in computing, a set of instructions that must be adhered to in all circumstances and at all times, not up for discussion or question. It is this kind of knowledge that defines training, in which routinised processes must be adhered to with complete compliance, and it is why training is so powerful in production line settings, where uniformity is a priority. There is no discussion about which part of the tin the bourbon biscuits go, or whether the cylinder block might be better bolted onto another part of the engine. If you are asked a question, and you can begin the answer with ‘always and only’ then you know that you are in a training environment. However, if your reply to the question is, ‘it depends’, then you are drawing on another kind of knowledge, Gnosis. Gnosis cannot be formulated as a set of instructions, because it arises directly from a personal encounter with the world, from your real-life, daily experience, in settings that are complex and problematic, not uniform and unvarying. In gnosis, one piece of knowledge is contingent on every other piece, and on a specific situation, embodied by individual people, and created by the professional conversation between doctor and patient. If you are asked a question and you begin your answer with ‘it depends’, then you are in an educational environment, where what is learned is professional judgement, drawing on the certainties of Episteme and using them to explore the alternatives, probabilities, uncertainties and possibilities of managing the needs of a specific, individual patient. Episteme is necessary to the practice of medicine and to the practice of education: you have to know your subject. But it is not sufficient to describe being a doctor or being a teacher – ‘knowing that’ is not the same as ‘knowing how’ – and it is for this reason that the initiation into postgraduate medical education is an initiation into dealing with uncertainty. This, above all, is what typifies innovation: a deliberate separation from the certainties of previous knowledge and existence, and an initiation into uncertainty and the possibilities it brings.

Now, therefore, we have three landmarks to look for when we are journeying into innovation, three questions to ask ourselves when we are questing to bring something new into being, three ways of clarifying and focussing and analysing our ideas and the advice we are given by others. We are ready, then, to find how innovation is done, and we shall begin with two stories of successful innovators.

The first is Alexander Fleming’s discovery, on returning from holiday, of what he initially named ‘mould juice’ on one of the dirty petrie dishes he had left behind. He must have seen hundreds such dishes, but suddenly he noticed one particular fungus on one particular dish, and showed it to his assistant – charmingly named Merlin – who reminded him that this accidental noticing was how he had discovered lysozome earlier. Fleming, however, grew disheartened with the difficulties of cultivating, refining and producing penicillin and actually gave it up as bad job in 1940, when two biochemists at Oxford, Lorey and Chain, stumbled across his publications and brought Fleming’s initial discovery to fruition.

Similarly, the non-stick frying pan came about because Roy Plunkett suddenly noticed that he only got 900g of TFE from a 1000g cylinder and was both curious and annoyed enough to take a hacksaw to it. Hearing the racket, Charlie Pederson came in from the lab across the corridor, in time to see Plunkett shake 10g of what was to

become PTFE our of the cylinder's remains. However, real research didn't happen until the atomic bomb Manhatten Project funded it, and ICI joined in, when Teflon was created. Again, others took its further development forward, into Tefal cookware, Gore-Tex clothing, Scotchgard carpet protector, and so on.

Fleming's noticing of the penicillin fungus gives us an example of someone starting from their everyday practice and building on a sudden, creative insight, to develop something quite new: the so-called 'bed to bench' process. Plunkett's PTFE is much more like a technology-transfer, 'bench to bed' approach, where a compound is developed to create new applications, but it, too, began with a sudden noticing, one that made him inspired enough to take a hacksaw to a solid metal cylinder. This is the key moment of innovation: the point at which intuition arrests the logical mind, noticing a new possibility which it can't yet put into words, but which arouses the imagination to ask, 'what if'? Perhaps every clinician has had that intuitive moment, when a patient's history and tests all point in one direction, but something makes you wonder whether their condition could be, in fact, something quite different. Intuition and imagination are movements that comes from a deeper level than conscious knowledge, and so we call Intuition 'the knowledge before knowing' that awakens the Imagination to new possibilities, so that it asks, in half-formed terms, 'what if'? Intellect then comes into play, led by Intuition and Imagination to move forward from the known into the unknown, on a long, patient, difficult journey: the perspiration that follows the inspiration.

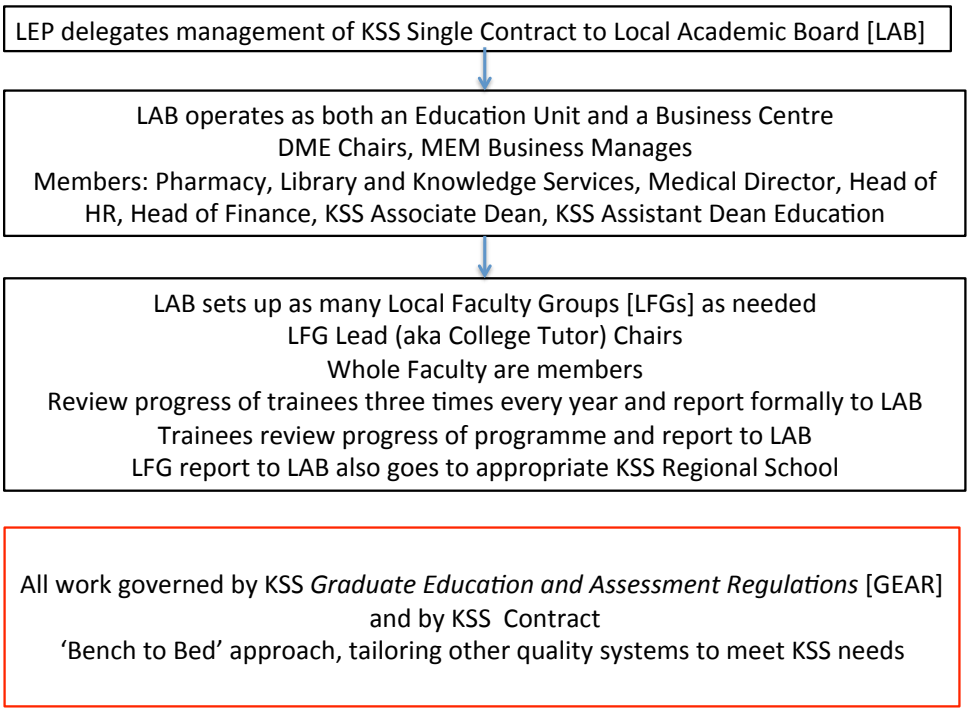
But note, too, how such journeys start with the help of an interested, supportive friend – the aptly named Merlin, the curious Charlie – who both witness and support the intuitive moment. And note, too, that the inventor needs the help of others to bring the intuition into full life in the world, to carry it forward, and to realise its full potential. This hero's journey is about relinquishing ego, not inflating it: the new idea has to be given to the world for it to come to life, not stored up in secret.
Various names have been given to this moment when Intuition and Imagination come together to provide sudden, powerful insight. The poet John Keats called it 'Negative Capability' and stressed, as we have, the importance of being able to sit with uncertainty without panicking into action. The psychoanalyst, Wilfred Bion, describes a state that he calls 'reverie', in which the unarticulated moral unconscious moves into consciousness. In the Renaissance, it was called 'anagogy', being taught by inspiration, and was the highest kind of knowledge, sought deliberately by Ficino and the Neo-Platonic philosophers. Today, we have called it 'gnosis', the knowledge arising from relationality, since Keats, Bion, Ficino, and your own clinical inspirations have in common the need to be in a specific, immediate, direct relationship with the source of inspiration. More prosaically, in PGME it is the quality that we call 'insight', the requirement that all doctors must develop and practice the set of humanistic qualities which the Gold Guide defines as 'professionalism'.

What do individuals need if they are to be innovative? First of all, they need time, space, and resource to look around them. Fleming and Plunkett were both expected to decide what to spend their time doing, and so they got on and made world-changing discoveries. As an employee, innovators need their role to be valued explicitly on the Business Map, to be seen as fundamental to the organisation's strategy, and to be built into their job description. Even more importantly, however, they need their work to be explicitly valued on the Ethical Map, to be operating to shared principles and values, in a culture of inquiry, discussion, and experimentation, that provides access to a expertise, ideas, and practice. Interdisciplinarity is vital, not

only to co-consult with expertise that you don't have yourself, but to develop a range of standpoints, to be able to look at things through a variety of lenses, and to learn from other disciplines. Crucially, however, you, your colleagues, and your organisation, have to be able to tolerate failure, and to see it as a helpful part of development, and pre-requisite of eventual success.

What do organisations need if they are to support innovation and implement the inventions of their innovators? First, the organisation needs a direct link between the innovator and the CEO and their senior decision-makers. This is the only way they will be able to design and implement effectively. Second, the organisation needs finance, human resource, and IT systems and managers that are supportive of innovation, and flexible enough to be responsive to it. As the literature on learning organisations tells us, this can be a challenge, since all three of these functions operate most efficiently on convergent, uniform, strongly boundaried systems, that can be intolerant of the divergent, specific, new needs of innovators. Third, in NHS Trusts, a key performance indicator for innovation potential is continuity in the senior management team: my experience is that if three of these people have all been in post for less than a year, then innovation in PGME is inhibited, and if more than four have all been in post for less than a year, innovation is severely compromised. Underlying innovation, as a basic prerequisite, therefore, is a stable organisational infrastructure, with good communication, shared values, and an explicit, practical support for innovators.

KSS Example 1: Managing the Single Contract



Like all Deaneries, KSS contracts annually with each NHS Trust in its region, in their role as Local Education Provider [LEP], to commission postgraduate medical education. To provide a robust quality management system, ensuring that KSS gets

value for money, and that postgraduate doctors get high-quality education, the Education Department created local structures within LEPs, specifically to manage its Contract. Locally, therefore, the KSS Contract is managed by the LEP's Local Academic Board [LAB], chaired by the Director of Medical Education [DME] and with membership from the LEP's senior management team, so that any fire-fighting can be done then and there. Reporting in to the LAB are as many Local Faculty Groups [LFG] as the LAB feels it needs, typically one per KSS Regional School. Each LFG is led by that Specialty's College Tutor, and meets three times a year to review the progress of each of its postgraduate doctors. Both LAB and LFGs operate to KSS *Graduate Education and Assessment Regulations* [GEAR], both meet three times a year, and both report in to KSS to enable us to produce our annual reports for statutory bodies. Here, then, you see a practical example of a 'bench to bed' approach, in which I took existing systems of quality assurance from other sectors and re-worked them for PGME.

Our system of teacher education for consultants provides an example of a 'bed to bench' approach. This began with a group of A & E consultants approaching me in 1993, wanting to know how they could find out whether their teaching was good or terrible. We discussed various possibilities, and tried various approaches, all of which looked promising but none of which worked, and so as a researcher, I started to observe them in their real-life, everyday practice. There, I noticed their practice of cross-consultation, heard the discussions they had, and developed the notion of a similar process for teacher education. This process I called a 'professional conversation', and I recruited senior educationists, whose expertise in teacher education was equivalent to the expertise of the consultants in their clinical specialty, to develop our programme. Now, working on a consultancy basis, a group of Education Advisers carry out one-to-one teaching observations, each about an hour long, of consultants working and teaching on wards, in clinics, and in theatres. Every hospital consultant has already attended a half-day Workshop, to establish shared principles and values, and a shared language, and typically, each consultant receives three visits, before both they and their Education Adviser sign them off as having developed a satisfactory standard of teaching in their real-life clinical settings. Inbetween each visit, they may have reading to do, or a particular focus to make, or journaling to complete, to provide continuity and further development. By 2014 we expect to have completed this programme with every one of the 2,500 consultants in our region, and at our last GMC inspection, this approach was regarded by them as a 'gold standard'.

On the Business Map, our quality system means that we are clear about what our money is buying from our LEPs, while for the Chief Executive Officers of each NHS Trust, one two hour face-to-face Contract Review meeting a year means that they can quickly reassure themselves and their Board that the Deanery Contract is operating effectively. On the Ethical Map, both the Deanery and the LEP are assured that each postgraduate doctor is receiving the support they require, that anyone needing additional support can be identified and supported immediately, and that best patient care is therefore being ensured.

On the Business Map, our teacher education system takes the Education Adviser to the consultant, and so removing locum costs and disruption to clinical work. On the Ethical Map, it has high validity – we accredit consultants as being able to really teach under the real pressures of clinical care – and it is tailored to individual need.

In both examples, the relationship between part and whole, between episteme and gnosis, is firmly held. The detailed, epistemic requirements of *GEAR* for the quality system are there to support the creation of a series of intersubjective relationships, between each postgraduate doctor and their Education Supervisor; between Education Supervisors at their LFG; between LFGs at the LAB; between the LAB and the CEO; and between the CEO, DME, and the Deanery. Similarly, and more simply, in our approach to teacher education, fundamental principles, values, language, and concepts – the episteme of the programme – are explored in the introductory workshop, which leads to the intersubjective relationship formed between Education Adviser and consultant, positioning it as gnosis. Crucially, in both cases, the innovation arose from an intuitive sense of need from both sides, from an imaginative collaboration, and from simply having the time, space, and resource, to think and explore creatively.